Lower Columbia River Water Use Plan

Lower Columbia River Sculpin and Dace Life History Assessment

Reference: CLBMON-43

Year 4 Report (2012)

Study Period: May 2012 – February 2013

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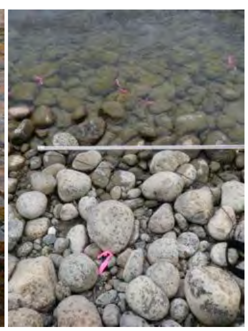
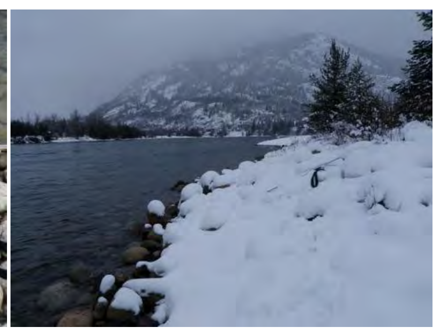
Lower Columbia River Sculpin and Dace Life History Assessment (CLBMON-43)

Year 4 Report (2012)



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CLBMON-43 Lower Columbia River Sculpin and Dace Life History Assessment

Year 4
FINAL REPORT

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Cover Photos Clockwise from top left: Slocan River at Sloc_39.4L in August 2012; Umatilla Dace (*Rhinichthys umatilla*) captured at Sloc_39.4L on May 9, 2012; LCR_10.5L during January 2013 surveys; location markers at LCR_24.5R during an HLK flow reduction; Torrent Sculpin (*Cottus rhotheus*) nest observed at LCR_2.8L on June 5, 2012.

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EXECUTIVE SUMMARY

The Columbia River Water Use Plan Consultative Committee identified that limited information was available to assess the potential impacts of seasonal operations of Hugh L. Keenleyside Dam (HLK) on sculpins and dace in the lower Columbia River (LCR) that are listed under the Species-At-Risk Act (SARA). Specifically, Umatilla Dace, Columbia Sculpin and Shorthead Sculpin are listed as species of Special Concern under SARA. During this process, several data gaps were identified with respect to fish habitat use and productivity in the LCR. The LCR sculpin and dace life history assessment (CLBMON-43) program's main objective is to collect information on the life history, timing, and habitat use of four sculpin (Prickly, Torrent, Columbia, and Shorthead) and two dace (Umatilla and Longnose) species that may be affected by water level fluctuations resulting from daily and seasonal operations of HLK. While all six species require study, the focus of the study is on the federally listed species (Shorthead and Columbia sculpin and Umatilla Dace) in the LCR. The present report discusses the results of Year 4, which was conducted between April 2012 and February 2013 to assess life history timing and habitats of these fishes as well as the potential impacts due to dam operations. The current state of knowledge with respect to BC Hydro's management questions for CLBMON-43 is provided in the following table. Further information will be collected in Year 5 to add to this knowledge.

Management Question	Status
How do water level fluctuations (diel and seasonal) in the lower Columbia River affect the distribution and habitat use of sculpins and dace, especially the listed species?	- HLK water level fluctuations occurring in September, October, February and late March may not influence the short-term distribution and habitat use of sculpins located in shallow shoreline areas that are at risk of dewatering in the LCR. This may also be true for Longnose Dace and Umatilla Dace, but sample sizes were too small (n=3 and 1, respectively) to draw any conclusion at this time. - A secondary high water period which occurs during the fall/winter period in the regulated LCR may provide an alternative habitat type for Umatilla Dace young of the year (YOY). This habitat type (i.e. flooded vegetation) is not available in an unregulated system.
What seasonal and diel habitat shifts do sculpins and dace (especially the listed species) make in response to water level fluctuations?	- Sculpins and dace moved away from areas that became dewatered, mainly towards the thalweg of the LCR, during flow reductions in September, October, February and late March. Habitat use has generally been the same before, during and after flow reductions. However, during some reductions sculpins were observed in deeper, faster or closer locations to shore than prior to these reductions. - Seasonal and diel shifts in habitat use were not commonly observed for Columbia and Shorthead sculpin in both the LCR and unregulated systems. - Adult Umatilla Dace use seasonally flooded shoreline vegetation during high-water periods in late spring and summer in the unregulated system; juveniles

Management Question	Status
	were observed in similar habitat in the LCR at that time. YOY were observed in predominantly gravel and cobble substrates during the low flow fall and winter periods in an unregulated system while they were observed in silt and flooded terrestrial vegetation during the winter in the regulated system.
Does the operation of HLK Dam alter these natural movements? Specifically, does the risk of stranding increase?	- The operations of HLK did not seem to alter the natural movements of adult sculpins and dace nor increase their risk of stranding during September, October, February or late March flow reductions. However, we cannot conclude at this time whether operations at HLK during other periods would alter the natural movements of target adult sculpins and dace and increase their risk of stranding.
Which operations, and at what season, pose the highest risk of stranding or interference with the normal life cycles of sculpins and dace?	- The risk of stranding at index sites for adult sculpins and dace during September, October, February and late March flow reductions at HLK was low. Also, these operations did not seem to interfere with the normal life cycles of sculpins and dace, since habitat use and movements were similar to what was observed outside of the flow reduction period at those times. - Flow reduction operations occurring between October 1 and May 30 may result in increased risk of stranding to listed sculpin and dace species (Golder 2011). It is likely that larval and juvenile life stages account for the majority of the sculpins and dace observed during this time based on current observations. This higher risk period likely corresponds to a time that would naturally not have much water level fluctuations and would have a longer wetted history, a factor that influences higher fish stranding in isolated pools (Irvine et al. 2008). - Critical life history periods for sculpins and dace include the spawning through larval rearing periods that occurs from June to late September. Male sculpins that actively guard nests (June to July in the LCR study area) may be at risk of stranding should their nest become dewatered as was observed in the unregulated Pass Creek. Recently emerged dace YOY using seasonally flooded terrestrial areas have been observed stranded in pools near Beaver Creek mouth as the LCR receded in summer (AMEC 2012).

1.0 INTRODUCTION

Operations of the Hugh L. Keenleyside Dam (HLK; Figure 1) affect the trophic productivity, quality and quantity of aquatic habitat, and the ecological health of the lower Columbia River (LCR; Aquametrix 1994, AMEC 2010a). As such, the Columbia River Water Use Plan (WUP) was initiated to address flow management issues with respect to impacts on competing water uses in the LCR, including fish, wildlife, domestic water supplies, recreationists, heritage uses, and electrical power needs. During the Columbia River WUP process, the Columbia River WUP Consultative Committee (CC) identified that biological data on threatened and endangered shallow water fish species, such as sculpins and dace, were lacking in the lower Columbia River (BC Hydro 2007). Specifically, limited information was available to assess potential impacts of seasonal operations of HLK Dam on endangered sculpins and dace in the LCR.

To address this data gap, the Columbia River WUP Consultative Committee recommended that “a study to determine the relative abundance, distribution, life histories, and habitat use of sculpins and dace in the lower Columbia River between HLK Dam and the US border” be undertaken (BC Hydro Terms of Reference (TOR) 2007). Species of interest include four species of sculpin and two species of dace: Prickly Sculpin (*Cottus asper*), Shorthead Sculpin (*C. confusus*), Columbia Sculpin (*C. hubbsi*), Torrent Sculpin (*C. rhotheus*), Longnose Dace (*Rhinichthys cataractae*) and Umatilla Dace (*R. umatilla*). Columbia Sculpin, Shorthead Sculpin and Umatilla Dace are listed as *Species of Special Concern* under the Species-At-Risk-Act (SARA; Government of Canada 2013). Shorthead Sculpin were reclassified from *Threatened* to *of Special Concern* in March 2013 which reflected an increase in the estimated number of locations in which this species is found (Government of Canada 2013).

Limited information exists on the ecology and behaviour of sculpins and dace in the lower Columbia River (McPhail 2007, AMEC 2010a). Previous studies targeting sculpins and dace mainly focused on methods to inventory and determine abundance and density of these species (R.L.&L. 1995, Golder 2002, AMEC 2003). Fish stranding and ramping studies conducted in the LCR by BC Hydro also provided information on distribution and relative abundance of these species. A few studies have collected seasonal and/or diel habitat use information on sculpins and dace (R.L.&L. 1995, AMEC 2003). Fish identification to the species level has been problematic and many have been misidentified in previous studies (AMEC 2010a). Also, in order to rapidly identify fish species and to focus on specific project objectives, many studies did not always identify fishes to the species level, which limits the species specific information available (AMEC 2010a).

It is important that the life history and habitat use of these species, in particular those federally listed, be assessed to determine potential impacts of flow fluctuations resulting from daily and seasonal operation of HLK Dam. It is also necessary to study these species’ life history and habitat use in a natural, unregulated setting as limited general life history and habitat use information is available for some species and life stages included in this study. Therefore, the present program also conducted studies in the unregulated Similkameen system (2009), Pass Creek (2010) and in the Slocan River (2011 and 2012) to fill in data gaps for some of the target species (AMEC 2010b, AMEC 2011, AMEC 2012). Sampling in the Similkameen system, which included the Similkameen and Tulameen rivers as well as Otter and Allison creeks, was conducted because a number of this program’s target species, most notably Columbia Sculpin, were present in high abundances (AMEC 2010a). Following initial life history information collection, methodology assessment and refinement in the Similkameen system (February to September 2009), studies were transferred to the LCR from October 2009 to present. In addition, studies on the unregulated Slocan River commenced in 2011 to fill in data gaps for Umatilla Dace (sampling locations, Figure 2).

2.0 OBJECTIVES

Management Questions of the Lower Columbia River Sculpin and Dace Life History Assessment (CLBMON-43) as outlined in the Terms of Reference (TOR) for this project are provided below (BC Hydro TOR 2007):

1. How do water level fluctuations (diel and seasonal) in the lower Columbia River affect the distribution and habitat use of sculpins and dace, especially the listed species?
2. What seasonal and diel habitat shifts do sculpins and dace (especially the listed species) make in response to water level fluctuations?
3. Do the operations of Hugh L. Keenleyside Dam alter these natural movements? Specifically, does this risk of stranding increase?
4. Which operations, and at what season, pose the highest risk of stranding or interference with the normal life cycles of sculpins and dace?

As knowledge of the basic life history and habitat use requirements for most of these species is lacking, the TOR specified that the monitoring program be designed around the following **Detailed Questions** and those in bolded text were the primary focus of Year 4:

A. Are there specific spawning areas utilized by the Columbia Sculpin and the Umatilla Dace and, if so, what are the temporal and biophysical characteristics of these areas?

B. Are there specific nursery areas used by Columbia Sculpin and Umatilla Dace and, if so, what are their biophysical characteristics?

C. Are there seasonal and diel shifts in habitat use by these species and, if so, how do these shifts relate to daily or seasonal water level fluctuations (diel and seasonal)?

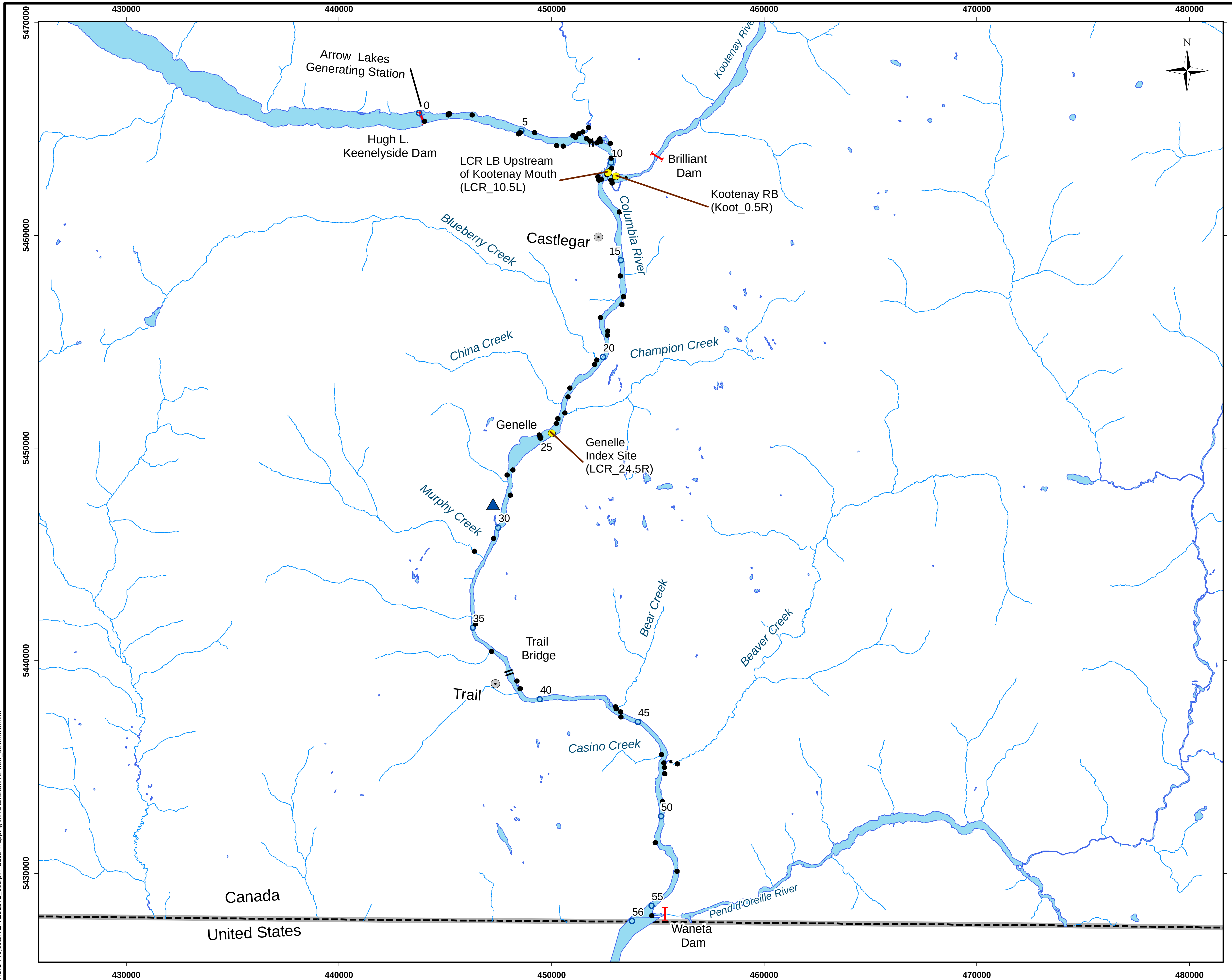
D. Do different age classes of Columbia Sculpin and Umatilla Dace use different habitats seasonally and, if so, do diel habitat shifts differ among age classes?

E. Are there over-wintering habitats used by these species and, if so, what are their biophysical characteristics?

F. Do diel and seasonal water level fluctuations affect spawning behaviour, embryo survival, or adult nest guarding behaviour of Columbia Sculpin and Umatilla Dace?

2.1 Purpose

The following fulfills AMEC's commitment to provide BC Hydro with a data report for Year 4 (2012) of this program and adds to the dataset collected to support BC Hydro's Detailed and Management questions outlined above. This report covers sculpin and dace studies conducted in the LCR and Slocan River from April 2012 to February 2013 (Year 4) and provides comparisons to unregulated systems, where applicable.



Legend

- 2012 Index Site
- 2009-2012 Sample Sites
- River Km
- Birchbank Water Survey Canada Station
- Dam
- City / Town
- River
- Lake

Scale: 1:175,000

4 2 0 4 8

Kilometres

Reference

Freshwater Atlas scale 1:20,000.

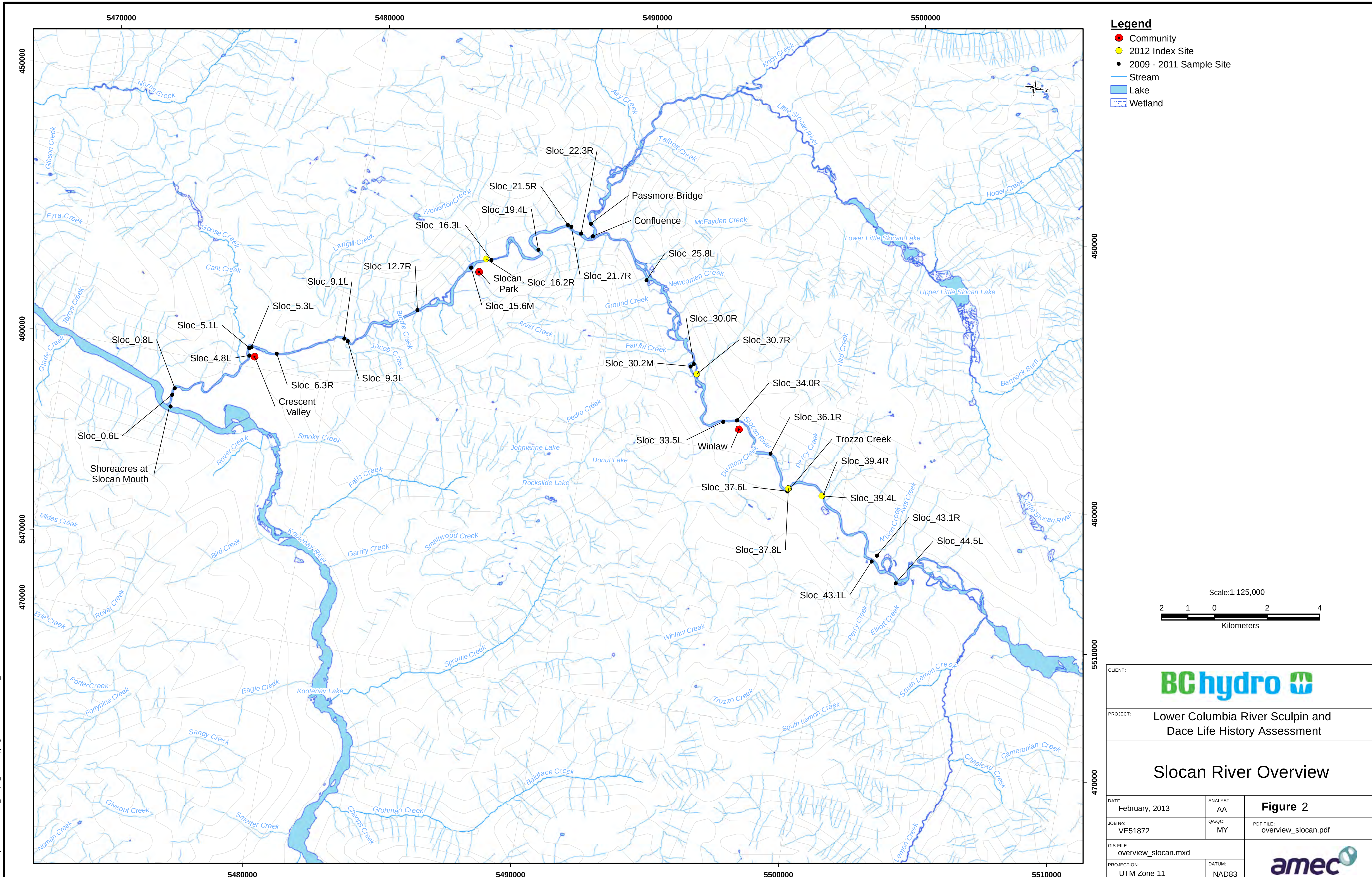
CLIENT: BC hydro

PROJECT: LCR Sculpin and Dace Life History Assessment

Columbia River Overview

DATE: February, 2013	ANALYST: AA	Figure 1
JOB No: VE51872	QA/QC: MY	PDF FILE: overview_columbia.pdf
GIS FILE: overview_columbia.mxd		
PROJECTION: UTM Zone 11	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\overview_columbia.mxd



Legend
Community
2012 Index Site
2009 - 2011 Sample Site
Stream
Lake
Wetland
Scale:1:125,000
2 1 0 2 4
Kilometers
Sloc_22.3R
Sloc_21.5R
Passmore Bridge
Sloc_19.4L
Confluence
Sloc_16.3L
Sloc_25.8L
Sloc_12.7R
Slocan Park
Sloc_16.2R
Sloc_21.7R
Sloc_9.1L
Sloc_15.6M
Sloc_5.3L
Sloc_30.0R
Sloc_5.1L
Sloc_0.8L
Sloc_30.7R
Sloc_4.8L
Sloc_30.2M
Sloc_9.3L
Sloc_6.3R
Sloc_34.0R
Crescent Valley
Sloc_36.1R
Sloc_0.6L
Sloc_33.5L
Winlaw
Trozzo Creek
Sloc_39.4R
Shoreacres at Slocan Mouth
Sloc_37.6L
Sloc_39.4L
Sloc_43.1R
Sloc_44.5L
Sloc_37.8L
Sloc_43.1L
Slocan River
Kootenay River
Kootenay Lake
Lower Little Slocan Lake
Upper Little Slocan Lake
Little Slocan River
Johnianne Lake
Donut Lake
Rockslide Lake
Norns Creek
Koch Creek
Airy Creek
Talbott Creek
Gibson Creek
Ezta Creek
Goose Creek
Wolverton Creek
Langill Creek
McFayden Creek
Hoder Creek
Cant Creek
Newcomen Creek
Ground Creek
Tanys Creek
Brouse Creek
Arvid Creek
Glade Creek
Jacob Creek
Fairful Creek
Hird Creek
Bannock Burn
Pedro Creek
Smoky Creek
Rover Creek
Dumont Creek
Percy Creek
Falls Creek
Aylwin Creek
Nixon Creek
Midas Creek
Smallwood Creek
Garrity Creek
Bird Creek
Erie Creek
Perry Creek
Elliott Creek
Winlaw Creek
Sproule Creek
Porter Creek
Fortynine Creek
Eagle Creek
Trozzo Creek
South Lemon Creek
Sandy Creek
Cameronian Creek
Chapleau Creek
Baldface Creek
Giveout Creek
Grohman Creek
Smelter Creek
Cheops Creek
Noman Creek
Lemon Creek
5470000 5480000 5490000 5500000 5510000
450000 460000 470000
Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\overview_slocan.mxd
CLIENT:
BChydro
PROJECT:
Lower Columbia River Sculpin and Dace Life History Assessment
Slocan River Overview
DATE: February, 2013
ANALYST: AA
Figure 2
JOB No: VE51872
QA/QC: MY
PDF FILE: overview_slocan.pdf
GIS FILE: overview_slocan.mxd
PROJECTION: UTM Zone 11
DATUM: NAD83
amec

3.0 METHODS

3.1 Study Areas

3.1.1 Lower Columbia River Study Area

The LCR study area encompassed the approximately 58 km section of the lower Columbia River from HLK to the U.S. Border as well as the lower Kootenay River below Brilliant Dam (Figure 1). However, the main focus of the study was concentrated around a number of index sites to monitor seasonal, diel and spawning habitat use and movements of various life stages. Index sites have been established over the duration of the program at locations in the lower Columbia and Kootenay rivers (AMEC 2012). Three main index sites were the focus of repeated sampling in Year 4; these were chosen based on habitat suitability for sculpin and/or dace, year-round accessibility and ability to monitor flow changes from either the lower Columbia or Kootenay rivers or both. Year 4 index sites included:

i) LCR_10.5L (LCR Left Bank (LB) upstream of Kootenay River mouth);

ii) LCR_24.5R (Genelle Index Site); and,

iii) Koot_0.5R (Kootenay River Right Bank (RB); Figure 1).

Additional sample sites were included from June through August throughout the LCR (Appendix A1) to expand the search area for sculpins and dace during their spawning periods. In addition, very high water levels precluded sampling at the three index sites for a portion of the 2012 high water period. The mouths of several tributaries were also sampled; Beaver Creek and an unnamed creek in Robson (LCR_43.9L and LCR_2.8L, respectively). These locations were considered LCR mainstem sites as the flow regime appeared to be more influenced by LCR than tributary discharge.

3.1.1.1 Tributaries

Tributaries to the lower Columbia and Kootenay rivers were not sampled in Year 4. However, mainstem areas at tributary mouths were sampled in the LCR (Section 3.1.1). Direct sampling of tributaries to these systems including Beaver, Blueberry, Murphy and Pass creeks has occurred in previous years (AMEC 2010, AMEC 2011, AMEC 2012).

3.1.2 Slocan River

The Slocan River was included in Year 4 to obtain additional information on Umatilla Dace life history and habitat use in an unregulated system to facilitate comparisons with the LCR study area and expand on information collected in Year 3 (AMEC 2012). Four index sites were selected in 2012, based on either frequent observations of Umatilla Dace or the capture of sexually mature Umatilla Dace in 2011. Index sites included: Sloc_16.2R; Sloc_30.7R; Sloc_37.8L; and, Sloc_39.4L (Figure 2). Three additional sites were sampled once or more to expand the search for adult Umatilla Dace: Sloc_22.3R; Sloc_30.2M; and, Sloc_43.1R (Figure 2, Appendix A2).

3.1.2.1 Tributaries

Tributaries of the Slocan River were not sampled in Year 4. Direct sampling of tributaries to the Slocan including Trozzo Creek and the Little Slocan River has occurred in previous years (AMEC 2010, AMEC 2011, AMEC 2012).

3.1.3 Similkameen River System

Sampling in the Similkameen watershed occurred in Year 1 (2009) to obtain information on select target species in an unregulated system to facilitate comparisons with the LCR study area. A summary and description of sample sites studied on the Similkameen River is provided in AMEC (2010b).

3.2 Sample Timing

A complete list of sample dates, locations and methods used during the Year 4 study period is provided in Appendix A. Sampling in the LCR study area occurred from mid April 2012 to late February 2013. The majority of sampling in the LCR study area focused on seasonal and diel habitat use and movements of various life stages of sculpins and dace especially in relation to water level fluctuations. Field surveys were also targeted at further identification of spawn times and habitats of the target species; however, sampling from June through August 2012 was limited by high water levels observed in the LCR. Field surveys in the LCR occurred approximately bimonthly from mid April through late August, then weekly through early-October and back to biweekly through mid December 2012 (Appendix A1). Sampling was also conducted in January and February 2013. Flow reduction surveys completed from March 30 to April 1, 2012 were included in the Year 3 report (AMEC 2012).

Sampling in the Slocan River occurred from mid-May 2012 to January 2013 (Appendix A2). Field surveys occurred monthly from April to November with additional surveys during August and September to cover the previously identified spawning period for Umatilla Dace (Appendix A2). A winter survey occurred in January 2013.

Throughout the remainder of this report, Year 4 is referred to as 2012 which includes data collected between March 2012 and February 2013.

3.3 Environmental Parameters

In order to address the management questions outlined for this program (Section 1.0) information on discharge and water temperature was collected. Hourly discharge and water temperature records for the LCR at Birchbank (BBK) were obtained from the MS Access database provided by the BC Hydro contract authority for this program. Hourly discharge records were obtained directly from Water Survey Canada (WSC) for the Slocan River near Crescent Valley from the WSC gauge (No: 08NJ013). In addition, Hobo Tidbit v2 water temperature loggers were deployed at the following locations: i) LCR_24.5R (Genelle Index Site; May 8, 2012 to February 14, 2013); ii) Koot_0.2L (Kootenay River below Selkirk College; October 25, 2009 to February 21, 2013); and, iii) Sloc_16.2R (Slocan Park; April 21, 2011 to April 4, 2013); and, iv) Sloc_39.4L (Appledale; May 10, 2012 to April 4, 2013). The loggers recorded water temperature every hour for the period of record and remain logging. Mean daily discharge and water temperature records for the LCR study area and the Slocan River were plotted separately.

3.4 Fish Capture & Observations

The following methods were used in Year 4. Additional sampling methods and advantages and disadvantages of each are discussed in AMEC (2010b).

3.4.1 Backpack Electrofishing

In order to determine species presence, spawn timing, behaviour and location (Specific Questions A and E), backpack electrofishing was used where water levels and accessibility allowed. A Smith-Root LR-24 backpack electrofisher was used with conductivity settings based on current water quality conditions and fish response/recovery. Two crew members, one operating the electrofisher and the other dip netting, conducted electrofishing surveys in shallower (depths between 0 and 1.5 m) shoreline areas of interest. In high velocity areas, a lip seine, sometimes referred to as a pole seine, was used in place of a dip net. The lip seine (1.5 m wide and 1 m high) was held in place downstream of the electrofishing zone to collect any stunned fish as they drifted with the current. Measurements recorded during electrofishing surveys included: electrofishing start/end time; electrofishing seconds; electrofisher settings as well as the length and width of the area electrofished. Catch-per-unit-effort (CPUE) for backpack electrofishing was also calculated for each site/survey (Appendix B). Backpack electrofishing enabled all life stages to be sampled as fish captured with this method during the program ranged between 11 and 160 mm in length. Note that sculpin lengths are measured by total length (TL) while dace are measured by fork length (FL).

3.4.2 Snorkel Observations & Dip Netting

Snorkel surveys were conducted to collect microhabitat use information for egg, YOY, juvenile and adult life stages of sculpins and dace (Detailed Questions A, B, C and E; Management Question 1, 2, and 4). Day and night-time snorkel surveys were conducted by two crew members experienced with identification of sculpins and dace. Snorkelers entered the water at the downstream end of the area to be surveyed and swam in an upstream direction along the shoreline searching for sculpins and dace. One snorkeler swam along the shoreline and the other snorkeler swam approximately one body length beside the first snorkeler to cover deeper habitats that could be safely sampled (i.e., up to the point where swimming could not be maintained due to flow conditions). This method required disturbing the substrate (e.g., cobbles and boulders) to see if a fish was using it for cover or if a nest was present (Section 3.4.5). Systematic observations of all sculpins and dace habitat were completed as best as possible within the flow and habitat conditions experienced during each survey. CPUE was calculated for each site/survey to compare and assess methods (Appendix B; Section 3.8).

The following were recorded during each observation taken: fish species, estimated length (mm) and microhabitat information was estimated as outlined in Section 3.7.1. Fish were captured by hand-held aquarium dip nets, when possible, and sampled as outlined in Section 3.5.

Dip netting allowed early life history stages to be sampled from slack, nearshore areas. Fish captured by this method were between 9 and 32 mm in length.

3.4.3 Nest Assessments

Nest assessments were used to answer Specific Questions A and E as well as Management Questions 1 and 4. A male sculpin will establish and guard a nest rock under which female sculpins will deposit egg masses to be fertilized. More than one female can place eggs on the underside of a single male's rock throughout the spawning period and each clump of eggs deposited can be identified by the number, colour and egg stage (AMEC 2010a). Egg diameter is similar for all sculpin species, except for Prickly Sculpins which lay significantly more eggs per clump with eggs smaller in diameter (AMEC 2010a, AMEC 2010b). Less is known about dace spawning, but egg diameters of Longnose and Umatilla dace are similar based on laboratory studies (see AMEC 2010a). For Longnose Dace, the male clears a patch of coarse gravel creating a depression to be used for spawning. Females lay eggs and males fertilize them over these cleaned gravel areas. It is unknown whether Umatilla Dace spawning is similar to Longnose Dace at this time. Further background information on the spawning of sculpins and dace is provided in AMEC (2010a and 2010b).

Sculpin nest searches were conducted on June 5, 2012 during day-time snorkel surveys at LCR_10.5L and LCR_2.8L; additional surveys were not conducted later in the spawning season as water levels became too high to access spawning substrates. Substrates (cobble/boulder) were carefully overturned to observe whether a nest was present. When a nest was observed the nest rock was carefully pulled to the surface either by hand or by a large dip net. Observations taken at each sculpin nest included: depth; velocity; UTM; number of egg masses; condition; colour; estimation of the number of eggs alive/dead/fungused; egg development stage; substrate type (i.e., cobble, boulder); rock dimensions; distance from shore; and other pertinent observations (e.g., presence of algae). Sculpin nests were returned to the same location and marked with a brightly coloured disk. Care was taken not to disturb the eggs on each nest. However, if eggs were dislodged when the rock was overturned, the egg masses were preserved so that the eggs could be counted and their diameter measured. Photographs of all nests were also taken.

Nest searches for Umatilla Dace were not conducted in 2012.

3.4.4 Minnow Trapping

A minnow trapping program was continued in 2012 following the successful collection of adult Umatilla Dace in the LCR, Kootenay and Slocan rivers (AMEC 2012). In order to refine estimates of spawn timing, behaviour and location (Specific Questions A and E), minnow traps were deployed in vehicle/foot accessible areas with low velocity on July 17 and August 30, 2012 in the lower Columbia and Kootenay rivers and monthly from May 8 to September 18 with additional effort in August/September in the Slocan River (Appendix A). Sampling was targeted at habitats and locations where Umatilla Dace have previously been captured.

Minnow traps were set in the afternoon and collected the following day with set times between 16 and 23 hours. The only exception was a diurnal sample program conducted in the Slocan River in mid-August during which traps were checked every 6 hours to capture the day, dusk, night and dawn periods (Section 3.4.8). A minimum of four traps were set at each site. All traps were baited with salmon roe encased within aluminum foil. Information recorded at each trap included: set and pull time, depth, velocity, habitat (e.g., substrate type and presence of vegetation) and distance from the shoreline. A general habitat overview, including photographs, was recorded at least once during the field season at each site. CPUE was calculated for every minnow trap at each site during each sample session (Appendix B). Minnow trapping captured fishes that ranged between 33 and 116 mm in length. The minimum girth of fish captured was limited by the mesh size of the traps (6.35 mm) and the maximum girth was limited by the trap entrance (25.4 mm).

3.4.5 Young-of-the-Year (YOY) Sampling

In order to answer Detailed Questions A and B, YOY sampling was conducted from July 2012 to February 2013. Sample methods used in Year 4 included backpack electrofishing and snorkelling. These methods are detailed in Sections 3.4.1 and 3.4.2.

3.4.6 Passive Integrated Transponder (PIT) Tagging

In Years 1 through 4, tracking Passive Integrated Transponder (PIT) tagged fish was used to help answer Detailed Questions A, C, D, and E as well as Management Questions 1 through 3 (AMEC 2010b; AMEC 2011; AMEC 2012). In Year 4, target fish captured by backpack electrofishing during sampling on March 28, May 7 and September 18/19 in 2012 and on February 7, 2013 at index sites in the LCR were PIT tagged. In addition, adult Umatilla Dace captured in minnow traps in the LCR and Slocan study areas between June and August 2012 were PIT tagged.

Passive Integrated Transponder (PIT) tags were implanted into anaesthetized adult dace and sculpin (>45 mm in length) by making a small incision (3 to 4 mm in length) on the ventral surface, anterior to the urogenital papilla. A PIT tag was manually inserted into the peritoneal cavity (Keeler 2006; Zaroban and Anglea 2010). Low tag loss rates and no change in net-avoidance behaviour have been documented for PIT tags inserted into the body-cavity of Shorthead Sculpin (Zaroban and Anglea 2010). Sutures and glues were not used because the incisions were small and these techniques were not useful in other sculpin tagging (Keeler 2006). Two sizes of PIT tags were used: 8.5 mm tags for fish between 45 and 60 mm; and, 11.5 mm tags for fishes >50 mm in length. Sculpins and dace between 50 and 60 mm ideally received larger tags, however, those with narrow abdominal cavities were tagged with the smaller tags. Following recovery from anaesthetic, processed target species were held instream for approximately 24 hours in live boxes (modified Rubbermaid™ tubs with cut-out mesh windows for water flow). After this time, fishes were inspected to confirm survival, tag retention and normal swimming/holding behaviour before being released to the river.

3.4.7 Passive Integrated Transponder (PIT) Tag Tracking

Tracking of PIT tagged fish occurred on April 13 (included in AMEC 2012), September 5, October 4, November 8 and December 17, 2012 at the two index sites. Additional tracking sessions were conducted in association with HLK flow reductions (Section 3.4.9). Tracking was not conducted between May and August because high water levels precluded wading where tagged fish were previously located. However, additional sampling methods were used to capture target species and captured fish were inspected for tags and marks.

A portable handheld PIT tag antennae designed by Destron Fearing Corp. (MN, USA) was used similarly to a metal detector to scan wadable habitat for PIT tagged fish. One crew member systematically scanned the entire index site with the PIT tag antennae from the downstream end to the upstream boundary. Tag detection with the PIT tag antennae is approximately 15-20 cm for 8.5 mm tags and approximately 35-45 cm for 11.5 mm tags (AMEC 2010b). Upon locating a tagged fish, the location was marked with a flagged bolt labelled with the PIT number. The second crew member recorded the GPS location, microhabitat use information and distance and direction of movement from last location, if possible, on standardized data forms. Fish were determined to be alive if they moved when the substrate was gently disturbed (this was not done during tracking surveys prior to or during flow reductions).

3.4.8 Diel Sampling

Backpack electrofishing was used to assess diel (day vs. night) differences in nearshore habitat use in the LCR and Kootenay River in spring, summer and fall in Year 4. Diel sampling was conducted during all three seasons at Koot_0.5R and during the summer at LCR_53.1R (Fort Shepherd Boat Launch). An area was delineated at each location and all wadable area was electrofished by a 2-person crew in the day and again at night to replicate similar effort levels. Headlamps were worn by each crew member to illuminate the survey area at night; direct illumination of areas yet to be surveyed was avoided as much as possible to reduce potential startling of fish. All fish observed were collected and microhabitat information was measured at each point of Umatilla Dace capture. Fishes were returned to the sample site immediately following the survey. The time interval between the day and night sampling was approximately 8 to 14 hours, depending on the season, to allow time for natural redistribution under normal flow conditions (i.e., sampling was not conducted during flow changes).

Diel PIT tracking surveys were conducted at two LCR index sites (LCR_10.5L and LCR_24.5R) on November 8, 2012. Surveys were spaced approximately 7 hours apart and followed tracking methods outlined in Section 3.4.7.

In the Slocan River, diel sampling using backpack electrofishing was conducted during all seasons in 2012. Methods were the same as those outlined above. Diel sampling was conducted at Sloc_39.4L during all seasons, Sloc_37.8L during all seasons except summer and at Sloc_16.2R and Sloc_30.7R in the fall and winter only (Appendix B).

To investigate diurnal differences in nearshore habitat use by Umatilla Dace during the spawning period, minnow traps were deployed at three Slocan River index sites and checked every 6 hours for a 24-hour period on August 16-17, 2012. This method has successfully been used by other researchers to study diel cycles for small stream-dwelling species such as speckled dace, blacknose dace, lake chub, threespine sticklebacks and juvenile white sucker (Reebs et al. 1995; Gryska 1998). General minnow trap deployment and data collection procedures are described in Section 3.4.4. Baited traps were set for intervals intended to capture activity during the day (09:00 – 15:00), dusk (15:00 – 21:00), night (21:00 – 03:00) and dawn (03:00 – 09:00). Traps were checked as close to the beginning and end times of these periods as possible. Any fish captured were identified to species and released approximately 2 m away from the traps; if UDC were captured, a length measurement was taken and they were examined for external signs of sexual maturity (Section 3.5).

3.4.9 Flow Reduction Sampling

In order to answer management questions pertaining to the impacts of HLK operations on the movements and habitat use of sculpins and dace, surveys occurred during flow reductions in September and October 2012 and February 2013. Adult sculpins and dace were captured on March 28, May 7 and September 17 and 18, 2012 and on February 7, 2013 by backpack electrofishing and were PIT tagged following methods outlined in Section 3.4.6 at LCR_10.5L (n= 106) and LCR_24.5R (n= 160). Tagged fishes were placed in flow-through bins secured in the river for approximately 24 hours. However, fishes were released directly to the river following full recovery on February 7, 2013 to allow natural redistribution prior to the flow reduction which commenced the afternoon of February 8, 2013. Fishes were scanned for PIT tags and returned back to the study site once tag retention was confirmed and they appeared fully recovered from surgery. Information collected during a HLK flow reduction March 30 to April 1, 2012 was included in AMEC (2012).

Pre-flow reduction tracking surveys were conducted prior to the commencement of HLK flow reductions, either one day or a few hours prior, depending on how much advance notice was available (Table 1). Each site was tracked once prior to, once during or immediately following and once again within 2 weeks following the reduction (Table 1).

Tracking surveys were conducted as outlined in Section 3.4.7. In addition, GPS track logs of the location of the wetted edge were collected prior to and following each flow reduction. Track logs were collected by one crew member walking slowly along the shoreline while holding a handheld GPS (Garmin 60Cx) set to log location coordinates every second.

Table 1: Summary of Hugh L. Keenleyside Dam (HLK) flow reductions and associated surveys at Lower Columbia (LCR) and Kootenay (Koot) River sites, 2012-2013.

Date	HLK (kcfs)	Flow Reduction Time	Sample Sites	Sample Time	Sample Method	Pre-reduction sampling	Post-reduction sampling
September 15, 2012	60 to 45	06:00 to 10:00	LCR_24.5R	12:15 to 13:25	PIT Tracking	Sep. 14	Sep. 17
			Koot_0.5R	10:20 to 10:35	Backpack Electrofishing		-
September 28, 2012	46 to 44	15:00 to 17:00	LCR_10.5L	-	PIT Tracking	Sep. 28	Oct. 4
September 29, 2012	44 to 32	07:00 to 09:00		10:30 to 12:45			
October 26, 2012	45 to 40	15:00 to 16:00	LCR_10.5L	-	PIT Tracking	Oct. 26	Nov. 8
October 27, 2012	40 to 30	08:00 to 09:00		11:35 to 13:15			
February 8, 2013	67 to 53.5	12:00 to 14:00	LCR_10.5L	15:20 to 16:15	PIT Tracking	Feb. 8	Feb. 14
			LCR_24.5R	17:00 to 18:40			
February 9, 2013	53.5 to 40	08:00 to 10:00	LCR_10.5L	11:30 to 12:47	PIT Tracking		
			LCR_24.5R	14:20 to 15:50			
			Koot_0.5R	13:05 to 13:30	Backpack Electrofishing	Feb. 7	-
February 16, 2013	40 to 28	08:00 to 10:00	LCR_10.5L	11:25 to 12:55	PIT Tracking	Feb. 14	Feb. 21
			LCR_24.5R	14:55 to 16:10			

Notes: "-" No survey conducted

Tracking was also conducted outside of the repeated tracking area during pre- and post-reduction sampling to determine if tagged fish moved to upstream or downstream areas outside of the tracking site. This was completed by tracking a minimum of 50 m upstream and 50 m downstream beyond the boundaries of the repeated tracking area.

In addition to PIT tracking, a single-pass backpack electrofishing survey was completed through the entire wadable area at Koot_0.5R prior to the flow reduction survey on September 14, 2012. Habitat use information was collected at the point of capture for all Umatilla Dace observed (Section 3.7). Dace captured were then identified to species, anesthetized, measured, weighed and marked with a visible implant elastomer (VIE) tag. Following recovery, all fish were returned to the general location of capture within the index site. A GPS track log was collected to delineate the area surveyed. Following the flow reduction on September 15, the same survey procedure was employed and the recapture of any VIE marked dace was recorded. This method was repeated again at Koot 0.5R prior to and following the February 9, 2013 flow reduction though dace were not tagged with VIE at this time.

3.5 Fish Life History Sampling

Captured fishes were identified to species and target species were measured for length (to the nearest mm) and assessed for ripeness/maturity (i.e., slight pressure on the abdomen was used to see if milt or eggs were expressed). If males were expressing milt and if females' expressed eggs or abdomens appeared soft or urogenital pores swollen then they were considered sexually mature and in spawning or just post-spawning condition. In addition to these characteristics, Umatilla Dace displaying red pigmentation on the lips and fin insertions were potentially in spawning condition and these characteristics were recorded when observed. Fish were also inspected for any anomalies and those of interest were photographed and/or vouchered.

3.6 Verification of Sculpin & Dace Identification

Identification of sculpins and dace to the species level can be difficult due to similar external features attributed to several of these species (AMEC 2010a). Photographs were collected during the 2012 study period to confirm species identification. In 2011, voucher samples of adult and juvenile Umatilla Dace were sent to Dr. Don McPhail (Curator Emeritus, University of British Columbia Fish Museum, Vancouver, BC) to confirm species identification. Additional samples of sculpins were also sent to Dr. McPhail in previous years (AMEC 2010b, 2011). Dr. McPhail confirmed that all vouchered specimens were correctly identified.

3.7 Incidental Captures From Other Programs

Incidental capture of sculpins also occurred during the Lower Columbia River Physical Habitat and Ecological Productivity (CLBMON-44) program conducted by Ecoscape Environmental Consultants. AMEC was provided with photos of seven sculpins captured in benthic rock baskets during that program. Sculpins were identified to species, where possible, and the location of capture (UTM) and depth of capture was added to the project database.

Sculpins and dace captured incidentally during other programs in the LCR, for example the Upper Columbia White Sturgeon Management Program, have been reported previously (AMEC 2012).

3.8 Microhabitat Use Measurements

In order to answer Detailed Questions A, C, D and E as well as Management Question 1, 2 and 3, habitat use information was recorded at locations where target fish species were observed during tracking surveys, snorkel surveys, YOY sampling and nest assessments. Measurements recorded included depth (m), mean column water velocity (m/s) taken at 60% mean depth, substrate type, % substrate embeddedness, presence of vegetation, location (i.e., bank (left, right, center), distance to shore (m)), and other relevant observations. Further details are provided in AMEC (2010b).

3.9 Data Analyses

The TOR specified that this program was qualitative in nature, therefore most data were tabulated and summarized by descriptive statistics (means, standard deviation, standard error, 95% confidence limits), where possible. All data collected in Year 4 were entered into the CLBMON-43 MS Access database developed specifically for this program. All descriptive statistics and analyses were compiled using JMP (Version 7.0) statistical software. Comparative statistics were used in Years 3 and 4 to evaluate data trends where possible. Data distributions were inspected using histograms to assess normality of the distribution and determine if transformation was required.

Seasons were defined by calendar dates, except for the separation between spring and summer where peak discharge in each system was used instead. Therefore, seasons in Year 4 were defined as follows:

- Spring - March 21 to July 21 (LCR Study Area) or June 23 (Slocan Study Area);
- Summer - July 21 (LCR Study Area) or June 23 (Slocan Study Area) to September 22;
- Fall - September 22 to December 21; and,
- Winter - December 22 to March 20.

CPUE was calculated based on sample methods used exclusively in Year 4. Minnow trapping was calculated using hours as the unit of effort to obtain a catch rate per hour. Backpack electrofishing and snorkel surveys were calculated using both sample effort time (seconds and hours, respectively) and square meter of area sampled as the unit of effort. Using sample area as the unit of effort allowed for direct comparisons of catch rates between backpack electrofishing and snorkelling methods; comparisons were not made between these two methods and minnow trapping as different units of effort were used.

Habitat use data were compared by season, day versus night and life stage for target species where information was available. Methods used in these analyses were those that collected direct microhabitat use measurements and included backpack electrofishing, snorkel, PIT tracking, seine netting, nest assessments and YOY sampling. Habitat use observations collected during flow reductions were not included as part of seasonal analyses. Habitat use observations for fish collected in minnow traps was analyzed separately, since fish were drawn into the traps and capture location may not be representative of direct habitat use. Information was pooled for all years that data is available (2010 to 2013) as limited observations for certain species, life stages and seasons are available at this time. Analysis of Variance (ANOVA) was used for multiple comparisons and Tukey's post hoc test was used to compare pairs of means. Statistical significance was set at $p < 0.05$ for both tests.

Comparisons of habitat use among age classes were facilitated by assigning life stages to all captured individuals based on general life history and development for sculpin and dace species as provided in AMEC (2010a). It was very difficult to identify YOY sculpins <20 mm length. Therefore, analyses of YOY habitats were conducted by pooling observations for all sculpin species. General life history categories included adult, juvenile and YOY (Table 2). The length values attributed to each life stage category were standardized in Year 3 based on initial results and that provided in the literature (AMEC 2010a).

Table 2: Life stage categories and associated lengths for sculpins (total length) and dace (fork length).

Life Stage	Length
Adult	>45 mm
Juvenile	>35 to 45 mm
YOY	Up to 35 mm for Columbia/Shorthead/Umatilla; Up to 40 mm for Prickly/Torrent

Diel minnow trap Umatilla Dace catch numbers and catch per unit effort were compared by ANOVA at each time interval (day, dusk, night and dawn) with statistical significance set at $p < 0.05$.

To compare movements during both flow reduction and non-flow reduction surveys, PIT-tracking data were reviewed and only sculpins and dace confirmed to be alive were included in analysis. The distances moved by PIT-tagged adult sculpins and dace were determined by calculating the difference between detection locations over time. If field displacement measurements were not available, the Pythagorean Theorem ($a^2+b^2=c^2$) was used to calculate the displacement as the shortest distance (i.e., as the crow flies) between easting and northing UTMs for one detection location and the next. Movement rate and direction were calculated for each flow reduction only on PIT-tagged fish which were observed during consecutive stages of the reduction.

Habitat variables were pooled by season for all tracked sculpins and dace observed prior to, immediately after and following flow reductions. Means with standard deviation were calculated for movement rates and habitat variables, where appropriate. ANOVA was used to determine if differences in habitat use and movement rates before, during and after flow reductions were statistically significant ($p < 0.05$).

4.0 RESULTS

The results presented herein are based mainly on the Detailed Questions (Section 2.0) that were the focus of Year 4, especially for Umatilla Dace where limited information was available from previous years.

4.1 Environmental Parameters

4.1.1 LCR Study Area

In 2012, freshet occurred in the LCR study area in late July (Figure 3). The ascending limb of the hydrograph occurred from approximately April 1 to July 21 and the descending limb from July 22 to late September. The period of ascending flows was longer than in 2011 and 2010 with flows increasing incrementally following the April 1 rainbow trout spawning protection flows (AMEC 2012). Peak discharge was 6,066 m^3/s on July 21, 2011 (Figure 3). Peak discharge was nearly 2,000 m^3/s higher than in 2011 (4,177 m^3/s on July 8; AMEC 2012), occurred approximately 2 weeks later than in 2011 and was the highest recorded since the construction of HLK in 1967. The low flow period in the LCR study area occurred from mid-September to mid-November at which time flows increased to approximately half of maximum annual discharge (approximately 3,000 m^3/s) until early February 2013 (Figure 3). Water temperatures gradually increased from March to reach a maximum of 17.4°C on August 15, 2012 and then declined into the fall period (Figure 3). Water temperature data collected at BBK were not used after May 26, 2012 due to equipment malfunction and data collected at Genelle were used for the remainder of the year.

4.1.2 Slocan River

In the Slocan River, freshet occurred in late June/early July in 2012. The ascending limb of the hydrograph occurred approximately April 10 to June 30 and the descending limb occurred from July 1 to September 1. Peak discharge was 660 m^3/s on June 23, 2012 (Figure 3). The low flow period on the Slocan River occurs between early September and early April (Figure 3). Water temperatures increased from winter lows in March to reach a maximum of 20°C on August 20 and then declined in late September 2012 (Figure 3).

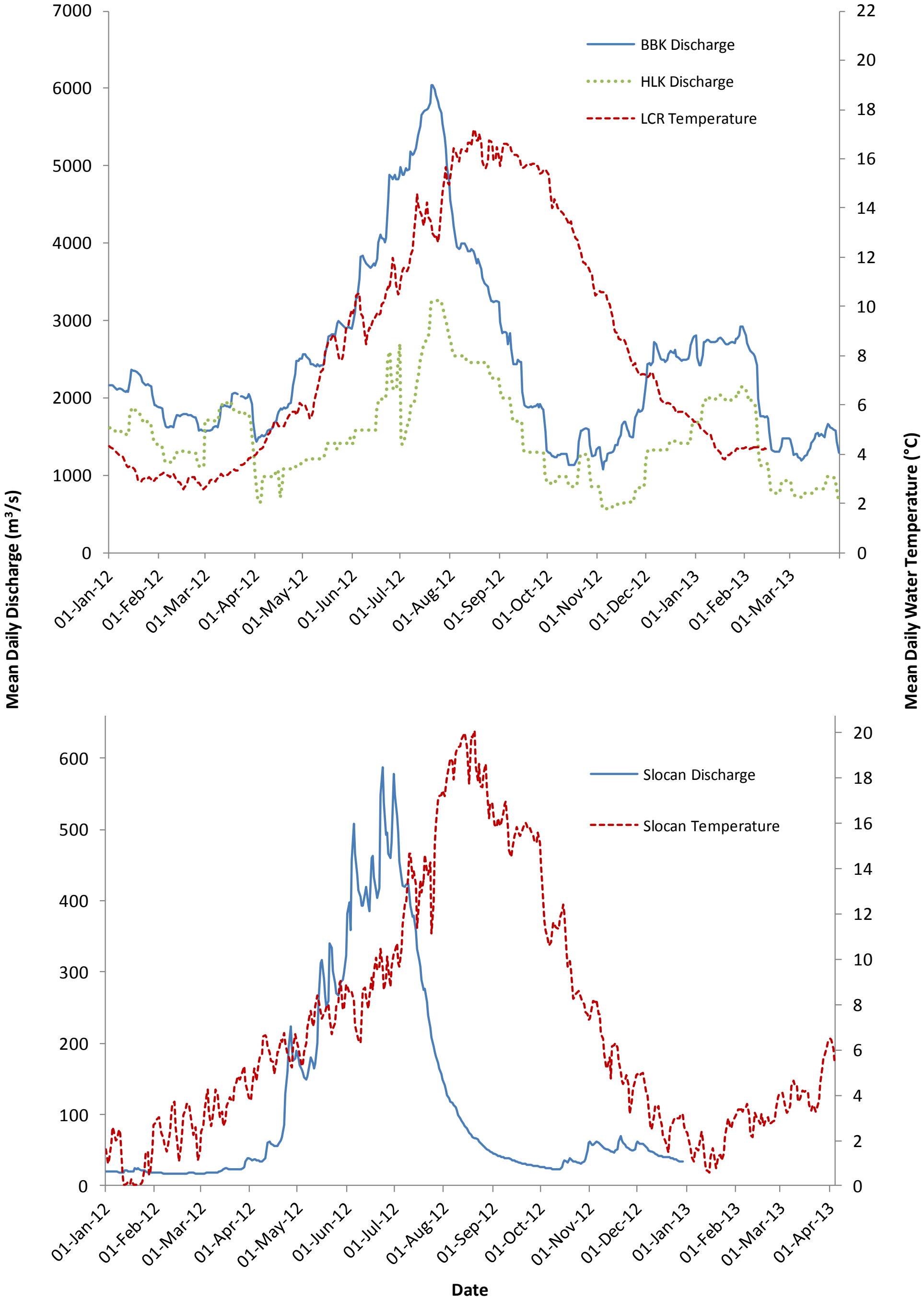


Figure 3: Discharge and water temperature for the LCR Study area (Top) as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK) and for the Slocan River (Bottom; WSC Station No: 08NJ013), January 2012 to April 2013. Note differences in scale for the discharge axis. LCR water temperature was measured at BBK from January 1 to May 25, 2012 and at the LCR_24.5R from May 26 to February 9, 2012.

4.2 Fish Distribution & Catch Rates

A summary of the overall effort spent for each fish survey method by study area, site and season is provided in Appendix B. In total, 867 hours of minnow trapping (MT), 34,702 seconds of backpack electrofishing (EF), 6 hours of snorkelling and 53.8 hours of PIT-tag tracking were completed in the LCR study area in 2012 and early 2013 (Year 4). This effort resulted in the capture of 3,101 fishes, which included 130 Umatilla Dace, 86 Columbia Sculpins and 102 Shorthead Sculpins (Table 3; Appendix B1 and B2). In addition, PIT-tagged sculpins and dace were relocated 215 times, which included 4 relocations of Umatilla Dace, 27 Columbia Sculpins and 60 Shorthead Sculpins (Appendix B3). In the Slocan River, 2,697 hours of minnow trapping and 19,541 backpack EF seconds were spent in 2012 and early 2013. This effort resulted in the capture of 980 fishes which included 106 Umatilla Dace (Appendix B1 and B2).

CPUE for Umatilla Dace captured with minnow traps was higher in the Slocan River than in the LCR study area (Table 3). Backpack electrofishing in both systems resulted in the same CPUE for Umatilla Dace and Columbia and Shorthead sculpin (Table 3). CPUEs for Columbia and Shorthead sculpin were the same in the LCR study area on a method by method basis. CPUE for snorkelling was lower than for backpack electrofishing in the LCR study area; identification of sculpins to species while snorkelling is difficult unless the sculpin is captured. Minnow trapping effort was higher and backpack electrofishing effort was lower in the Slocan River than the LCR study area in Year 4; snorkel surveys were not conducted in the Slocan River in 2012.

Distribution maps outlining Umatilla Dace, Columbia Sculpin and Shorthead Sculpin capture locations in the LCR have been updated with Year 4 capture information and are provided in Appendix D. Further information for these species is provided below.

Table 3: Total captures of Umatilla Dace, Columbia Sculpin and Shorthead Sculpin in the lower Columbia (LCR) and Slocan study areas by capture method, 2012-13. Catch per Unit Effort (CPUE) is provided in brackets.

Capture Method	LCR			Slocan
	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin	Umatilla Dace
Minnow Trapping	9 (0.01)	0 (0)	0 (0)	44 (0.02)
Backpack Electrofishing	121 (0.01)	84 (0.01)	100 (0.01)	62 (0.01)
Snorkeling	0 (0)	2 (0.002)	2 (0.002)	-
Total	**130**	**86**	**102**	**106**

Note: CPUE was calculated as fish captured per hour of effort for minnow trapping and as fish captured per square meter for electrofishing and snorkelling.

4.2.1 Umatilla Dace

In the LCR study area, the majority of Umatilla Dace were captured in the lower Kootenay River, predominantly at Koot_0.5R (Figure 1). CPUE was highest during the winter when using backpack electrofishing (Table 4). Catch rates were similar in the spring and summer using minnow traps which were the only seasons they were used in Year 4 (Table 4). Umatilla Dace are distributed throughout the LCR study area (Appendix C). Sites with the highest capture rates over the course of this study have included Koot_0.5R, LCR_47.5L and LCR_53.1L.

In the Slocan River study area, Umatilla Dace sampling occurred at four sample sites in Year 4 and catch was highest at Sloc_30.7L (Figure 2; Appendix B). CPUE was highest during fall when using backpack electrofishing and during the summer when using minnow traps (Table 5).

4.2.1.1 LCR Study Area

Based on both the actual number of fishes captured, backpack electrofishing was the most successful way to capture Umatilla Dace followed by minnow trapping in the LCR study area (Table 3). Of the 130 Umatilla Dace captured in the LCR study area, 97 (75%) were from the lower Kootenay River (n=89 backpack electrofishing and n=8 MT), mostly at Koot_0.5R (Appendix B1 and B2). The remaining 33 were captured in mainstem LCR sites, almost entirely by backpack electrofishing (n=32; Appendix B2).

Average CPUE for Umatilla Dace captured in the LCR study area varied by method and season of sampling. On a seasonal basis, CPUE was similar using minnow traps in the spring and summer which were the only seasons they were used (Table 4). CPUE was also similar using backpack electrofishing during the spring, summer and fall seasons but was higher during the winter period. Umatilla Dace were not observed during snorkel surveys in 2012 (Table 4). Sites where the highest Umatilla Dace CPUE was observed (all methods) included Koot_0.5R, LCR_2.8L, LCR_24.5R, LCR_47.5L and LCR_53.1L (Appendix B).

Table 4: Average catch per unit effort (CPUE) by season, method and species in the LCR study area, 2012. Results are also presented for all fish captured. Methods include minnow trapping (MT), backpack electrofishing (EF) and snorkelling (SW). CPUE for MT =fish/hr and for EF and SW =fish/m^2.

Flow Period	All Fish Captured			Umatilla Dace			Columbia Sculpin			Shorthead Sculpin		
	MT	EF	SW	MT	EF	SW	MT	EF	SW	MT	EF	SW
Spring	0.049	0.038	0.034	0.005	0.005	0	0	0.003	0.002	0	0.007	0
Summer	0.063	0.593	0.250	0.006	0.004	0	0	0.015	0.002	0	0.016	0.004
Fall	-	0.022	-	-	0.002	-	-	0	-	-	0	-
Winter	-	0.030	-	-	0.015	-	-	0.002	-	-	0.001	-

Note: "-" denotes no sampling using that method occurred during the specified season.

4.2.1.2 Slocan River

In total, 106 Umatilla Dace were captured in the Slocan River. Backpack electrofishing (n=62) was the most successful way to capture Umatilla Dace followed by minnow trapping (n=44).

As with the LCR study area, Umatilla Dace CPUE in the Slocan River varied by season and capture method used. On a seasonal basis, minnow trap CPUE was highest during the summer followed by the spring. The highest backpack electrofishing CPUE was observed during the summer and fall while spring and winter had similar lower catch rates (Table 5). Of the four index sites on the Slocan River, CPUE was highest at site Sloc_30.7R for both methods used, followed by Sloc_37.8L (Appendix B1 and B2). However, backpack electrofishing effort (seconds) was low at Sloc_30.7R.

The seasonal timing of the highest and lowest CPUE was similar for the LCR and Slocan study areas for minnow trapping, though CPUE was higher in the Slocan during the summer compared with the LCR study area (Tables 4 and 5). The highest backpack electrofishing CPUE was observed in fall in the Slocan River and winter in the LCR study area; catch rates were similar in both systems in spring and summer (≤0.005; Tables 4 and 5).

Table 5: Average catch per unit effort (CPUE) by season, method and species in the Slocan River, 2012. Results are also presented for all fish captured. Methods include minnow trapping (MT) and backpack electrofishing (EF). CPUE for MT = fish/hr and for EF = fish/m^2.

Flow Period	All Fish Captured		Umatilla Dace	
	MT	EF	MT	EF
Spring	0.055	0.054	0.009	0.005
Summer	0.145	0.169	0.012	0.001
Fall	-	0.162	-	0.019
Winter	-	0.035	-	0.004

Note: "-" denotes no sampling using that method occurred during the specified season.

4.2.2 Columbia Sculpin

In the LCR study area, Columbia Sculpin CPUE was highest during the summer and higher using backpack electrofishing than snorkel surveys. Columbia Sculpin are distributed throughout the LCR study area (Appendix C). Sites with the highest capture rates over the course of this study have included LCR_25.1R than at LCR_10.5L.

Columbia Sculpin were captured in the Slocan River in 2012 (Appendix B). However, sculpins were not always identified to the species level in the Slocan River as Umatilla Dace were the sampling priority. Therefore CPUE calculations have not been included for Columbia Sculpin in the Slocan River in 2012.

Columbia Sculpins were studied in the unregulated Similkameen system in Years 1 and 2. Further information on catch and distribution is found in AMEC (2010b).

4.2.2.1 LCR Study Area

Nearly all Columbia Sculpins were captured by backpack electrofishing in the LCR study area in Year 4 (n=84). All were captured at sites in the mainstem LCR except for one that was captured in the lower Kootenay River. One Columbia Sculpin was observed in the LCR and one in the Kootenay River during snorkel surveys (n=2; Appendix C). More Columbia Sculpins were captured at the index site at LCR_25.1R (n=71) than at LCR_10.5L (n=12).

Columbia Sculpin CPUE was highest using backpack electrofishing in the LCR study area; the highest CPUE was observed during the summer period and no or low catch rates were observed in other seasons (Table 4). Snorkel survey observation rates were the same in the two seasons sampled, however this is based on the observation of two Columbia Sculpins during 2012 snorkel surveys (Table 4). Columbia Sculpin were not captured in minnow traps set in the LCR study area in 2012. Sampling for Columbia Sculpin was focused at the two index sites in 2012; these locations were selected as high CPUE rates have been observed here during previous surveys (AMEC 2011, AMEC 2012).

4.2.2.2 Slocan River

Columbia Sculpins (n=4) were identified in the Slocan River at Sloc_16.2R and were captured by backpack electrofishing (n=3) and minnow traps (n=1). Additional sculpins (n=138) captured by electrofishing at Sloc_16.2R, Sloc_22.3R, Sloc_37.8L and Sloc_39.4L may have included Columbia Sculpins though they not identified to the species level due to alternative sampling priorities (Appendix B2). Columbia Sculpins were also caught at Sloc_16.2R and Sloc_22.3R as well as in the Little Slocan River in 2011 (AMEC 2012).

4.2.3 Shorthead Sculpin

In the LCR study area, CPUE was highest during the summer and was higher using backpack electrofishing than snorkel survey methods in Year 4. Shorthead Sculpin are distributed throughout the LCR study area (Appendix C). Sites with the highest capture rates over the course of this study have included LCR_25.1R than at LCR_10.5L.

Shorthead Sculpins were captured in the Slocan River in 2012 (Appendix B2). Shorthead Sculpins were studied in the unregulated Pass Creek, a tributary to the LCR, in Year 2. Further information on catch and distribution is found in AMEC (2011).

4.2.3.1 LCR Study Area

Shorthead Sculpins (n=102) were captured by backpack electrofishing (n=100) and snorkel surveys (n=2) in the LCR study area (Appendix B2 and B3). Five Shorthead Sculpins were captured in the lower Kootenay River by backpack electrofishing (n=3) and snorkel surveys (n=2). Shorthead Sculpin were not captured in minnow traps set in the LCR study area in 2012. More Shorthead Sculpins were captured at the index site at LCR_10.5L (n=54) than at LCR_25.1R (n=41).

Shorthead Sculpin CPUE was highest using backpack electrofishing in the LCR study area; CPUE was highest during the summer followed by the spring (Table 4). Snorkel survey observations of Shorthead Sculpins were only made in the summer (n=2) and not during the spring. Sampling for Shorthead Sculpin was focused at the two index sites in 2012; these locations were selected as high CPUE rates have been observed here during previous surveys (AMEC 2011, AMEC 2012). Two Shorthead Sculpins were identified in rock baskets used in productivity studies (CLBMON-44) at LCR_8.3R and LCR_9.0L in October 2012 (Appendix B3).

4.2.3.2 Slocan River

Shorthead Sculpins (n=14) were identified in the Slocan River at Sloc_16.2R, Sloc_22.3R and Sloc_39.4L and were all captured by backpack electrofishing (Appendix B2). Additional sculpins (n=138) captured by electrofishing at Sloc_16.2R, Sloc_22.3R, Sloc_37.8L and Sloc_39.4L may have included Shorthead Sculpins though they were not identified to the species level due to alternative sampling priorities (Appendix B2). Shorthead Sculpins were also caught throughout the Slocan River as well as in the Little Slocan River in 2011 (AMEC 2012).

4.3 Life Stage & Size

The following section presents a summary of the lengths and life stages of all target species observed in regulated and unregulated study areas. Data presented are a compilation of all data collected during Years 1 through 4. Similar sampling effort was expended during all seasons except for winter when sample effort was lower (AMEC 2010b, 2011 and 2012).

4.3.1 Umatilla Dace

Mean fork length for Umatilla Dace captured in the LCR study area (all years combined 2009-2012) was 36 mm and ranged from 16 to 78 mm (Table 6). The majority of Umatilla Dace captured in the LCR study area were juveniles (n=254) followed by young-of-the year (YOY; n=144) with only 67 of the 465 fish classified as adults. The majority of adults were captured in the summer (n=56) with very few observed in the spring (n=9) and fall (n=2). Juvenile catch numbers were highest in the spring followed by summer and fall (n= 113, 82 and 59, respectively). No adult or juvenile Umatilla Dace were captured during the winter in the LCR study area. YOY were captured during all seasons with the majority captured in fall and winter (n=58 and 53, respectively).

In the Slocan River, the mean fork length of Umatilla Dace was 56 mm and ranged from 19 to 110 mm (all years combined; Table 6). Adults comprised the majority of the catch (n=366) followed by YOY (n=62) and juveniles (n=31). The majority of adults were captured in the summer (n=316) followed by spring and fall (n=29 and 21, respectively). Juveniles were mainly captured in the summer (n=29) while two were captured in the spring. Both adults and juveniles were not captured in the winter and juveniles were also not captured in the fall. The majority of YOY were captured in the fall (n=47) followed by the winter, spring and summer (n= 8, 6 and 1, respectively).

Table 6: Mean length of target fish species captured in the LCR study area compared to the unregulated tributaries for all years of study combined, 2009- 2013. Standard deviation is provided in brackets.

Species	LCR Study Area			Unregulated Tributary[1]			
	N	Mean Length (mm)	Length Range (mm)	Tributary Name	N	Mean Length (mm)	Length Range (mm)
Umatilla Dace	465	36.0 (10.6)	16-78	Slocan River	459	55.7 (18.0)	19-110
Columbia Sculpin	148	61.3 (21.4)	22-99	Similkameen River system	983	57.5 (17.4)	27-115
Shorthead Sculpin	316	58.3 (21.0)	17-110	Pass Creek	939	57.3 (14.7)	17-111

Notes – Dace are measured by fork length while sculpins are measured by total length.
[1] – Similkameen and Pass Creek data were provided in AMEC 2010b and AMEC 2011.

4.3.2 Columbia Sculpin

Mean total length of Columbia Sculpin captured in the LCR study area (all years combined) was 61 mm and ranged from 22-99 mm (Table 6). The majority of Columbia Sculpins captured in the LCR study area were adults (n=115) followed by YOY (n=24) and juveniles (n=9). Adults have been captured in all seasons with the majority observed in summer (n=61). Juveniles were captured in similar numbers during all seasons except for winter when none were captured. The majority of YOY were identified during the summer (n=13) with less captured in the fall and spring (n=9 and 2, respectively).

In the unregulated Similkameen system, mean total length of Columbia Sculpin was 68 mm and ranged from 47 to 105 mm (Table 6; AMEC 2010b). All three life stages were present during the summer and winter when sampling was conducted in this system; other seasons were not sampled at this time (AMEC 2010b). However, very few YOY were collected during summer (n=3) likely because this life stage was not catchable for that cohort year until winter (n=73). A higher number of juveniles were observed during summer (n=181) compared to winter (n=21), similar to adults (summer n=470; winter n=236). Additional information is also provided in AMEC (2010b).

4.3.3 Shorthead Sculpin

Mean total length of Shorthead Sculpin captured in the LCR study area (all years combined) was 58 mm and ranged from 17-110 mm (Table 6). The majority of Shorthead Sculpins captured in the LCR study area were adults (n=211) which were captured in similar numbers during all seasons except for fewer in the winter (n=4). Juveniles (n=64) and YOY (n=41) were captured in the spring, summer and fall in the LCR study area. Catch was similar for both life stages during each of those seasons with the fewest observed in the spring.

In Pass Creek, the unregulated system, mean total length of Shorthead Sculpins was 57 mm and ranged from 17-111 mm (Table 6). Similar to the LCR study area, adults (n=687) comprised the majority of the Shorthead Sculpin catch in Pass Creek in all seasons compared to juveniles (n=207) and YOY (n=45). Juveniles and YOY were captured during the spring and summer, but not during fall (AMEC 2011).

4.4 Spawning Behaviour, Timing & Habitats

The following section describes spawning behaviour, spawn timing and habitat use for target species. Observations for sculpins were obtained from surveys conducted in the LCR study area, whereas information for Umatilla Dace was based on sampling in the Slocan River because mature Umatilla Dace were not observed in the LCR at this time.

4.4.1 Umatilla Dace

4.4.1.1 Spawning Observations & Habitats

Four Umatilla Dace in spawning condition were captured in the Slocan River at Sloc_37.8L on August 16 and 17, 2012. All four were males that expressed milt, had orange or red pigmentation on the lips as well as at the pectoral and pelvic fin insertions and ranged between 74 and 89 mm fork length (Appendix D1). Fish were captured during a diel sampling program where minnow traps were checked every 6 hours for a 24-hour period; captures of males in spawning condition occurred once during each time interval assessed (daytime, dusk, nighttime and dawn).

In addition to the four sexually mature Umatilla Dace captured, one adult Umatilla Dace (88 mm fork length) displaying spawning colouration (red/orange on lips, fin insertions and fins) was captured at Sloc_39.4L on August 29, 2012; this fish did not express eggs or milt at the time of capture (Figure 4). The abdomen of this fish was soft and the urogenital pore appeared slightly engorged; these are similar observations to recently spawned female Umatilla Dace captured in the Slocan River in 2011 though it is unconfirmed the dace captured in 2012 was a female as well (AMEC 2012). An additional adult Umatilla Dace (93 mm fork length) with some orange pigmentation at fin insertions and upper lip was captured during an overnight minnow trapping earlier in the spring at Sloc_39.4L on May 8, 2012. However, this dace was not considered in spawning condition as no other spawning characteristics were observed.

It is possible that the four Umatilla Dace captured in spawning condition and the one additional Umatilla displaying spawning characteristics were captured in minnow traps set close to their spawning locations or that these fish were seeking out a sheltered area to spawn. These minnow traps were set in locations 0.5 to 2 m from the shoreline in pool habitat with silt substrates, flooded vegetation and aquatic macrophytes. Water depths were between 0.2 and 0.8 m with no flow (Appendix D1). These habitats are within the range of those where female and male Umatilla Dace in spawning condition or displaying spawning colouration were captured in the Slocan River in 2011 (AMEC 2012).

Figure 4: Umatilla Dace displaying spawning colouration (red pigment on lips and at pelvic and pectoral fin insertions) observed in the Slocan River at km 39.4L on August 29, 2012.

As in 2011, there were no mature Umatilla Dace observed in spawning condition in the LCR study area in 2012. However, Umatilla Dace YOY (19-25 mm fork length) were collected September 14-15 in the LCR study area (Koot_0.5R), which was slightly earlier than when YOY were first identified in the Slocan River (October 11) in 2012 (Appendix B4).

4.4.1.2 Spawn Timing

Spawn timing was based on all observations of mature Umatilla Dace captured in spawning condition in mid-August (i.e., displaying spawning colouration and expressing eggs/milt). As Umatilla Dace in spawning condition were only captured on one date, the estimated start and end dates are based on 2011 observations (AMEC 2012). Spawn timing was estimated to occur from mid-July to mid-September in the Slocan River when daily average water temperatures were between 12°C and 20°C (Figure 5). The spawning period occurred during the descending limb of the hydrograph, commencing approximately two weeks after peak discharge was observed (Figure 5). Annual maximum water temperature was observed during the spawning period.

Umatilla Dace fry are approximately 7 mm at hatch (McPhail 2007). Dace fry measuring 10 mm, assumed to be Umatilla, have previously been captured in the Slocan River in early August (McPhail 2007). Umatilla Dace measuring 19 – 25 mm (n=6) were captured on October 11, 2012 at Sloc_16.2R, Sloc_37.8L and Sloc_39.4L (Appendix B4). The sizes of these dace suggest they were likely YOY from the 2012 cohort.

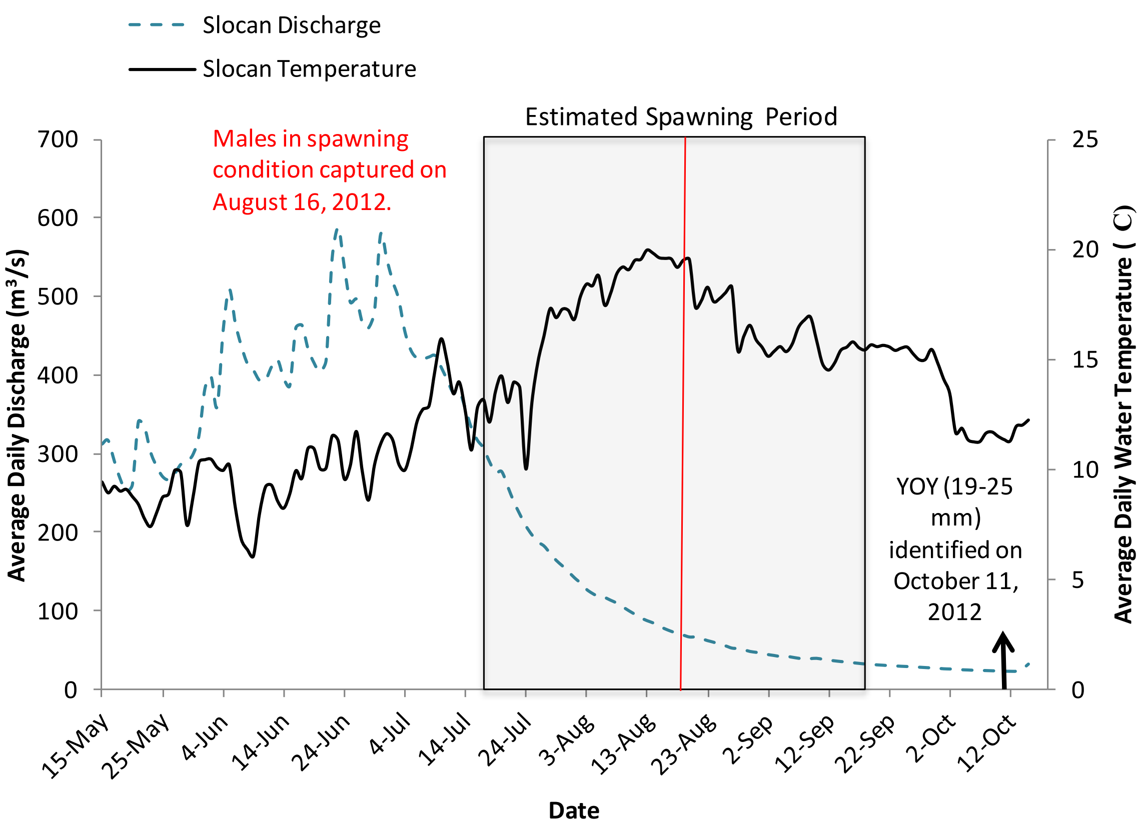


Figure 5: Estimated spawning period for Umatilla Dace in the Slocan River, 2011. Discharge was recorded near Crescent Valley (WSC No. 08NJ013) and water temperatures at Sloc_39.4L (Appledale). Red lines indicate the date Umatilla Dace were observed in spawning condition. Arrow indicates when YOY were first observed in 2012.

4.4.2 Columbia and Shorthead Sculpins

Columbia and Shorthead sculpin spawning was not observed in the LCR in 2012. As previously mentioned, high water levels during the sculpin spawning period limited assessment opportunities in 2012. However, it is possible that four sculpin nests observed at LCR_2.8L on June 5, 2012 belonged to Columbia or Shorthead sculpins as species was not confirmed (Section 4.4.3). Columbia and Shorthead sculpin spawning has been documented in the LCR in previous years (AMEC 2011 and AMEC 2012).

4.4.3 General Sculpin Species

4.4.3.1 Spawning Observations & Habitats

General spawning habitat use is based on a total of five sculpin nests observed at LCR_2.8L on June 5, 2012 (Appendix D2). Nests were observed at this site in 2011 and this was the only site where nest searches could be completed in 2012 as this area is influenced by discharges from HLK and not other tributaries (i.e., lower water level and better water clarity). One Torrent Sculpin nest was identified; the remaining four nests were not identified to species and could possibly belong to any sculpin species except prickly (egg diameters are much smaller and number of eggs much higher than the other three species; AMEC 2010a). The stage of the eggs in the nests ranged from yellow and milky (newly fertilized) to eyed and not moving (Appendix D2). The Torrent Sculpin nest contained 3 egg clumps estimated to have been spawned two weeks (eyed non-moving eggs), one week (pink non-eyed eggs) and one or two days (yellow and milky) prior to observation (Figure 6).

In 2012, sculpin nests were observed between 5 and 8 m from the shoreline in pool habitat. Nests were located on cobble substrate (5-10% embedded) at depths between 0.9 and 1.8 m with velocities of 0 or 0.1 m/s (Appendix D2). These measurements fall within the habitat, calendar date and water level range of what has been observed previously in the LCR (AMEC 2012).

Figure 6: Torrent Sculpin nest with eggs from three females observed in the LCR at LCR_2.8L (Unnamed Tributary Mouth in Robson) on June 5, 2012.

4.4.3.2 Spawn Timing

General spawn timing for sculpins in the LCR was estimated to range from late May to mid July in 2012 when daily average water temperatures at Genelle were between 8°C and 14°C (Figure 7). Discharge increased steadily throughout the estimated spawning period reaching annual maximum in late July (Figure 7). As sculpin nest identification was not possible after June 5, 2012 due to increasing water levels it is possible that the spawning period extended further into July in 2012.

Spawn timing for all sculpin species in the LCR in 2012 was similar to 2010 and 2011 when spawn timing was estimated to occur between the end of May and mid-July when average daily water temperatures at Birchbank were between 9°C to 16°C (AMEC 2011; AMEC 2012). Water temperature trends were similar for all years though slightly warmer during the spawning period in 2010 than the two years following. Discharge in 2012 varied from the previous two years as one annual peak occurred in late July compared to discharge peaking in mid-June and again in mid-July in 2010 and 2011. Peak discharge also occurred after the estimated spawning period in 2012 and peak daily discharge (6,043 m^3/s) was higher than in 2011 (4,155 m^3/s) and 2010 (2,767 m^3/s; AMEC 2011; AMEC 2012).

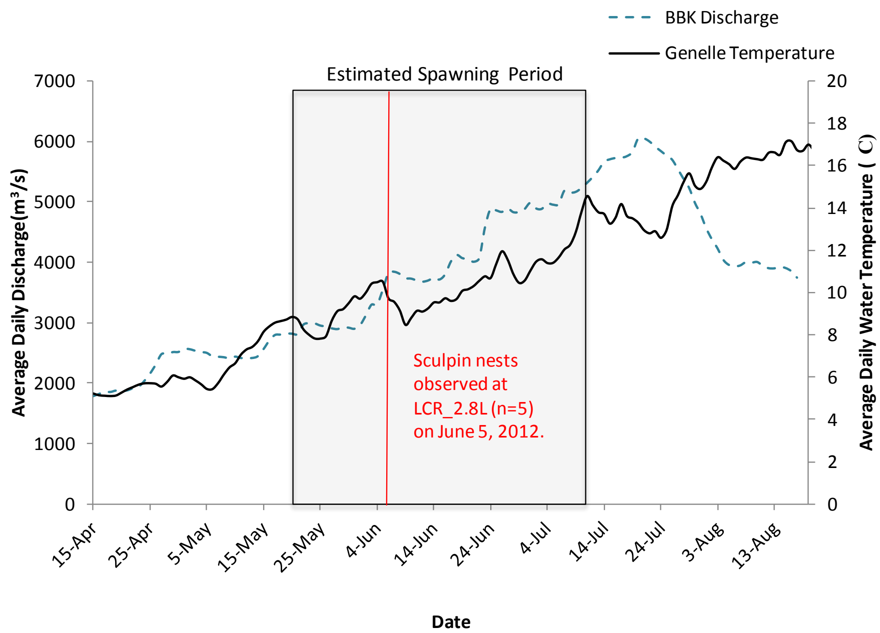


Figure 7: General estimated spawning period for sculpins in the LCR, 2012. Discharge was measured at BBK (Birchbank; WSC Station No: 08NE0558) and water temperature was measured at LCR_25.4R (Genelle). The red line indicates the day.

4.5 Embryo Survival

The following section describes embryo survival for target species. Observations for sculpins were obtained from surveys conducted in the LCR study area, whereas information for Umatilla Dace was based on sampling in the Slocan River because mature Umatilla Dace were not observed in the LCR at this time.

4.5.1 Sculpins

Egg survival was high for most (n=3 out of 5) sculpin nests of all species observed at LCR_2.8L. Three of these nests had observed egg survival greater than 95%, one was too deep to determine and the final nest consisted of only dead eggs. The dead nest contained 10 dead eggs and the location (5 m from shore) and depth (1.2 m) suggest the dead eggs resulted from nest abandonment and not changing environmental conditions (AMEC 2010b; Appendix D2).

Survival of embryos in nests at the LCR_24.5R, where low embryo survival has been observed in previous years (AMEC 2012), was not assessed in 2012. Egg survival for sculpin nests at LCR_24.5R averaged 25% in 2010 (n=11) and 58% in 2011 (n=10) when survival estimation was possible (AMEC 2011; AMEC 2012). High water levels during the sculpin spawning period did not allow assessment at this location in 2012.

4.5.2 Dace

Fertilized dace eggs were not observed during the present study.

4.6 Habitat Use

Habitat use information focuses on Umatilla Dace, Columbia Sculpin and Shorthead Sculpin. An overview of habitats sampled in comparison to where fishes were captured, habitat use by season, diel period and life stage is also presented where possible. Comparisons between the regulated LCR study area and the unregulated Slocan River systems are included, where possible. Habitat use information associated with minnow traps is presented separately from other methods as they may have drawn fish in from other habitats.

4.6.1 Habitats Sampled

4.6.1.1 LCR Study Area

In the LCR study area, minnow traps (n=75) were used to sample depths between 0.22 and 1.3 m. Average velocities at these locations ranged from 0 to 0.4 m/s and substrates associated with these locations included silt, cobble, boulder as well as flooded vegetation. Flooded vegetation was the most common substrate sampled in 2012 due to the high water levels observed throughout the sample period. Horizontal distance from minnow trap sets to the wetted edge ranged from 1 to 15 m in the LCR study area (Appendix B1).

Habitats sampled using backpack electrofishing and snorkelling were similar to those sampled in 2011. These habitats included depths that ranged from 0.02 to 1.5 m, average velocities ranged from 0 to 1.5 m/s and substrates were mostly cobble/gravel/fines with some boulder/sand sections (AMEC 2012). Flooded vegetation and aquatic macrophyte areas were also sampled in 2012. Backpack electrofishing and snorkelling were restricted to shallow areas from the water's edge out to an area that was no deeper than 1.5 m, depending on velocity.

4.6.1.2 Slocan River Study Area

In the Slocan River, minnow traps (n=205) were used to sample depths between 0.15 and 2 m. Average velocities at these locations ranged from 0 to 0.6 m/s and substrates associated with these locations included silt, sand, gravel, cobble, boulder as well as flooded vegetation, aquatic macrophytes and some woody debris. Flooded vegetation associated with silt was the most common substrate sampled, followed by cobble/sand. Distance from minnow trap sets to the wetted edge ranged from 0 to 11 m in the Slocan study area (Appendix B1).

Habitats sampled within index sites by backpack electrofishing included depths that ranged from 0.01 to 1.5 m, average velocities that ranged from 0 to 1.3 m/s and substrates that were mostly cobble/gravel with some boulder/sand sections. In 2012, areas of silt, flooded vegetation and aquatic macrophytes were also sampled. As mentioned above, backpack electrofishing was restricted to shallow areas from the water's edge out to an area that was no deeper than 1.5 m, depending on velocity.

4.6.2 Umatilla Dace

4.6.2.1 Minnow Trap Capture Habitat Use

In the LCR study area, Umatilla Dace were captured in minnow traps (n=4) set in habitats which were not significantly ($p > 0.05$) different from the range of habitats sampled by all minnow trap sets (n=43; Table 7; Appendix B1). The mean depth of traps in which Umatilla Dace were captured was the same as the mean depth in which all traps were set (0.6 m). There was no significant difference between the average velocity in which all traps were set (0.07 m/s) than in those that captured Umatilla Dace (0 m/s). There was no significant difference between the distance from shore in which all traps were set (4.9 m) compared with those that captured Umatilla Dace (3.6 m). Substrates/cover present at Umatilla Dace capture locations were dominated by flooded vegetation followed by silt (Table 7). In the LCR, 70% of the minnow trap sites were in flooded vegetation followed by silt (23%).

In the unregulated Slocan River, there was no difference between the mean depth of minnow trap set locations (n=187) and those which captured Umatilla Dace (n=29; 0.7 m; Table 7). The same trend was observed for average velocity which had a mean of 0.08 m/s at locations where Umatilla Dace were captured compared with 0.07 m/s for all minnow trap sets. There was also no significant difference between the distance from shore in which all traps were set (2.4 m) compared with those that captured Umatilla Dace (2.3 m). Finally, substrates/cover at minnow trap locations in which Umatilla Dace were captured were predominantly flooded vegetation followed by boulder and silt. This was very similar to the composition of substrates/cover at all locations sampled, which was dominated by flooded vegetation (26%) followed by silt (20%) and aquatic macrophytes (17%).

Table 7: Mean depth, velocity and % substrate composition of minnow traps that captured Umatilla Dace set in the LCR study area and the Slocan River, 2012. Standard deviations (SD) are provided in parentheses.

Study Area	Number	Depth (m)		Velocity (m/s)		Distance to Shore (m)		Substrate
		Mean (SD)	Range Sampled	Mean (SD)	Range Sampled	Mean (SD)	Range Sampled	% Composition
LCR	4	0.6 (0.4)	0.2 - 1.3	0 (0)	0 - 0.4	3.6 (1.5)	1 -15	Flooded Vegetation (75%); Silt (25%)
Slocan River	29	0.7 (0.5)	0.2 - 2.0	0.1 (0.1)	0 - 0.6	2.3 (1.7)	0 - 11	Flooded Vegetation (31%); Boulder (21%); Silt (17%); Aquatic Macrophytes (14%); Cobble (7%); Gravel (7%); Sand (3%)

4.6.2.2 Seasonal Habitats

In the LCR study area, Umatilla Dace were observed in similar depths and velocities in all seasons, except for winter when they were only captured in areas with zero flow (Table 8). The majority were captured in pool habitat in all seasons except for spring when more Umatilla Dace were captured in riffle habitat (Table 8). Substrates at point of capture varied by season with spring and summer use dominated by flooded vegetation, fall dominated by cobble and winter by silt and flooded vegetation.

In the unregulated Slocan River, Umatilla Dace were mostly found in silty areas with some aquatic macrophytes during the low flow (fall) period, whereas during the ascending (spring) and descending (summer) flow periods Umatilla Dace were associated mostly with flooded vegetation (Table 8). Mean depth at capture was higher in the summer while velocity was higher in the spring in the unregulated system (Table 8). All Umatilla Dace observed in the spring were located in run habitat while the majority observed in all other seasons were located in pool habitat (Table 8). Umatilla Dace were observed using a variety of substrates in all seasons; flooded vegetation was used only in the spring and summer while higher proportions of cobble and gravel were used in the fall and winter, respectively, than in other seasons (Table 8).

Table 8: Habitat characteristics observed for Umatilla Dace in the Regulated LCR study area and the Unregulated Slocan River during different seasons, 2009-2012. Observations based on fish captured by all methods combined when direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Season	LCR Study Area					Slocan River				
	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Habitat Type	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Habitat Type
Spring	21	0.25 (0.22)	0.07 (0.12)	Flooded Vegetation (68%); Cobble (7%)	Riffle (43%); Run (28.5%); Pool (28.5%)	12	0.44 (0.22)	0.15 (0.16)	Flooded Vegetation (33%); Silt (25%); Cobble (25%); Boulder (17%)	Run (100%)
Summer	75	0.24 (0.15)	0.02 (0.08)	Flooded Vegetation (70%); Silt (17%); Cobble (7%); Boulder (4%); Gravel (2%)	Pool (97%); Run (3%)	15	0.62 (0.54)	0.06 (0.09)	Boulder (31%); Silt (31%); Flooded Vegetation (19%); Aquatic Macrophytes (13%); Gravel (6%)	Pool (70%); Run (24%); Riffle (6%)
Fall	22	0.18 (0.13)	0.01 (0.03)	Cobble (94%); Boulder (6%)	Pool (61%); Run (29%)	40	0.26 (0.23)	0.06 (0.06)	Cobble (39%); Gravel (32%); Aquatic Macrophytes (17%); Silt (7%); Boulder	Pool (100%)
Winter	52	0.17 (0.11)	0 (0)	Silt (54%); Flooded Vegetation (32%); Gravel (10%); Cobble (3%)	Pool (100%)	8	0.21 (0.07)	0.02 (0.04)	Gravel (63%); Silt (25%); Boulder (12%)	Pool (89%); Run (11%)

Source: AMEC 2010b, 2011, 2012

4.6.2.3 Diel Habitats

In the LCR study area, CPUE of Umatilla Dace using nearshore areas was not significantly different during the day than the night in either summer (F (1, 2) = 0.456, p = 0.568) or winter (F (1, 2) = 0.085, p = 0.798); the sample size during the fall was too small to test statistically and sampling did not occur in the spring. Depth, average velocity and substrate at point of capture did not differ significantly between day and night surveys in the summer or winter at LCR sample locations. Umatilla Dace habitat use was also similar day versus night for all 2012 habitat data (Table 9).

In the Slocan River, CPUE of Umatilla Dace using nearshore areas was not significantly different during the day versus the night in either spring (F (1, 2) = 0.264, p = 0.659), fall (F (1, 6) = 0.4278, p = 0.537), or winter (F (1, 4) = 0.119, p =0.748); the sample size during the summer was too small to test statistically. As in the LCR study area, depth, average velocity and substrate at point of capture did not differ significantly between day and night surveys in the spring, fall or winter at Slocan River index locations. Umatilla Dace habitat use was also similar day versus night for all 2012 habitat data (Table 9).

Table 9: Habitat characteristics observed for Umatilla Dace in the Regulated LCR study area and the Unregulated Slocan River during day and night surveys, 2012. Observations based on fish captured by electrofishing. Means are presented, where appropriate, with standard deviation in parentheses.

Day/Night	LCR Study Area				Slocan River			
	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Sample Size	Depth (m)	Velocity (m/s)	Substrate
Day	20	0.20 (0.12)	0.01 (0.03)	Flooded Vegetation (45%); Silt (30%); Gravel (15%); Cobble (10%)	32	0.21 (0.09)	0.08 (0.01)	Cobble (47%); Gravel (38%); Silt (12%); Flooded Vegetation (3%)
Night	21	0.21 (0.11)	0.02 (0.02)	Flooded Vegetation (76 %); Silt (14%); Boulder (10%)	23	0.28 (0.21)	0.07 (0.01)	Cobble (39%); Gravel (35%); Flooded Vegetation (13%); Silt (9%); Boulder (4%)

Summer minnow trapping surveys targeting four time periods (day, dusk, night and dawn) conducted at three index sites in the unregulated Slocan River did not suggest significant differences in catch rates at various times of the day (Figure 8). Overall, 23 Umatilla Dace were captured during the 24-hour sample period (Appendix B). No significant differences in catch per time period at each site were observed and therefore data was pooled across all sites. Similar abundances were observed during the dawn, day and dusk time periods (n=6, 8 and 7, respectively) with fewer captured at night (n=2). However, differences in abundances were not statistically significant ($F_{(3, 68)} = 0.757$; $p = 0.5219$).

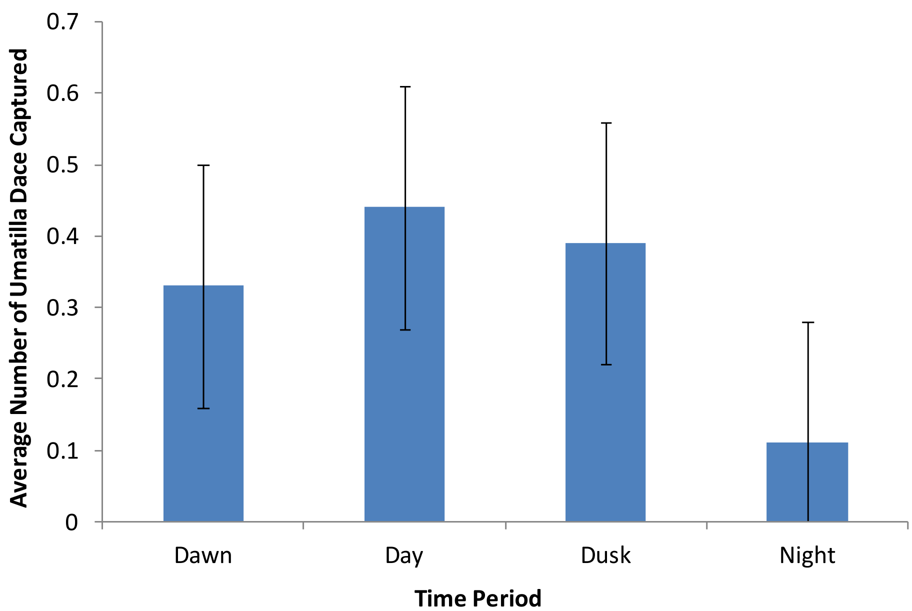


Figure 8: Average number of Umatilla Dace captured in minnow traps checked at intervals to capture day (09:00 to 15:00), dusk (15:00 to 21:00), night (21:00 to 03:00) and dawn (03:00 to 09:00) over a 24-hour period at three index sites in the Slocan River on August 16-17, 2012. Bars represent standard error (SE = 0.17).

4.6.2.4 Life Stage

The information presented below provides a general description of habitat for each Umatilla Dace life stage over all seasons combined, since not enough observations were available to provide seasonal comparisons. Additional information on Umatilla Dace YOY is provided in Section 4.6.3.

In the regulated LCR study area, adult Umatilla Dace were observed in slightly deeper and faster areas than juveniles and YOY (Table 10). The majority (90%) of adults and juveniles were captured in either cobble or flooded vegetation while YOY were observed using a range of substrates predominated by silt and flooded vegetation (Table 10). All life stages were primarily captured in pool habitat with little to no velocity.

In the unregulated Slocan River, adults were observed in deeper habitats than juveniles and YOY while adults and YOY were located in slightly faster habitats than juveniles (Table 10). All Umatilla Dace captured were mostly in pool areas with little to no flow (Table 10). Adults and YOY were observed using a variety of substrates while juveniles were observed only in silt (Table 10). Adults were predominantly located in areas with vegetation or boulder substrates while YOY were predominantly observed using cobble and gravel (Table 10).

Adults in the unregulated Slocan River were in similar habitats as observed in the regulated LCR study area (Table 10). Adults were in deeper areas with a wider variety of substrates in the Slocan than in the LCR and dominant substrates used by each life stage also varied between the two systems (Table 10).

Table 10: Habitat characteristics observed for adult, juvenile and young-of-year (YOY) Umatilla Dace in the Regulated LCR study area and the Unregulated Slocan River, 2009-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Life Stage	LCR Study Area					Slocan River				
	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Habitat Type	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Habitat Type
Adult	20	0.27 (0.20)	0.08 (0.17)	Cobble (50%); Flooded Vegetation (40%); Silt (10%)	Pool (72%); Riffle (21%); Run (7%)	35	0.71 (0.53)	0.09 (0.13)	Aquatic Macrophytes (24%); Boulder (24%); Flooded Vegetation (22%); Silt (16%); Cobble (11%); Gravel (3%)	Pool (68%); Run (29%); Riffle (3%)
Juvenile	74	0.19 (0.12)	0.01 (0.03)	Flooded Vegetation (72%); Cobble (18%); Silt (8%); Boulder (2%)	Pool (89%); Run (11%)	20	0.17 (0.11)	0 (0)	Silt (100%)	Pool (100%)
YOY	74	0.17 (0.18)	0.01 (0.02)	Silt (45%); Flooded Vegetation (35%); Cobble (14%); Gravel (5%); Boulder (1%)	Pool (80%); Run (20%)	56	0.20 (0.10)	0.07 (0.07)	Cobble (46%); Gravel (36%); Silt (11%); Aquatic Macrophytes (5%); Boulder (2%)	Pool (100%)

Source: AMEC 2010b, 2011, 2012

4.6.3 Larval Umatilla Dace Habitat Use

Young-of-the-year (YOY) Umatilla Dace were observed in the LCR study area in all seasons, though observations in the summer have been limited (Table 11). YOY have been captured in shallow, nearshore areas with negligible flow in all seasons. In the spring and summer, YOY were predominantly captured in seasonally flooded vegetation, though limited numbers have been captured during those seasons. In the fall, when low flows are generally observed in the LCR study area, YOY were captured in cobble areas while during the winter, when flows were higher than seasonal lows, YOY were predominantly located in silt and flooded vegetation (Table 11). The mean distance YOY were captured from shore varied by season; YOY were captured closer to shore in the winter than in the fall. During winter surveys in January 2013, Umatilla Dace YOY captured at Koot_0.5R were located between 0.1 and 0.5 m from shore along the undercut, silt banks which were flooded above the vegetation line at the water level observed at that time.

The majority of Umatilla Dace YOY in the LCR study area have been captured at Koot_0.5R in Year 4 as well as in previous sample years (AMEC 2012; Appendix B). Umatilla Dace YOY have also been captured at the following locations in the LCR study area: i) LCR_2.8L; ii) LCR_10.5L; iii) LCR_16.7L; iv) LCR_24.5R; v) LCR_47.5L; vi) LCR_51.4R; and, vii) LCR_53.1L. Dace sp. which were too small to identify to species and may have been Umatilla Dace have been captured at i) LCR_38.4L; ii) Koot_1.2L; and, iii) Koot_0.2L as well as the locations listed above (Figure 1). As in 2010 and 2011 (AMEC 2011, 2012), larval dace were often located in similar habitats as larval suckers (*Catostomus* spp.) during the summer and early fall. Mixed schools of dace and sucker YOY, estimated to contain thousands of individuals, were found along flooded shorelines.

Table 11: Seasonal habitat characteristics observed for young-of-year (YOY) Umatilla Dace in the Regulated LCR study area and the Unregulated Slocan River, 2009-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Season	LCR Study Area					Slocan River				
	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Distance from Shore (m)	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Distance from Shore (m)
Spring	9	0.30 (0.30)	0 (0)	Flooded Vegetation (100%)	1.3 (1.0)	1	0.2	0	Silt (100%)	0.5
Summer	3	0.30 (0.28)	0.03 (0.06)	Flooded Vegetation (34%); Gravel (33%); Silt (33%)	-	0	-	-	-	-
Fall	11	0.19 (0.15)	0.02 (0.03)	Cobble (91%); Boulder (9%)	2.2 (2.4)	47	0.20 (0.11)	0.08 (0.08)	Cobble (56%); Gravel (32%); Aquatic Macrophytes (6%); Silt (6%)	0.9 (0.5)
Winter	51	0.14 (0.11)	0 (0)	Silt (63%); Flooded Vegetation (31%); Gravel (6%)	0.2 (0.2)	8	0.21 (0.07)	0.02 (0.04)	Gravel (63%); Silt (25%); Boulder (12%)	0.7 (0.7)

Source: AMEC 2010b, 2011, 2012

In the Slocan River, Umatilla Dace YOY were located in nearshore areas with similar depths and velocities in the fall and winter as they were in the LCR study area (Table 11). Substrates used were similar in the fall but varied in the winter as areas of flooded terrestrial vegetation were not present at Slocan River index sites at this time; the majority of YOY were located in gravel areas (Table 11). Larval dace were observed at the following locations in the Slocan River in 2011: i) Sloc_16.2R; ii) Sloc_30.7R; iii) Sloc_37.8L; and, iv) Sloc_39.4L (Figure 2).

4.6.4 Columbia Sculpin

4.6.4.1 Seasonal Habitats

In the LCR study area, Columbia Sculpin were observed in similar habitats during the spring, summer and winter, which included the predominant use of cobble substrates and run habitat (Table 12). Columbia Sculpin were observed in shallow areas in the winter and areas with higher velocity in the summer compared with the other seasons (Table 12). Habitat information for Columbia Sculpin in the LCR study area during the fall, except for during flow reductions, is not available at this time.

Table 12: Habitat characteristics observed for Columbia Sculpin in the LCR study area during different seasons, 2009-2012. Observations based on fish captured by all methods combined when direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Flow Period	Sample Size	Regulated System			
		Depth	Velocity	Substrate	Habitat Type
Spring	**16**	0.66 (0.34)	0.18 (0.15)	Cobble (62%); Boulder (38%)	Run (88%); Pool (12%)
Summer	**4**	0.63 (0.25)	0.30 (0.24)	Cobble (100%)	Run (100%)
Fall	**0**	-	-	-	-
Winter	**9**	0.41 (0.33)	0.18 (0.18)	Cobble (78%); Boulder (22%)	Run (67%); Pool (33%)

Notes: "-" No habitat information available
Source: AMEC 2010b, 2011, 2012

4.6.4.2 Diel Habitats

No Columbia Sculpin were observed during day/night surveys in the LCR study area in 2012 (Appendix B). Very few sculpins of any species were observed during day/night backpack electrofishing and PIT tracking surveys in 2012 (Appendix B2 and B3). Habitats used by sculpins observed during PIT tracking surveys in November 2012 did not suggest differences in habitat use between day and night (Appendix B4).

Additional diel PIT tracking surveys will be conducted in Year 5 at LCR index sites to further investigate differences in day/night habitat use by Columbia Sculpin.

4.6.4.3 Life Stage

The information presented below provides a general description of habitat for each life stage over all seasons/periods combined, since not enough observations were available to provide seasonal comparisons.

In the regulated LCR study area, Columbia Sculpin YOY were observed in deeper and slower water than adults and juveniles (Table 13). All life stages were observed to use predominantly cobble and boulder substrate, with YOY also using flooded vegetation, silt, sand and gravel (Table 13). The majority of adults were observed in run habitat while YOY were in pool habitat; information for the six juveniles observed is not available (Table 13).

Table 13: Habitat characteristics observed for adult, juvenile and young-of-year (YOY) Columbia Sculpin in the LCR study area, 2009-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Life Stage	Sample Size	Regulated System			
		Depth	Velocity	Substrate	Habitat Type
Adult	**22**	0.60 (0.38)	0.17 (0.16)	Cobble (77%); Boulder (23%)	Run (78%); Pool (22%)
Juvenile	**6**	0.50 (0.06)	0.26 (0.20)	Boulder (50%); Cobble (50%)	-
YOY[1]	**239**	0.83 (0.47)	0.08 (0.24)	Cobble (47%); Boulder (22%); Flooded Vegetation (13%); Silt (12%); Sand (5%); Gravel (1%)	Pool (74%); Run (23%); Riffle (3%)

Notes: [1] = YOY includes all sculpin species captured; "-" = No habitat information available.
Source: AMEC 2010b, 2011, 2012

4.6.5 Shorthead Sculpin

4.6.5.1 Seasonal Habitats

In the LCR study area, Shorthead Sculpin were observed in deeper areas during the spring and shallower areas in the winter than in other seasons (Table 14). Shorthead Sculpin were observed in pool habitat with slower velocity water in the winter compared with other seasons which were dominated by observations in run habitat with similar average water velocities (Table 14). The majority of Shorthead Sculpin were observed using cobble substrate in all seasons, followed by boulder in the spring and summer and gravel in the fall and winter (Table 14).

Table 14: Habitat characteristics observed for Shorthead Sculpin in the LCR study area during different seasons, 2009-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Season	Sample Size	Regulated System			
		Depth	Velocity	Substrate	Habitat Type
Spring	**33**	0.80 (0.34)	0.22 (0.14)	Cobble (64%); Boulder (36%)	Run (81%); Pool (13%); Riffle (6%)
Summer	**37**	0.69 (0.40)	0.34 (0.25)	Cobble (70%); Boulder (22%); Flooded Vegetation (8%)	Run (88%); Pool (12%)
Fall	**17**	0.54 (0.28)	0.25 (0.25)	Cobble (94%); Gravel (6%)	Run (88%); Pool (12%)
Winter	**5**	0.44 (0.25)	0.03 (0.03)	Cobble (80%); Gravel (20%)	Pool (80%); Run (20%)

Source: AMEC 2010b, 2011, 2012

4.6.5.2 Diel Habitats

No Shorthead Sculpin were observed during day/night electrofishing surveys in the LCR study area in 2012 (Appendix B2). Shorthead Sculpins were located during daytime PIT tracking surveys on November 8, 2012 at LCR_10.5L (n=2) and LCR_24.5R (n=1) but none were relocated during the night. Habitats used by these three Shorthead Sculpins were similar to the habitats that all sculpins were observed both day and night during these surveys (Appendix B4).

Additional diel PIT tracking surveys will be conducted in Year 5 at LCR index sites to further investigate differences in day/night habitat use by Shorthead Sculpin.

4.6.5.3 Life Stage

The information presented below provides a general description of habitat for each Shorthead Sculpin life stage over all seasons/periods combined, since not enough observations were available to provide seasonal comparisons. Additional information on sculpin YOY is provided in Section 4.6.3.

In the LCR study area, adult and juvenile Shorthead Sculpins were observed in very similar habitats (Table 15). YOY sculpins were observed in deeper, slower pool habitats using a wider range of substrates than juvenile and adult Shorthead Sculpins.

Table 15: Habitat characteristics observed for adult, juvenile and young-of-year (YOY) Shorthead Sculpin in the LCR study area, 2009-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Life Stage	Sample Size	Regulated System			
		Depth	Velocity	Substrate	Habitat Type
Adult	**68**	0.69 (0.37)	0.26 (0.22)	Cobble (75%); Boulder (22%); Gravel (3%)	Run (80%); Pool (17%); Riffle (3%)
Juvenile	**20**	0.65 (0.33)	0.31 (0.22)	Cobble (75%); Boulder (25%)	Run (100%)
YOY[1]	**239**	0.83 (0.47)	0.08 (0.24)	Cobble (47%); Boulder (22%); Flooded Vegetation (13%); Silt (12%); Sand (5%); Gravel (1%)	Pool (73%); Run (24%); Riffle (3%)

Notes:[1] = YOY includes all sculpin species captured
Source: AMEC 2010b, 2011, 2012

4.6.6 General Larval Sculpins Habitat Use

As in previous years, difficulty in identification of recently emerged YOY sculpins to species, especially Columbia and Shorthead sculpins, necessitated description of nursery habitat for general sculpin species in 2012 (AMEC 2011 and 2012). Habitat data collected for all YOY sculpins observed in the LCR study area is provided in Table 16. Winter habitat data was not included as habitat data is currently only available for one sculpin YOY during that season. Sculpin YOY were located in areas with similar depths, velocities, substrates and distances from shore in the spring and summer (Table 16). A wider array of substrates were used during the summer though cobble and boulder were the dominant substrates used in both spring and summer.

Nursery areas can be described by YOY habitat variable observations collected during the summer (Table 16). As in Years 2 and 3, YOY sculpins were often observed resting on top of substrates sometimes with multiple individuals on the same rock, potentially indicating that they were hatched nearby or even under the observed rock.

Table 16: Habitat characteristics observed for young-of-year (YOY) sculpins in the LCR study area in spring and summer, 2010-2012. Observations based on fish captured by all methods combined where direct habitat measurement was possible. Means are presented, where appropriate, with standard deviation in parentheses.

Season	LCR Study Area				
	Sample Size	Depth (m)	Velocity (m/s)	Substrate	Distance from Shore (m)
Spring	29	0.73 (0.37)	0.13 (0.12)	Cobble (79%); Boulder (21%)	3.5 (2.4)
Summer	209	0.84 (0.49)	0.08 (0.25)	Cobble (43%); Boulder (24%); Flooded Vegetation (14%); Silt (13%); Sand (5%)	3.8 (3.0)

Source: AMEC 2010b, 2011, 2012

Initial observations of larval sculpins from the 2012 cohort were made in the LCR study area on September 5, 2012 at Koot_0.2R. At this time, 83 YOY sculpins (25 to 40 mm total length) from the 2012 cohort were observed during snorkel surveys (Appendix B4). High water levels through July precluded sampling during the previously identified emergence period for sculpins (sculpin YOY were first observed on July 18, 2011 though high water levels and poor visibility precluded sampling in the June through early July period in 2011; AMEC 2012).

Young-of-year sculpins have been located at numerous locations in the LCR study area during Years 1 to 4. These have included the following locations: LCR_1.5L, LCR_2.8L, LCR_5.0R, LCR_8.4L, LCR_10.3L, LCR_10.5L, LCR_16.7L, LCR_24.5R, LCR_43.8L, LCR_43.9L, LCR_47.2R, LCR_47.5L, LCR_51.4R, LCR_53.1L, the Kootenay River at Koot_0.2L, Koot_0.2R and Koot_0.5R, and Beaver Creek (Appendix C).

4.7 Seasonal Flow Reduction Observations for the LCR Study Area

Flow reduction sampling was conducted during three HLK flow reductions in fall 2012 and two HLK flow reductions in winter 2013 (Table 3). A summary of all flow related movements of PIT-tagged sculpins and dace observed during these reductions is provided in Table 17. In general, PIT-tagged sculpins predominantly moved away from the wetted edge during flow reductions and more tagged sculpins were relocated immediately after flow reductions than before or following the reductions. No PIT-tagged sculpins were observed to remain in areas that became dewatered during these reductions (Table 17). Very few dace observations were made during flow reduction surveys (n=3; Table 17).

Seasonal flow reduction observations and habitat use summaries are provided below. Results are summarized at the general sculpin or dace species level. All movement data collected for individual fish is provided in Appendix E.

Table 17: Direction and movement of PIT-tagged sculpins and dace during and following flow reductions at Hugh L. Keenleyside Dam (HLK). Seasonal movement rates not associated with flow reductions are included for reference.

Flow Reduction Dates	HLK Discharge		Approximate Vertical Reduction Observed (m)	Location	Total Number of PIT Tags Located			Flow Reduction Observations			Post - Flow Reduction Observations			Seasonal Movement Rate (m/hr)	Comments
	Pre-reduction (kcfs)	Post-reduction (kcfs)			Pre	Reduction	Post	Mean Movement Rate (m/hr)	Direction[1]	Number Observed	Mean Movement Rate (m/hr)	Direction[1]	Number Observed		
Sep. 15, 2012	60	45	1	LCR_24.5R	0	0	0	-	-	-	-	-	-		No dewatered PIT tags.
Sep. 28 - 29, 2012	46	32	1	LCR_10.5L	12	14	7	0.2 (0.1)	DS (12.5%) US (12.5%) Out (75 %)	8	0.1 (0.1)	DS (50%) Unk (50%)	2	0.006 (0.005; n=6)	No dewatered PIT tags.
Oct. 26 - 27, 2012	45	30	0.75	LCR_10.5L	2	9	4	0.02 (0.03)	None (50%) Out (50%)	2	0.002 (0.002)	DS (33.3%) In (33.3%) Out (33.3%)	3		No dewatered PIT tags.
Feb. 8 - 9, 2013	67	40	1.5	LCR_10.5L	1	8	7	0	None (100%)	1	0.01 (0.01)	DS (20%) US (20%) Out (40%) Unk (20%)	5	-	No dewatered PIT tags.
			1.75	LCR_24.5R	4	10	8	0.09 (0.07)	None (17%) Out (83%)	6	0.01 (0.02)	DS (29%) Out (14%) None (43%) Unk (14%)	7	0 (n=1)	No dace movement observed post-reduction (n=1); No dewatered PIT tags.
Feb. 16, 2013	40	28	0.5	LCR_10.5L	7	7	2	0.01 (0.01)	None (50%) Out (50%)	4	0.08 (0.04)	US (50%) Unk (50%)	2	-	No dewatered PIT tags.
			1	LCR_24.5R	8	10	7	0.02 (0.03)	DS (33%) Out (17%) None (50%)	6	0.005 (0.006)	DS (25%) US (25%) None (50%)	4	0 (n=1)	No dace movement observed during (n=1) or post-reduction (n=1); No dewatered PIT tags.

Notes: [1] DS= downstream; US = upstream; Out = away from shore; In = toward shore; None = no movement; Unk = unknown.

4.7.1 Fall 2012

Sampling was conducted at a minimum of one LCR study area index site prior to, immediately after and following HLK flow reductions which occurred on September 15, September 29 and October 27, 2012. Backpack electrofishing was conducted to collect sculpins and dace for PIT-tagging at LCR_10.5L on September 17, 2013 (n=71 sculpin) and LCR_24.5R on September 18, 2013 (n=83 sculpin and n=23 dace). No PIT-tagged sculpins or dace were observed to become stranded during these flow reductions. There was no significant difference ($p > 0.05$) in the rate of sculpin movement resulting from flow reductions (both immediately after and following the reduction) compared with background seasonal movement rate (Table 17). LCR flows were generally at or near seasonal lows during the early fall, with some variability through the period, and then increased in late fall to approximately half of maximum annual discharge (Figure 3). Discharge and observation summaries for each flow reduction are provided below.

4.7.1.1 HLK Flow Reduction September 15, 2013

Four PIT-tags were located at index site LCR_24.5R on September 14, 2012; however, they were later confirmed to be inactive tags (i.e. deceased fish). Following the reduction of Arrow Lakes discharge from 1698 to 1308 m^3/s (60 to 45 kcfs at HLK), no tagged sculpins or dace were relocated within the index site in wetted or dewatered areas (Figure 9). Tagged fish were also not located in the additional area tracked downstream of the index site.

Surveys at Koot_0.5R conducted before and after the flow reduction suggested CPUE of Umatilla Dace was higher immediately following the reduction (0.01 Umatilla Dace per electrofishing second) than before the reduction ($0.7x10^{-3}$ Umatilla Dace per electrofishing second). CPUE was also higher for all fish caught following the reduction compared with before (Appendix B2). No Umatilla (n=1) or Longnose Dace (n=16) tagged with VIE prior to the reduction were recaptured following the reduction.

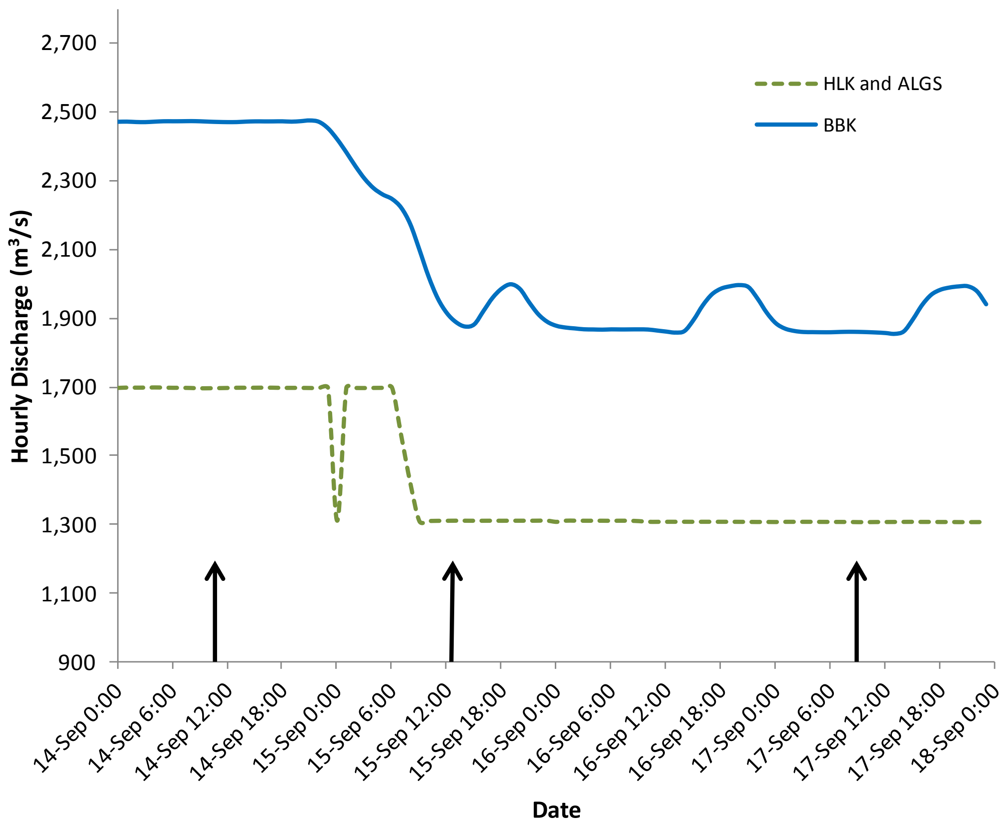


Figure 9: Discharge for the LCR as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK)/Arrow Lakes Generating Station (ALGS) during a flow reduction at HLK, September 15, 2012. Arrows indicate sample timing.

4.7.1.2 HLK Flow Reduction September 28-29, 2013

Twelve PIT-tagged sculpins were located in the wadable area prior to the flow reduction commencing on September 28, 2013 at LCR_10.5L (Table 17). Following the reduction of Arrow Lakes discharge from 1,305 to 904 m^3/s (46 to 32 kcfs at HLK), 14 PIT-tagged sculpins were located, 8 of which were relocations of those observed the previous day (Table 17; Figure 10). Of the 8 sculpins relocated, 7 had moved from areas that had become dewatered while one moved from an area that remained wetted (Appendix F). The majority of these sculpins moved away from the wetted edge toward the thalweg (Table 17; Appendix F1). The mean rate of movement of sculpins in relation to the flow change was higher than both the seasonal and post-reduction movement rates (Table 17). During a follow-up tracking survey on October 4, 2012, two of the sculpins observed during the flow reduction were relocated along with an additional five sculpins (Appendix F1).

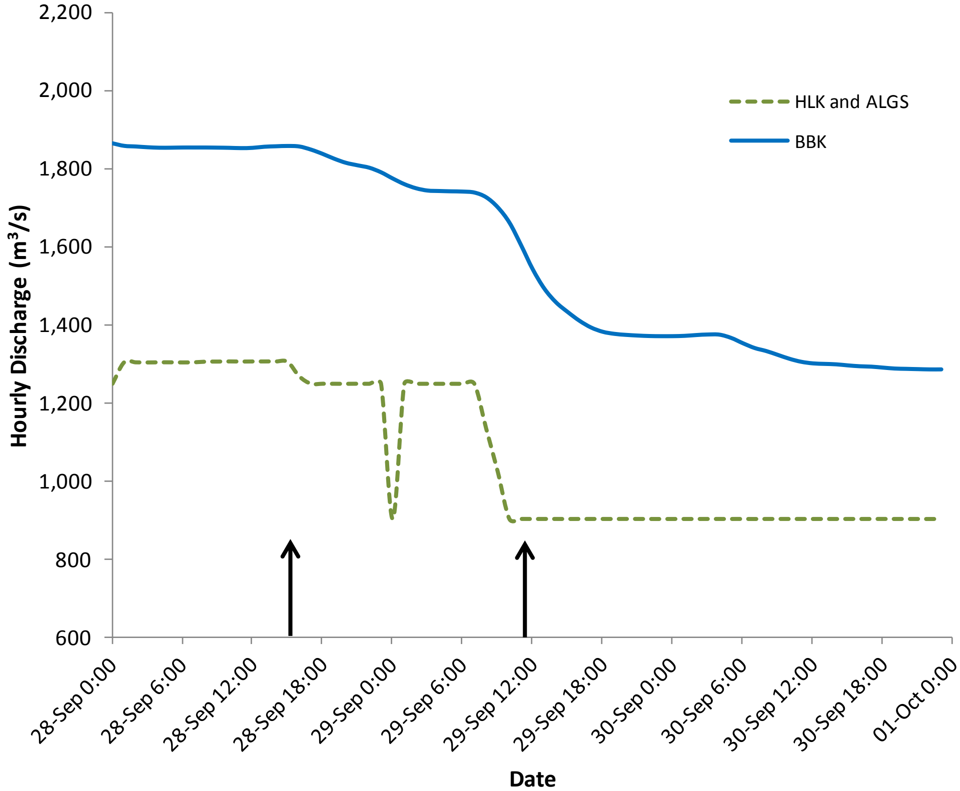


Figure 10: Discharge for the LCR as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK)/Arrow Lakes Generating Station (ALGS) during a flow reduction at HLK, September 28-29, 2012. Arrows indicate sample timing. A follow-up survey was conducted on October 4, 2012.

4.7.1.3 HLK Flow Reduction October 26-27, 2013

Two PIT-tagged sculpins were located in the wadable area prior to the flow reduction commencing the afternoon of October 26 and concluding on October 27, 2013 at LCR_10.5L (Table 17). Following the reduction of Arrow Lakes discharge from 1,273 to 853 m^3/s (45 to 30 kcfs at HLK), 9 PIT-tagged sculpins were located, 2 of which were the sculpins observed the previous day (Table 17; Figure 11). One sculpin moved 1 m out from an area that became dewatered which the other remained in a similar location that did not dewater (Appendix F2). The mean rate of movement of the two sculpins observed during the flow change was higher than both the seasonal and post-reduction movement rates, though the sample sizes were small (Table 17). During a follow-up tracking survey on October 4, 2012, three of the sculpins observed during the flow reduction were relocated along with one additional sculpin (Appendix F2).

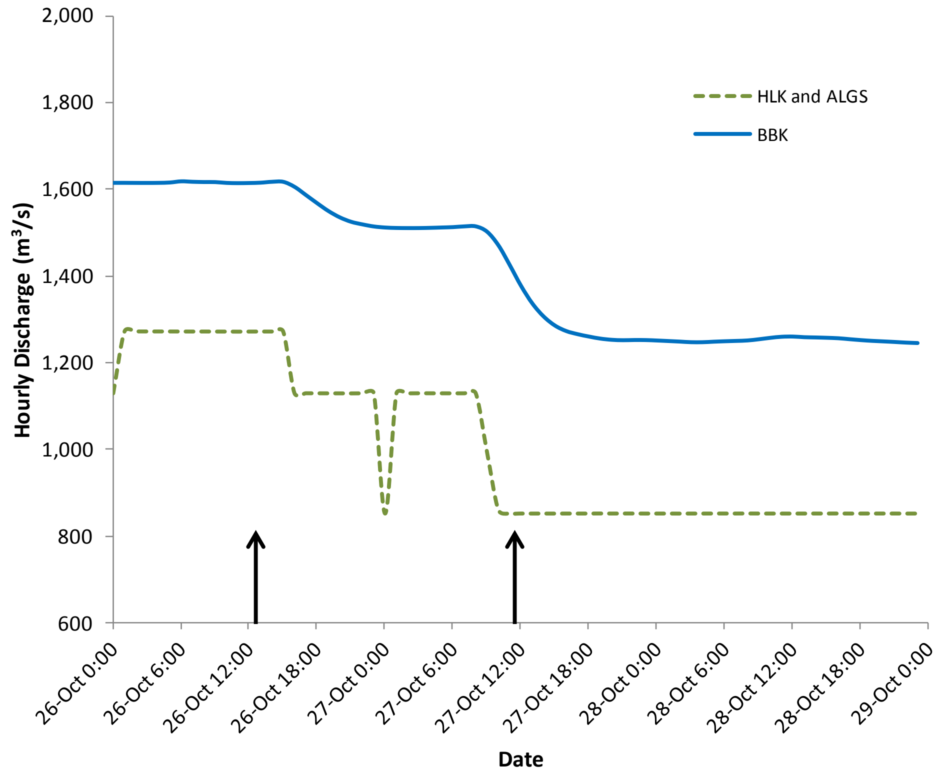


Figure 11: Discharge for the LCR as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK)/Arrow Lakes Generating Station (ALGS) during a flow reduction at HLK, October 26-27, 2012. Arrows indicate sample timing. A follow-up survey was conducted on November 8, 2012.

4.7.1.4 Fall Flow Reduction Habitat Use

Habitats used by sculpins (all species combined) were similar before, immediately after and following fall flow reductions in 2012 (Table 18). There were no significant differences in habitat use variable before, immediately after and following fall flow reductions except for average velocity ($F(2, 45) = 4.99$, $p = 0.01$; Table 18). Tukey's post hoc comparisons indicated the mean velocity following flow reductions was significantly higher than the mean velocity before ($p = 0.05$) and immediately after ($p = 0.004$) flow reductions (Table 18).

Table 18: Sculpin species habitat use observed during PIT-tag tracking surveys before (pre), immediately after (reduction) and in follow-up (post) to flow reductions at Hugh L. Keenleyside Dam on September 28-29 and October 26-27, 2012 at LCR_10.5L. Means are presented, where appropriate, with standard deviation in parentheses.

Flow Reduction Phase	Sample Size	Depth (m)	Average Velocity (m/s)	Substrate	Distance to Shore (m)	Embededness (%)
Pre	14	0.50 (0.23)	0.09 (0.10)	Cobble (100%)	2.1 (1.4)	8 (3)
Reduction	23	0.47 (0.30)	0.15 (0.19)	Cobble (82%) Boulder (9%) Gravel (9%)	3.2 (2.6)	7 (3)
Post	11	0.63 (0.17)	0.33 (0.30)	Cobble (100%)	3.7 (0.7)	8 (5)

4.7.2 Winter 2013

Sampling was conducted at both LCR study area index sites prior to, immediately after and following HLK flow reductions which occurred on February 8-9 and 16, 2013. Backpack electrofishing was conducted to collect sculpins and dace for PIT-tagging at LCR_10.5L (n=7 sculpins) and LCR_24.5R on February 7, 2013 (n=14 sculpins). No PIT-tagged sculpins or dace were observed to become stranded during these flow reductions. Comparison between movement rates during the flow reductions with background seasonal movement rates is not available at this time (Table 17). LCR flows were approximately half of maximum annual discharge in early 2013 and dropped to their annual low in late March 2013 (Figure 3). Discharge and observation summaries for each flow reduction are provided below.

4.7.2.1 HLK Flow Reduction February 8-9, 2013

One PIT-tagged sculpin was located in the wadable area prior to the flow reduction commencing on February 9, 2013 at LCR_10.5L (Table 17). Following the first stage of the two day reduction of Arrow Lakes discharge from 1,880 to 1,529 m^3/s (67 to 53.5 kcfs at HLK) on February 9, 2013 the sculpin had moved and one new sculpin was located (Appendix F). Following the second day of the discharge reduction from 1,525 to 1,135 m^3/s (53.5 to 40 kcfs), eight sculpins were located including the one observed the previous day (Table 17; Figure 12). The one relocated sculpin remained in the same location it was observed the previous day while the other seven were in areas which had previously been too deep to track (Appendix F3). During the follow-up survey on February 14, 2013, five sculpins observed during the flow reduction were relocated as well as two additional sculpins (Table 17). Comparisons to seasonal movement rates are not possible due to a low sample size of non-flow reduction observations.

During the same flow reduction at LCR_24.5R, four PIT-tagged sculpins were located prior to the first stage of the flow reduction, two of which were relocated after the first stage of the reduction along with two additional sculpins (Appendix F4). Following the second stage of the reduction on February 9, 2013, a total nine sculpins and one Longnose Dace were located at the site (Appendix F4). The mean rate of sculpin movement was higher during the flow reduction than the post-reduction movement rate and the majority of sculpins moved away from the wetted edge as water levels dropped (Table 17). The one Longnose Dace observed remained in the same area on both February 9 and February 14, 2013 (Appendix F4).

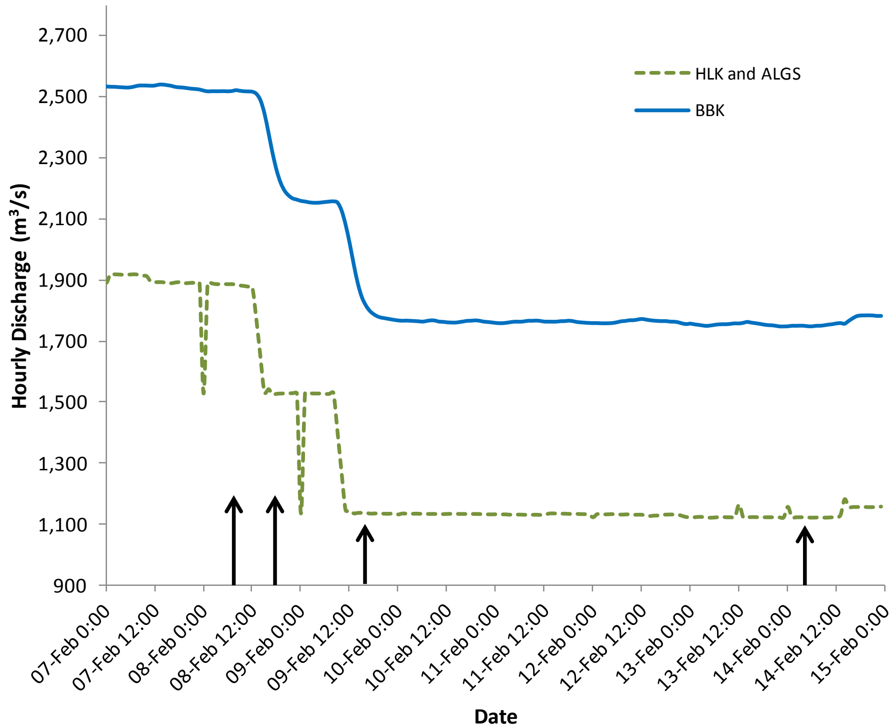


Figure 12: Discharge for the LCR as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK)/Arrow Lakes Generating Station (ALGS) during a flow reduction at HLK, February 8-9, 2013. Arrows outline sample timing.

Surveys at Koot_0.5R conducted before (February 7) and after (February 9) the flow reduction suggested CPUE of Umatilla Dace was higher prior to the reduction (0.04 Umatilla Dace per electrofishing second) than after the reduction (0.003 Umatilla Dace per electrofishing second). CPUE was also higher for all fish caught before the reduction compared with after (Appendix B). Prior to the reduction, Umatilla Dace (n=23, 22-33 mm fork length) young of the year were located within 0.5 m of shore along the vegetated edge of an undercut silt bank (Figure 13). Very few Umatilla Dace (n=2) were captured in the adjacent near shore area following the flow reduction. Two isolated pools were observed following the reduction but no Umatilla Dace were observed stranded within them at this time (Figure 13). Umatilla Dace were also not observed during stranding surveys conducted under CLBMON-42 at this location at this time (CLBMON-42 LCR Fish Stranding Database).

Figure 13: Koot_0.5R before (February 7, 2013; above) and after (February 9, 2013; below) a flow reduction at Hugh L. Keenleyside Dam (HLK) on February 8 and 9, 2013. No sculpin or dace were found in the isolated pools after the flow reduction.

4.7.2.2 HLK Flow Reduction February 16, 2013

Seven PIT-tagged sculpins were located in the wadable area prior to the flow reduction on February 16, 2013 at LCR_10.5L (Table 17). Following the reduction of Arrow Lakes discharge from 1,160 to 767 m^3/s (40 to 28 kcfs at HLK), 10 PIT-tagged sculpins were located, 4 of which were the sculpins observed the previous day (Table 17; Figure 14). Two sculpins moved out of areas that became dewatered while the other two remained in the same locations which did not become dewatered (Appendix F5). During a follow-up tracking survey on February 21, 2013 only two of the sculpins were relocated. The mean rate of movement was higher following the flow reduction than what was observed during the reduction, though the sample sizes were small (Table 17).

Prior to the same reduction at LCR_24.5R, seven sculpins and one Longnose Dace were located (Table 17). Following the reduction, one sculpin and one Longnose Dace were observed to move out of areas that dewatered, five remained in the same locations observed previously that did not dewater and two new sculpins and one Umatilla Dace were located (Appendix F6). During follow-up tracking surveys on February 21, 2013, three sculpins and one Umatilla Dace were relocated. The mean rate of movement for sculpins observed during the reduction was higher than what was observed following the reduction (Table 17).

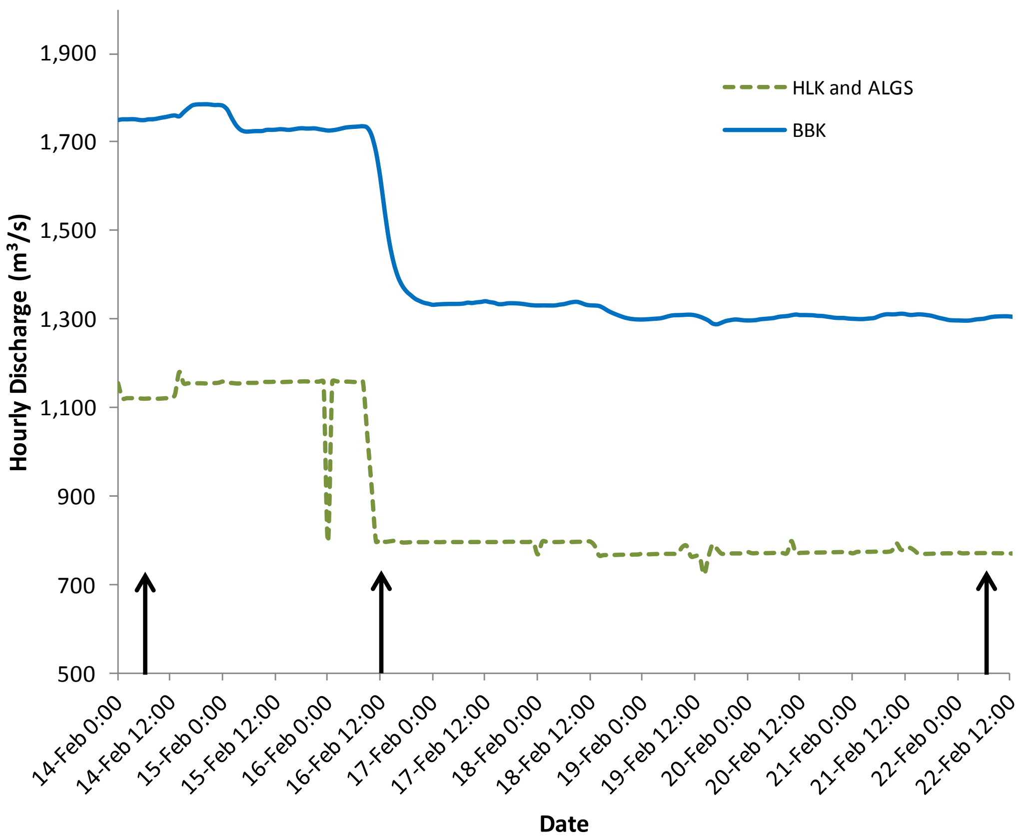


Figure 14: Discharge for the LCR as measured at BBK (Birchbank; WSC Station No: 08NE0558) and Hugh L. Keenleyside Dam (HLK)/Arrow Lakes Generating Station (ALGS) during a flow reduction at HLK, February 16, 2013. Arrows outline sample timing.

Surveys were not conducted at Koot_0.5R under this program during the February 16, 2012 HLK flow reduction. However, Umatilla Dace (n=32, 22-35 mm fork length) were observed to have become stranded within one isolated pool following the water level reduction (CLBMON-42 LCR Fish Stranding Database).

4.7.2.3 Winter Flow Reduction Habitat Use

Habitats used by sculpins (all species combined) were generally similar before, immediately after and following winter flow reductions in 2013 at both index sites (Tables19 and 20). There were no significant differences in habitat use variables before, immediately after and following winter flow reductions at site LCR_10.5L (Table 1919). No significant differences were observed at site LCR_24.5R at these times except for the distance sculpins were observed from the shoreline ($F_{(2, 56)} = 3.64$, $p = 0.03$; Table 20). Tukey's post hoc comparisons indicated the mean distance sculpins were from shore immediately following winter flow reductions was significantly closer than they were prior to the reductions ($p < 0.05$; Table 20). Dace (both species combined) also used similar habitats, however, the sample size was small (Table 21).

Table 19: Sculpin species habitat use observed during PIT-tag tracking surveys before (pre), immediately after (reduction) and in follow-up (post) to flow reductions at Hugh L. Keenleyside Dam on February 8-9 and February 16, 2013 at LCR_10.5L. Means are presented, where appropriate, with standard deviation in parentheses.

Flow Reduction Phase	Sample Size	Depth (m)	Average Velocity (m/s)	Substrate	Distance to Shore (m)	Embededness (%)
Pre	15	0.56 (0.23)	0.08 (0.13)	Cobble (87%) Gravel (13%)	2.8 (1.4)	16 (13)
Reduction	16	0.51 (0.34)	0.07 (0.10)	Cobble (88%) Boulder (12%)	2.3 (1.3)	12 (14)
Post	16	0.53 (0.22)	0.07 (0.12)	Cobble (88%) Gravel (12%)	3.0 (1.6)	17 (13)

Table 20: Sculpin species habitat use observed during PIT-tag tracking surveys before (pre), immediately after (reduction) and in follow-up (post) to flow reductions at Hugh L. Keenleyside Dam on February 8-9 and February 16, 2013 at LCR_24.5R. Means are presented, where appropriate, with standard deviation in parentheses.

Flow Reduction Phase	Sample Size	Depth (m)	Average Velocity (m/s)	Substrate	Distance to Shore (m)	Embededness (%)
Pre	18	0.51 (0.27)	0.20 (0.13)	Cobble (100%)	2.0 (0.9)	9 (2)
Reduction	21	0.30 (0.26)	0.13 (0.17)	Cobble (100%)	1.2 (1.0)	8 (3)
Post	20	0.47 (0.30)	0.13 (0.13)	Cobble (90%) Boulder (10%)	1.6 (1.0)	8 (3)

Table 21: Dace species habitat use observed during PIT-tag tracking surveys before (pre), immediately after (reduction) and in follow-up (post) to flow reductions at Hugh L. Keenleyside Dam on February 8-9 and February 16, 2013 at LCR_24.5R. Means are presented, where appropriate, with standard deviation in parentheses.

Flow Reduction Phase	Sample Size	Depth (m)	Average Velocity (m/s)	Substrate	Distance to Shore (m)	Embededness (%)
Pre	2	0.63 (0)	0.08 (0)	Cobble (100%)	2.8 (0)	10 (0)
Reduction	3	0.34 (0.16)	0.03 (0.03)	Cobble (100%)	1.45 (1.18)	8 (3)
Post	3	0.57 (0.10)	0.05 (0.05)	Cobble (100%)	2.4 (0.8)	10 (0)

5.0 DISCUSSION

The following discussion is structured in terms of the six Detailed and the four broad Management Questions. Detailed Questions are presented first because information collected to answer these questions provides the basis for answering the broader Management Questions specified for this program. The letter and/or number for each question are referenced in parentheses under each subheading. Information on Shorthead Sculpin is also included as this species is SARA-listed as being of Special Concern, but was not specifically included within some of the Detailed Questions below.

5.1 Are there specific spawning areas utilized by the Columbia Sculpin and the Umatilla Dace and, if so, what are the temporal and biophysical characteristics of these areas? (A)

Detailed discussion for each species and the temporal and biophysical characteristics of their specific spawning areas in regulated and unregulated systems are provided below (Table 22).

Table 22: Summary of spawn timing and associated daily average water temperatures for target species in the lower Columbia River, Similkameen River and Slocan River study areas, 2009-2012.

Species	LCR Study Area		Unregulated Tributaries							
	Columbia River		Pass Creek		Tulameen River		Otter Creek		Slocan River	
	Time Period	Water Temperature (°C)	Time Period	Water Temperature (°C)	Time Period	Water Temperature (°C)	Time Period	Water Temperature (°C)	Time Period	Water Temperature (°C)
Columbia Sculpin	Early June to late July	9.5 to 15	-	-	Mid June to early July	8 to 15	Mid May to Mid June	8 to 15	-	-
Shorthead Sculpin	Early June to late July	9.5 to 15	Mid June to late July	8 to 14	-	-	-	-	-	-
Umatilla Dace	-	-	-	-	-	-	-	-	Mid July to Mid September	12 to 20

Note: "-" data not available.

5.1.1 Umatilla Dace

Spawn timing in the Slocan River, based on the presence of ripe fish, was estimated to occur from mid-July through to mid-September when daily average water temperatures were between 12°C and 20°C (Table 22). The spawning period was estimated to commence in mid-summer approximately two weeks after peak discharge and last throughout the descending limb of the hydrograph through to the low flow period in late summer. Actual spawning behaviour was not directly observed nor were fertilized eggs observed *in situ* during the 2011 or 2012 spawning seasons. Therefore, specific spawning areas utilized by Umatilla Dace are not known at this time, but they may be close to the locations where mature fish were captured. Mature males and females (61 to 110 mm fork length) were captured in minnow traps set along low velocity shoreline areas with flooded vegetation and/or aquatic macrophytes, silt substrates and at water depths ranging from 0.2 to 1.5 m. Sampling in August 2012 did not suggest that males in spawning condition move into nearshore areas at specific times of the day (i.e. daytime, dusk, nighttime and dawn). However, the number of sexually mature males captured during this sample session was very low (n=4). Whether these fish were drawn into the baited traps to feed, seek shelter or spawn is unknown at this time. Information from the literature only indicated that Umatilla Dace may spawn in mid-summer because near-ripe individuals were collected in July and the closely related leopard and speckled dace species also spawn at this time (Peden and Hughes 1981, 1984, Peden 1991, McPhail 2003, 2007).

There were no mature Umatilla Dace observed in spawning condition despite expending extensive effort within the LCR study area. No dace were observed over 68 mm FL during all years of this study, which is similar to that observed during stranding and ramping studies on the LCR where Umatilla Dace were not larger than 58 mm FL (Golder 2007). The only known large adult Umatilla Dace (122 mm TL) captured within the LCR study area was observed on the lower Kootenay River during boat electrofishing surveys conducted in the Brilliant Dam tailwater area on August 12, 2010 (Golder 2011). This fish was not in spawning condition and was collected at depths between 6 and 12 m, with turbulent flow and low amounts of substrate interstices (Golder 2011).

Based on observations in the Slocan River, Umatilla Dace are hypothesized to spawn in the LCR study area between early July and mid-September. The spawning time likely occurs when daily average water temperatures are between 12°C to 19°C at Birchbank, which encompasses the peak of freshet through the descending limb of the hydrograph to the low flow period in late summer (Figure 3; AMEC 2012).

5.1.2 Columbia Sculpin

In the LCR study area, Columbia Sculpin have been directly observed spawning at LCR_24.5R (Genelle) and LCR_8.4L (CPR Bridge at Robson) in mid-July 2011 and mid-June 2010, respectively. Spawning habitat characteristics for the two Columbia Sculpin nests observed in the LCR study area included run habitat with unembedded boulder and cobble substrates at depths from 0.4 to 0.5 m and average velocities from 0.05 to 0.2 m/s. These nest sites were similar to spawning areas utilized between late May and mid-June in the Similkameen River watershed, an unregulated system where a larger population of this species resides (AMEC 2010b). For example, in Otter Creek, Columbia Sculpin were observed to use run or riffle habitat with boulder and cobble substrates having an embeddedness ranging between 10 and 40%. Nests were located where depths ranged from 0.27 to 0.67 m, with average velocities ranging from 0.36 to 0.74 m/s (AMEC 2010b). In the Tulameen River, Columbia Sculpin nests were in riffle habitats with boulder and cobble substrates (10-30% embeddedness) at depths ranging from 0.10 to 0.48 m and average velocity ranging from 0.17 to 1.11 m/s (AMEC 2010b). Areas with similar biophysical characteristics within the LCR study area may also provide spawning habitats for this species. Also, other sites where Columbia Sculpin (and larval stages) have been captured but not observed to be spawning may be potential spawning areas for this species (Appendix C).

Spawn timing, which includes the deposition, incubation, and hatching of eggs for Columbia Sculpin in the LCR study area, was estimated to occur between early June and late July which is predominantly during the ascending limb of the hydrograph around peak freshet when daily average water temperatures were between 9.5°C and 15°C (Table 22). Egg deposition occurs predominantly during the ascending limb, but hatching occurs when water levels are receding.

Spawning was not observed directly during previous studies in the Lower Columbia and Kootenay rivers, but it was suggested that it starts mid/late May because temperatures around this time are 10 ºC and YOY were absent in early June sampling, but present in early August (15-25 mm TL; R.L.&L. 1995).

In the Similkameen River watershed, it was determined that spawning was more influenced by water temperature than discharge, since both Otter Creek and the Tulameen River had very different discharge regimes, but spawning was observed at water temperatures between 8°C and 15°C on both these systems (AMEC 2010b). In the unregulated system, spawning, egg deposition and hatching occurred during the descending limb of the hydrograph (AMEC 2010b). In Otter Creek, this occurred from mid-May to mid-June, whereas in the Tulameen River, the spawning period occurred from early to mid-June until early to mid-July. McPhail (2007) indicated that Columbia Sculpin spawn in the spring with water temperatures between 7ºC to 12ºC from mid-May to late June in Otter Creek.

5.1.3 Shorthead Sculpin

In the LCR study area, Shorthead Sculpin were observed spawning at LCR_24.5R and LCR_10.5L in 2011 (AMEC 2012). Spawning habitat characteristics for the three Shorthead Sculpin nests observed in the LCR study area included run habitats with unembedded boulder substrates at depths from 0.3 to 1.3 m and average velocities from 0.01 to 0.5 m/s. These nest sites were located in similar substrates to those observed in Pass Creek, an unregulated tributary of the LCR where a larger concentration of individuals have been observed (AMEC 2010b). For example, five nests in Pass Creek were observed in run habitat with boulder and cobble substrates that were between 5-40% embedded. However, two nests observed at LCR_10.5L were in areas that were 2-3 times as deep and at slower velocities (maximum flow of 0.17 m/s) compared to nests at Pass Creek (depth=0.42 to 0.62 m; velocity= 0.43 to 0.66 m/s). As a side note, the maximum depth in which observations were made in Pass Creek was approximately 1 m as velocities became too high to access deeper areas during the spawning period (AMEC 2011). Areas with similar biophysical characteristics within the LCR study area may also provide spawning habitats for this species. Also, other sites where Shorthead Sculpin (and larval stages) have been captured, but not directly observed to be spawning may be potential spawning areas for this species (Appendix C).

Spawn timing for Shorthead Sculpin in the LCR study area was estimated to occur between early June and late July which is predominantly during the ascending limb of the hydrograph around peak freshet when daily average water temperatures were between 9.5°C and 15°C (Table 22). Egg deposition occurs predominantly during the ascending limb, but hatching occurs when water levels are receding.

In the unregulated Pass Creek, spawn timing was estimated to range from mid/late June to late July when average daily water temperatures were between 8°C to 14°C, similar to the LCR study area, but this occurred along the descending limb of the hydrograph (AMEC 2011). Gasser et al. (1981) indicated that Shorthead Sculpin in the Big Lost River (Idaho, USA) had an egg deposition time restricted to less than two weeks starting in mid–April. McPhail (2007) indicated that Shorthead Sculpin in B.C probably spawn in early May and the breeding season likely extends to mid-July based on observations of eyed eggs in nests at this time.

5.2 Are there specific nursery areas used by Columbia Sculpin and Umatilla Dace and, if so, what are their biophysical characteristics? (B)

5.2.1 Umatilla Dace

In the regulated LCR study area, Umatilla Dace YOY have been captured at Koot_0.2R, Koot_0.5R, Koot_0.3L, Koot_1.2L, LCR_2.8L, LCR_10.5L, LCR_16.7L, LCR_24.5R, LCR_47.5L, LCR_51.4R, LCR_53.1L (Appendix C). Other Umatilla Dace life stages have also been captured at these locations though the majority of those caught have been YOY. Nursery areas in the fall, when Umatilla Dace can be identified to species following emergence during the summer, consisted of shallow, low velocity, nearshore areas with mainly cobble substrates. Moving into the winter, YOY were located at similar depths and velocities as summer though they were closer to the shore in areas of silt and flooded terrestrial vegetation. In the spring and summer, Umatilla Dace YOY were observed in more variable depths in pool areas with negligible flow and substrates including flooded vegetation, gravel and silt. Nursery habitats used in the unregulated Slocan River were very similar though YOY were located in predominantly gravel areas in the winter.

General larval dace habitats also provide information on their nursery areas as small dace (<15 mm) were potentially Longnose or Umatilla Dace. Larval dace were observed from late July to mid-October. In the LCR study area, larval dace habitats were similar to those observed in 2010 and 2011 and included shallow, nearshore (1 to 2.5 m from the water's edge), pool areas with negligible flow and flooded vegetation and silt substrate between late July and the end of August (AMEC 2012). As in 2010 and 2011 (AMEC 2011, 2012), larval dace were often located in similar habitats as larval suckers (*Catostomus* spp.) during the summer and early fall. Combined schools of dace and sucker YOY, estimated to contain thousands of individuals, were found along flooded shorelines. These areas had water temperatures up to 10°C warmer than adjacent mainstem areas (AMEC 2011). In the Slocan River, dace YOY were closer to the shoreline (0.2 m) and mostly in pool habitats (silt/sand), but they were also present in riffles (cobble/gravel) compared to the LCR study area.

In early August, Umatilla Dace fry (~10 mm TL) were observed foraging in the mid-column during the day along the quiet margins of the Slocan River (McPhail 2007). These areas of the Slocan River were shallow (<10 cm), had no measurable current and had sand or silt substrate (McPhail 2007). By late August, fry were still foraging in the mid-column in shallow water (<10 cm), but they had shifted to areas dominated by cobble and gravel substrates (McPhail 2007). In the Similkameen River, Peden and Orchard (1993) found similar YOY habitat use as described for the Slocan River by McPhail (2007). These shallow areas had water temperatures that were as much as 4ºC above the rest of the river and may have helped growth (Peden and Orchard 1993).

In general, dace YOY and juveniles are not as bottom oriented as adults (R.L.&L. 1995, McPhail 2003, 2007). A school of approximately 2000 dace fry (not identified to species; may have included Umatilla Dace) was observed during the summer of 1994 while conducting a snorkel float in the lower Columbia River at the Waneta Eddy; indicating this may be an important location for YOY life stages (R.L.&L. 1995). These dace were in the water column and did not exhibit a specific orientation to the current and fish were observed holding in and around large rip-rap boulders that comprise the north shore of the eddy (R.L. &L. 1995).

5.2.2 Columbia Sculpin

In the LCR study area, 26 (YOY) Columbia Sculpin were identified to species at Koot_0.5R, Koot_0.2R, LCR_16.7L, LCR_24.5R, LCR_47.2R and LCR_49.4L between 2010 and early 2013. Habitat information is not available for these larval sculpin. However, YOY identified as general sculpin (too small to determine species) have been observed at numerous locations throughout the study area between 2010 and 2012 and likely include larval Columbia Sculpin (Section 4.6.6). Habitat characteristics of these general nursery areas were similar in the spring and summer and included the predominant use of cobble and boulder substrates, water depths between 0.1 and 1.5 m, average velocities ranging from 0 to 0.5 m/s distributed throughout the near shore area. YOY sculpins have often been observed resting on top of large substrates (e.g., boulders) sometimes with multiple individuals on the same rock, potentially indicative that they were hatched nearby or even under the observed rock (AMEC 2011).

These results suggest that a greater diversity of nursery habitats may be used by Columbia Sculpin in the LCR than have previously been described. McPhail (2007) indicated that YOY Columbia Sculpins use flooded vegetation as shelter in the margins at times of high water. In the lower Columbia and Kootenay rivers, R.L.&L. (1995) located YOY Columbia Sculpins mostly along stream margins with depths <0.2 m and velocities <0.1 m/s suggesting that these shallower, low flow areas most likely provide refuge from predators, since these areas were not used by larger fish.

In the unregulated Similkameen River watershed, one larval Columbia Sculpin (16 mm TL) was captured in Otter Creek in early July under a patch of flooded grass in a pool that had fine substrate, water depth was 0.3 m and water velocity was negligible (AMEC 2010b).

5.2.3 Shorthead Sculpin

In the LCR study area, 42 YOY Shorthead Sculpins have been identified to species at Koot_0.2R, Koot_0.3L, LCR_10.5L, LCR_16.7L, LCR_24.5R, LCR_47.2R, LCR_47.5L and LCR_53.1L between 2010 and early 2013 (Appendix C). General nursery areas for sculpins were outlined above for Columbia Sculpins and would apply to this species as well.

As with Columbia Sculpin, Shorthead Sculpin may utilize a greater diversity of nursery habitats than those previously described. Newly hatched Shorthead Sculpins were observed in the Slocan River in early July in flooded vegetation along the edges of the river (McPhail 2007). These locations had mud/sand substrate, were <10 cm deep and had water velocities <0.1 m/s (McPhail 2007). Shorthead Sculpin YOY were captured in Pass Creek in October 2009, though direct habitat use observations are not available. This site consisted of habitat with a mean depth of 0.3 m, mean average velocity of 0.6 m/s with the majority of the substrate consisting of cobble followed by gravel (AMEC 2010b).

5.3 Are there seasonal and diel shifts in habitat use by these species and, if so, how do these shifts relate to daily or seasonal water level fluctuations (diel and seasonal)? (C)

5.3.1 Umatilla Dace

Seasonal shifts in habitat were observed for Umatilla Dace on both systems, but observations indicated that diel habitat shifts may not occur. Flooded vegetation available during high water periods (i.e. freshet) appears to be an important habitat for Umatilla Dace. In the LCR study area, Umatilla Dace were observed in similar depths, velocities and habitat types in all seasons except for the fall when they were in areas with cobble compared to flooded vegetation and silt, as was predominant during all other seasons. In the unregulated Slocan River, Umatilla Dace were located in deeper and faster water in the spring and summer than other seasons, likely due to freshet conditions. Dominant substrates varied by season and were more diverse than in the LCR study area; flooded vegetation was only used in the spring and summer as this type of habitat is not available in this unregulated system during the fall and winter. Umatilla Dace YOY use shallow, low or no velocity nearshore areas with variable substrates year round in both the regulated and unregulated system.

Diel habitat use shifts were not observed during seasonal sampling in either the regulated LCR or unregulated Slocan River study areas, though sample sizes have been small. Umatilla Dace were not found in nearshore areas or specific habitat types in higher abundances during one specific diel period (dawn, day, dusk or night) during the summer spawning period on the Slocan River. Further investigations in Year 5 will be conducted to see if nearshore habitat use varies by season and if specific habitats are used more abundantly during the spawning season as a potential indication of Umatilla Dace spawning habitat.

Longnose Dace, are known to be nocturnal and this strategy has been attributed to predator avoidance and possible competition from juvenile rainbow trout (*Oncorhynchus mykiss*) while Blacknose Dace (*Rhinichthys atratulus*) are diurnal which was not considered a disadvantage to predator avoidance as higher light levels allow rapid predator detection and avoidance (Reebs et al. 1995). Habitat use has been related to fish size, with larger Umatilla Dace located in the deepest, fastest sections of the river and using larger substrate for cover (Peden and Orchard 1993, R.L.&L. 1995, McPhail 2003, 2007). R.L.&L. (1995) suggested that diel habitat shifts may occur during winter, spring and fall because Umatilla Dace were more abundant in nearshore catches during the day compared to night potentially shifting to deeper habitats that could not be sampled. In addition, a greater abundance of large fish was recorded in the nearshore area during summer and fall compared to other seasons suggesting a seasonal habitat shift for this species (R.L.&L. 1995).

5.3.2 Columbia Sculpin

Based on the limited observations available at this time, seasonal habitat shifts were not apparent for Columbia Sculpin in the LCR study area. Columbia Sculpin were captured at similar depths, velocities, substrates and habitat types in the spring, summer and winter; fall habitat use not associated with a flow reduction is not available at this time. No Columbia Sculpin were captured during diel sampling in the LCR study in 2012. Very few sculpins of any species were captured during day/night surveys. Tracking surveys at LCR index sites in fall 2012 did not suggest differences in the habitats used by sculpins during the day versus the night. Additional details pertaining to overwinter habitat use are provided in Section 5.5.2 and sculpin nesting habitats are provided in Section 5.6.2.

In the unregulated Similkameen River system, adult Columbia Sculpin used similar habitats during both day and night and this did not seem to change seasonally (AMEC 2010b).

5.3.3 Shorthead Sculpin

In the LCR study area, Shorthead Sculpin were located in deeper areas during the spring and shallower areas in the winter than in other seasons. Shorthead Sculpin were observed in pool habitat with slower velocity water in the winter compared with other seasons which were dominated by observations in run habitat with similar average water velocities. The majority of Shorthead Sculpins were observed using cobble substrate in all seasons. Water levels in the LCR study area increase to approximately half of peak discharge in late fall through winter. Backflooding has been observed during this time within sections of LCR index sites and may explain why winter habitat use appears to be in slower, pool areas.

Shorthead Sculpins (n=3) were only captured during the day during diel sampling in the LCR study in fall 2012. The habitat used by these sculpins was very similar to the habitats that all sculpin species were observed in day and night during the surveys. Tracking surveys at LCR index sites in fall 2012 did not suggest differences in the habitats used by sculpins during the day versus the night. Additional details pertaining to overwinter habitat use are provided in Section 5.5.3 and sculpin nesting habitats are provided in Section 5.6.3.

In the unregulated Pass Creek, some seasonal shifts in habitats used by adult Shorthead Sculpin were observed (AMEC 2011). For example, average depth used by adults was observed to vary by season with the deepest water used in summer, followed by winter, and shallower depths used in spring. During the spring, fish were observed moving into shallow, newly flooded areas along the left bank in the Pass Creek index site likely for feeding and seeking shelter from higher freshet flows, since spawning was not observed at this time. Although overall velocity was observed to be higher in mid-spring than in early spring and summer, Shorthead Sculpin were observed in fastest currents during summer, whereas velocity used in winter and spring did not vary. The majority of Shorthead Sculpins were observed using cobble substrates in all seasons with embeddedness ranging between 5-10%, which was similar to that available in the entire site. Habitat use was not observed to be significantly different during the day versus night for Shorthead Sculpin and this did not vary between winter and spring; summer diel tracking was not completed due to different sampling priorities. Diel displacements in Pass Creek were not significantly different between seasons and species (AMEC 2011).

5.4 Do different age classes of Columbia Sculpin and Umatilla Dace use different habitats seasonally and, if so, do diel habitat shifts differ among age classes? (D)

5.4.1 Umatilla Dace

Seasonal shifts in habitat were observed for different life stages of Umatilla Dace on both systems, but observations indicated that diel habitat shifts may not occur. Based on observations from both systems, adult and juvenile Umatilla Dace seem to move into nearshore flooded areas during the spring/summer period and possibly move to deeper areas after the spawning period and/or in fall. Meanwhile, Umatilla Dace YOY appear to be more abundant in nearshore areas during the fall and winter than other seasons, likely to avoid high velocity areas and potentially to feed. Neither adults nor juveniles have been captured during the winter in either system over the course of this program, while the highest CPUE for YOYs was observed in the fall and the winter in the Slocan and LCR study areas, respectively. See Section 4.9.1 for additional information on larval dace habitat use.

Diel habitat use shifts were not observed during seasonal sampling in either the regulated LCR or unregulated Slocan River study areas, though sample sizes have been small. Adults Umatilla Dace were observed to use nearshore areas in similar abundances during dawn, daytime, dusk and nighttime during the summer in the Slocan River. Catch abundance during seasonal diel sampling was no different day and night in either system using backpack electrofishing which mainly captures younger life stages (YOY and juveniles; AMEC 2012).

Seasonally flooded vegetation appears to be an important rearing and holding habitat for Umatilla Dace. In the Slocan River, juvenile Umatilla Dace (up to 40 mm) were observed in shallow, quiet areas and were often associated with flooded vegetation during freshet (McPhail 2007). By late August, juveniles were to deeper, faster habitats, were found closer to the shore and in shallower, slower water than adults, but were using more adult substrates (McPhail 2007). In the lower Columbia River, young juvenile (age-1+) Umatilla Dace were abundant in shallow nearshore environments during their second summer, but by fall had shifted to deeper, faster waters (R.L.&L. 1995). Peden and Orchard (1993) indicated that the shallow areas where YOY Umatilla Dace were observed had water temperatures that were as much as 4ºC above the rest of the river and may have helped growth.

5.4.2 Columbia Sculpin

Shifts in habitat were observed for different life stages of Columbia Sculpin in the LCR study area, but there are limited observations available at this time to determine if seasonal habitat shifts occur by life stage. Adults and juveniles used faster and shallower areas than YOY while all life stages used predominantly cobble and boulder substrates. In general, the abundance of Columbia Sculpin in nearshore habitat was highest during the summer compared with other seasons. See Sections 5.3.2 and 5.6.2 for additional information on diel habitat use and spawning habitats used by Columbia Sculpin.

Seasonal and diel habitat shifts are likely required for juvenile and YOY sculpin life stages as they feed and grow throughout the year. Sculpin YOY have been observed in deeper and slower water in a greater diversity of substrates than Columbia Sculpin adults and juveniles in the LCR study area over the course of this program. McPhail (2007) indicated that under most flow conditions, juvenile Columbia Sculpin inhabit riffle habitat, which differs from adult habitat in that it is shallower, slower and has smaller substrate (coarse gravel; McPhail 2007). These habitat use differences observed for juvenile Columbia Sculpin may be due to predation or cannibalistic pressures from other sculpins. For example, juvenile Mottled Sculpin have been shown to prefer the same microhabitat as adults (Downhower and Brown 1979, Anderson 1985, van Snik Gray and Stauffer 1999), but are most abundant in slower, shallower areas because adults feed on sculpins 40 mm smaller than their own body length (Downhower and Brown 1979). McPhail (2007) also indicated that YOY Columbia Sculpin use flooded vegetation as shelter in the margins at times of high water and to avoid predators.

5.4.3 Shorthead Sculpin

Similarly to Columbia Sculpin, shifts in habitat were observed for different life stages of Shorthead Sculpin in the LCR study area, but there are limited observations available at this time to determine if seasonal habitat shifts occur by life stage. Adults and juveniles used faster and slightly shallower areas than sculpin YOY while all life stages used predominantly cobble and boulder substrates. In general, the abundance of Shorthead Sculpin in nearshore habitat was highest during the summer compared with other seasons. See Sections 5.3.3 and 5.6.3 for additional information on diel habitat use and spawning habitats used by Shorthead Sculpin.

As for Columbia Sculpin, seasonal and diel shifts in habitats are likely required for juvenile and YOY Shorthead Sculpin life stages as they feed and grow throughout the year. Shorthead Sculpin YOY have been observed in deeper and slower water in a greater diversity of substrates than Shorthead Sculpin adults and juveniles in the LCR study area over the course of this program. McPhail (2007) indicated that during high water in spring, juvenile Shorthead Sculpin were associated with low flows, shallow depths and sand substrates with scattered cobble and boulder for cover in B.C streams. As water levels subsided, juveniles moved to deeper habitats with higher water velocities and coarser substrate and some were observed in adult habitats by late September (McPhail 2007). Again these shifts are likely related to growth/feeding and predator avoidance.

5.5 Are there over-wintering habitats used by these species and, if so, what are their biophysical characteristics? (E)

The following discussion includes Umatilla Dace and general sculpin species, since observations are limited for Columbia and Shorthead sculpin for the overwinter period at this time.

5.5.1 Umatilla Dace

Over-winter habitats used by Umatilla Dace appear to vary by life stage. No Umatilla Dace adults or juveniles were captured in either system during winter surveys. However, YOY were captured in higher abundances during the fall and winter than other seasons in both systems. Overwinter habitat used by Umatilla Dace YOY in both the regulated and unregulated system consisted of shallow, slow velocity areas with silt and gravel substrate very close to shore. In the LCR study area, YOY were also located in areas of terrestrial vegetation which were flooded during the winter. Drafting of Arrow Lakes reservoir during the winter results in flows which are higher than the seasonal low flows that occur in an unregulated system during this time (Figure 3).

These initial results indicated that older life stages of Umatilla Dace may use deeper, non-wadable areas in both the LCR and Slocan River study areas as over-wintering habitat. Additional information is provided in Section 4.10.1. Further information on over-wintering habitats will be collected in Year 5.

5.5.2 Sculpin Species

Columbia and Shorthead Sculpin were located in similar habitats during the winter as during other seasons in the LCR study area, though Columbia Sculpin were in slightly shallower areas compared to other seasons. However, very few habitat observations are available for these species in certain seasons.

Catch per unit effort and observations during flow reductions suggest the general use of nearshore habitats by sculpins were lower during the fall and winter than during other seasons. The lowest catch rates for Columbia and Shorthead sculpin occurred during the fall and winter in the LCR study area. During flow reduction sampling in the fall and winter, more sculpins were observed immediately after flow reductions than had been located during pre-reduction surveys. These results potentially suggest that sculpins either move to deeper water during the fall through spring period, or, that they remain in established locations as water levels increase during the fall in the regulated LCR.

In the unregulated systems, Columbia and Shorthead sculpin were mostly observed to use similar habitats during the overwinter period as per other times of the year. Overwinter habitat included water depths ranging from 0.2 to 0.4 m, average water velocity ranging from 0.1 to 0.2 m/s and they mostly used cobble substrates followed by boulder that were between 10-30% embedded (AMEC 2010b, 2011). One exception was for Shorthead Sculpin in Pass Creek that used higher average velocities during the overwinter period (0.69 m/s), but other habitat variables were similar throughout the year (AMEC 2011). In the unregulated Similkameen system, habitat use for Columbia Sculpins was not observed to vary between spring, summer, and fall (a proxy for winter) (AMEC 2010b). Further information on over-wintering habitats for specific species will be collected in Year 5.

5.6 Do diel and seasonal water level fluctuations affect spawning behaviour, embryo survival, or adult nest guarding behaviour of Columbia Sculpin and Umatilla Dace? (F)

5.6.1 Umatilla Dace

5.6.1.1 Spawning Behaviour

It is unknown at this time if water level fluctuations affect Umatilla Dace spawning behaviour, since actual spawning behaviour was not directly observed nor were fertilized eggs observed *in situ* during the 2011 or 2012 spawning season. However, Umatilla Dace were observed to be in spawning condition on the Slocan River in 2011. This was the first time that these observations have been made in the wild (Haas 2001; D. McPhail, pers. comm., 2011). Males in spawning condition displayed orange pigmentation on their lips as well as on their pelvic and pectoral fin insertions and many expressed milt when slight pressure was applied to their abdomen. Females in spawning condition displayed bright red colouration on their lips and snout area and some females with these characteristics also expressed eggs. Spawn timing in the Slocan River, based on the presence of ripe fish, was estimated to occur from mid-July through to mid-September along the descending limb of the hydrograph and when water temperatures were between 12°C and 20°C. Mature fish in spawning condition were not observed in the regulated

LCR study area at this time and fish over 68 mm FL were not captured despite expending high amounts of sampling effort. Based on observations taken in the Slocan River, it is estimated that spawning in the LCR study area may occur from early July to mid September as water levels are receding following freshet.

5.6.1.2 Embryo Survival

Information for Umatilla Dace embryo survival was not obtained during the present study, since fertilized eggs were not observed *in situ*. Newly fertilized eggs are adhesive and about 2 mm in diameter (McPhail 2003, 2007). In the laboratory, Umatilla Dace eggs were observed to be very adhesive and easily damaged (Haas 2001). Hatching also occurred over a two day period and time to hatching at 18ºC ranged from 5 to 7 days (Haas 2001). Fry are approximately 7 mm when they hatch (McPhail 2003, 2007). It is likely that Umatilla Dace fry spend a week in the gravel after hatching before they emerge (McPhail 2003, 2007).

5.6.1.3 Adult Nest Guarding Behaviour

It is not known whether Umatilla Dace build and guard nests during the spawning period, since direct observations were not obtained during the present study. Haas (2001) observed Umatilla Dace spawning under laboratory conditions, but detailed information on spawning behaviour was not provided. Spawning has not been observed in the wild.

5.6.2 Columbia Sculpin

5.6.2.1 Spawning Behaviour

Changes to the hydrograph in the regulated LCR may affect Columbia Sculpin spawning behaviour in terms of spawn timing. However, actual spawning behaviours (colouration, nest guarding and polygynous spawning behaviour) have not been observed to be affected at this time.

Columbia Sculpin in the unregulated Similkameen system were observed spawning during the descending limb of the hydrograph when water temperatures were between 8°C and 15°C. Even though different flow regimes were observed at index sites on the Similkameen system, the onset of spawning was triggered when water temperatures reached approximately 8°C (AMEC 2010b). In the regulated LCR study area, spawn timing for Columbia Sculpin occurred predominantly during the ascending limb of the hydrograph through to peak discharge when water temperatures were between 9°C and 15°C (early June to late July).

Spawning behaviour for Columbia Sculpin in both the regulated and unregulated systems were similar to what has been reported for this species. That is, breeding colouration was observed in adult male Columbia Sculpins that were guarding nests. Breeding males' entire bodies are black except for a band of orange along the upper tip of the first dorsal fin (McPhail 2007). Breeding females do not develop this obvious spawning colouration although they have noticeable swollen abdomens (McPhail 2007). Male sculpin are territorial and guard nests under rocks (McPhail 2007). Female sculpins deposit their adhesive eggs in a clump on the underside of the nest rock and the male fertilizes them and guards the nest until they hatch (McPhail 2007). Like many sculpin species, Columbia Sculpin are polygynous (McPhail 2007) and most of the Columbia Sculpin nests observed in both systems during this program had more than one clump of eggs indicating that more than one female deposited its eggs at the nest rock. In addition, mature Columbia Sculpin males were observed to move very little at index sites on the Similkameen system during the spawning period as they were likely guarding their nests. Spawning movements for tagged Columbia Sculpins in the LCR study area were not available due to the low number of observations collected at index sites in the LCR study area in 2010 and due to very high water levels that precluded tracking in 2011 and 2012.

5.6.2.2 Embryo Survival

Lowered egg survival for Columbia Sculpin has been observed at some locations within the regulated LCR study area, but it is not clear at this time whether water level fluctuations are the reason. Egg survival for Columbia Sculpin in natural systems is high. For example, in the Similkameen system egg survival ranged between 95-99% (AMEC 2010b). Larvae were often observed moving inside captured eggs from the Similkameen system indicative of survival to hatch. Hatch rate may also be quite high as almost all of the eggs collected in the Similkameen system hatched directly in sample bags they were collected in.

In the LCR study area, limited information is available on embryo survival as only two Columbia Sculpin nests have been confirmed at this time. One nest, located at LCR_24.5R on July 13, 2011 contained approximately 70% viable, eyed unmoving eggs, which is slightly lower than that observed in the Similkameen system. The second nest, located at LCR_8.4L on June 17, 2010 was very recently spawned and therefore estimates of embryo survival are not applicable to this discussion. However, information collected at 33 sculpin nest locations in the LCR study area, may provide insight on general trends in embryo survival in the LCR, since these nests may have belonged to Columbia, Shorthead or Torrent Sculpins. Nests located in the upper LCR study area (i.e., LCR_1.5L, LCR_2.8L and LCR_10.5L) had embryo survival rates generally greater than 98%, consistent with those observed in the Similkameen. However, downstream at LCR_24.5R (Genelle Index Site) egg survival for sculpin nests varied between 0 and 100% and averaged 25% in 2010 and 58% in 2011. Nests were located in mid-June in 2010 and mid-July in 2011. Such low egg survival had not previously been reported for sculpins (D. McPhail, pers. comm., 2011).

Inspection of the hydrograph indicates that it was unlikely that nests at LCR_24.5R became dewatered during the spawning period in 2010 and 2011. In 2010, it was noted that nests were present near a thick green algae, which covered some of the nest rocks, but it was not clear if survival rates were different on nest rocks with or without algae. At night, algae absorbs oxygen and this pulse in low oxygen may affect egg survival (D. McPhail, pers. comm., 2010). In 2011, algae was not observed on the nest rocks as it had been the previous year. Additionally, nests with high egg survival were located at LCR_10.5L, a site with abundant Dydimo (*Didymosphenia geminata*).

The nearshore and shoreline areas at LCR_24.5R consist of a series of cobble/boulder groynes that create a series of back eddies (Photo 4 in AMEC 2011). The extent and location of back eddies varies with discharge as do resulting areas of sediment (silt/sand) deposition. As a result, there is potential that a sculpin nest was spawned in run habitat with constantly flowing, oxygenated water, but as water levels change these locations can become stagnant, pool habitat. Habitat information collected at four nest locations at LCR_24.5R on July 13, 2011 and repeated one week later indicated that these nests were located in slower velocity, shallower locations with half classified as pool while they had all previously been in run habitat. One nest of nearly 100% non-viable eggs appeared black, possibly due to sedimentation at the egg deposition location.

Additional surveys in Year 5 will further investigate the low egg survival rates observed at this location.

5.6.2.3 Adult Nest Guarding Behaviour

Adult nest guarding behaviour has not been observed to be directly affected by water level fluctuations for Columbia Sculpins at this time. However, adult nest guarding seems to be a strong behaviour for sculpins and they have been observed to guard their nests even if water levels decline and will even guard their nests when egg mortality is high. For example in the LCR study area at LCR_24.5R, 11 spawning sculpins were observed guarding their nests even though the majority of eggs on these nests were dead and/or fungused. It is possible that the nests belonged to either Columbia, Torrent or Shorthead Sculpins based on the diameter of eggs, but sculpins could not be captured during the snorkel survey to confirm their identification. The low embryo survival at these nests may, however, suggest that males were not able to adequately perform typical nest guarding behaviours even though they remained with the nest. Males will guard nests by attacking potential intruders which approach the nest. They will also fan the eggs with their pectoral fins and clean the surface of the eggs with their anal fin by undulating their body laterally while upside-down under the nest rock (Goto 1988). The reason why males at LCR_24.5R were unable to perform these activities may be the result of the environmental factors observed at this location as suggested in Section 5.6.2.2. Further information on male nest guarding behaviour at Genelle will be collected in Year 5.

5.6.3 Shorthead Sculpin

5.6.3.1 Spawning Behaviour

Changes to the hydrograph in the regulated LCR may affect Shorthead Sculpin spawning behaviour, in terms of spawn timing, compared to unregulated systems. However, actual spawning behaviour has not been observed to be affected at this time.

Shorthead Sculpin were observed to spawn in the unregulated Pass Creek from late June to late July when water temperatures were between 8°C and 15°C. Spawning was observed during the period when flows had likely just peaked and were beginning to recede. In the regulated LCR study area, spawning occurred during the same period as observed for Columbia Sculpin. That is, spawning occurred during the ascending limb of the hydrograph through peak discharge when water temperatures were between 9°C and 15°C (early June to late July).

Spawning behaviour for Shorthead Sculpin in both the regulated and unregulated systems were similar to what has been reported for this species. Male Shorthead Sculpin were territorial and were found under rocks (McPhail 2007). Adhesive eggs were observed in clumps on the underside of a male's nest rock (McPhail 2007). Male's were observed to be guarding their nests until the eggs hatched (McPhail 2007; see below). In British Columbia streams, nests contained several clumps of eggs suggesting that they are polygynous like other sculpin species (McPhail 2007). Shorthead Sculpin nests in both the unregulated and regulated system were also observed to contain more than one clump of eggs during this program.

5.6.3.2 Embryo Survival

Seasonal water level fluctuations have been observed to affect embryo survival for Shorthead Sculpins on the unregulated Pass Creek. In 2010, one nest was observed to be dewatered as water levels declined during spring freshet. The nest was still being guarded by the male (see below) and contained four egg masses with approximately 375 eyed, unmoving eggs of which 12 were dead. A small pool of water, elevated in temperature (21°C compared to 8°C in Pass Creek), remained under the rock, covering both the sculpin and his nest, but even if the larvae hatched it was unlikely that they could have survived because the nest was not connected to the flowing mainstem (AMEC 2011). However, other nests in Pass Creek were observed to have high egg survival (>95%) at this time. In the regulated LCR study area, one Shorthead Sculpin nest observed in 2011 at LCR_24.5R likely had high egg survival, but it could not be estimated as the majority of remaining eggs were the casings of hatched eggs. As per Columbia Sculpins, it is possible that nests with low embryo survival observed at LCR_24.5R belonged to Shorthead Sculpins (Section 5.6.2.2).

5.6.3.3 Adult Nest Guarding Behaviour

Seasonal flow fluctuations did not alter the strong nest guarding behaviour that has been observed for Shorthead Sculpins. That is, adult nest guarding behaviour was prevalent even when a Shorthead Sculpin nest was dewatered and stranded from the mainstem as observed in unregulated Pass Creek. One PIT tagged male Shorthead Sculpin was observed to be guarding its nest in an area stranded from the mainstem of Pass Creek on July 14, 2010 (Section 5.6.3.2). Water levels were declining in Pass Creek after the spring freshet.

In the LCR study area, 11 spawning sculpins were observed guarding their nests at LCR_24.5R even though the majority of eggs on these nests were dead and/or fungused. It is possible that male sculpin were unable to perform typical nest guarding behaviour thus resulting in low embryo survival at this location (Section 5.6.2.3).

5.7 How do water level fluctuations (diel and seasonal) in the lower Columbia River affect the distribution and habitat use of sculpins and dace, especially the listed species? (#1)

Water level fluctuations occurring in the early spring 2010, early spring 2012, fall 2012 and winter 2013 at HLK may not influence the short-term distribution and habitat use of sculpins located in shallow shoreline areas that are at risk of dewatering in the LCR. This may also be true for Longnose and Umatilla Dace during early spring 2012 and winter 2013, but sample sizes were too small to draw these conclusions at this time (n=1 and n=3, respectively). During September and October 2012 and February 2013 flow reductions, tagged sculpins were observed to move away from areas that were at risk of dewatering. As water levels receded during the observed flow reductions, tagged fish moved away from areas that became dewatered, with the majority of displacements directed toward the thalweg (Appendix F). Sculpins were also observed to move during reductions if they were in locations that did not dewater, however, these movements were less common and fish often remained in the same location. The rate of movements made during the fall flow reductions were not found to differ from post-flow reduction or seasonal movement rates. That is, tagged fish did not move more or less frequently or distribute themselves differently during flow reduction sampling compared to other periods.

The majority of habitat use variables were not observed to vary prior to, during or following HLK flow reductions in early spring, fall and winter. However, tagged sculpins at LCR_24.5R were located in significantly deeper locations following an early spring flow reduction compared to before and during it, tagged sculpins at LCR_10.5L were observed in areas with significantly faster water following fall flow reductions compared to before and immediately after them and tagged sculpins at LCR_24.5R were located significantly closer to shore immediately after winter flow reductions than they had been before the reductions.

Regulation of the LCR has resulted in two high water periods: one during the spring/summer runoff period and a second, though less prominent, during the late fall and winter as the Arrow Lakes reservoir is drafted. All life stages of Umatilla Dace have been observed in flooded terrestrial areas during the spring/summer high water period in both the regulated and non-regulated system (see Section 5.4). Umatilla Dace YOY are generally located in shallow pool areas close to shore in all seasons. In winter 2013, Umatilla Dace YOY were captured very close to shore in areas of terrestrial flooded vegetation in the LCR, a habitat that is not available in an unregulated system. Conversely, sculpin abundance in nearshore areas was lower during this period than other seasons. More sculpins were located immediately following flow reductions than had been observed before, potentially indicating limited use of these temporarily flooded areas during the winter.

5.8 What seasonal and diel habitat shifts do sculpins and dace (especially the listed species) make in response to water level fluctuations? (#2)

The information to address this management question is provided in Sections 5.3 and 5.4.

Seasonal and diel shifts in habitat use were not commonly observed for sculpins studied in the unregulated Similkameen system, where peak flows occur in spring (mid-May to mid-June) and low flows occur from the summer through the early spring period (mid-August through April; AMEC 2010b). This finding was consistent for Shorthead Sculpin in Pass Creek, an unregulated system, where they were observed in similar diel and seasonal habitats (AMEC 2011). Diel habitat shifts have not been observed for Umatilla Dace in the Slocan River, but seasonal habitat shifts do occur as they have been captured in areas of terrestrial vegetation that is seasonally flooded during the freshet.

5.9 Do the operations of Hugh L. Keenleyside Dam alter these natural movements? Specifically, does this risk of stranding increase? (#3)

The operations of HLK did not seem to alter the natural movements of sculpins and increase their risk of stranding during fall, winter or early spring flow reductions. Initial observations suggest adult dace movements are also not altered but limited information is available at this time. We cannot conclude at this time whether operations at HLK during the summer would alter the natural movements of target sculpins and dace and increase their risk of stranding.

The results of targeted sampling during flow reductions in March 2010, March 2012, September 2012, October 2012 and February 2013 indicated that the risk of stranding to sculpins was very low at that time. In addition, no significant differences in the majority of habitat use variables or rate of movement were observed during the flow reduction compared to pre, post or seasonal flow reduction habitats and movement rates (See Sections 4.7 and 5.7). Columbia, Shorthead, Prickly and Torrent sculpins have been observed to move to deeper habitats as water levels receded rather than remaining in areas that would result in stranding. Longnose Dace (n=3), like the sculpins, moved to deeper areas rather than remaining in locations that became dewatered and that observed in March 2012 (n=1) made similar movements during and following the late March flow reduction. Results during fall 2012 and winter 2013 differed slightly from previous years in that sculpin movement was observed during flow reductions even if sculpins were located in areas that remained wetted. In late March 2010 and 2012 fish did not move if they were located in deeper/steeper sided locations that did not seem at risk of dewatering (AMEC 2011; AMEC 2012). However, sample sizes were larger and more flow reductions were observed in Year 4 than during previous years which may account for this new observation.

Perhaps the phased HLK flow reductions, which occur over multiple days when larger drops are required, provides time for tagged fish to respond to declining water levels. In the LCR, both adult and juvenile sculpin and dace species were observed to be prone to stranding below HLK during rapid discharge reductions (R.L.&L. 1995). Sculpin and dace species are often observed during fish salvage activities conducted below HLK (Golder 2011). Experiments conducted in the study area using native fish species (including sculpins and dace) to determine factors influencing fish stranding found that higher natural fish density, longer periods of wetted history and higher ramping rates all led to higher probabilities of pool stranding (Irvine et al. 2008). However, none of the factors was significant in predicting the probability of these species becoming stranded interstitially (Irvine et al. 2008).

The findings of Bell et al. (2008), who studied the effects of daily reservoir fluctuations on salmonid fry, are pertinent for sculpins and dace stranding risk, especially since their results were similar to those reported for other riverine studies. They observed that:

- Stranding was found in habitat with ≤6% slope.
- Most stranded fishes were detected on rock substrate, typically in interstitial spaces among cobbles or in potholes.
- Few stranded fishes were observed in vegetative substrate, but detection probabilities were lower in vegetated areas as vegetation density increased.
- No relationship was apparent between the range in fluctuation and the number of stranded fishes; range of fluctuation is only significant in that it affects the total area that is exposed and the number of potential potholes or other features that become accessible and then drained.
- No relationship was apparent between the average rate of water surface decline and the number of stranded fishes; stranding was independent of the rate of fluctuation, but rates of decline less than 18 cm/hr were not observed in this study. And,

- Incidence of stranding appeared to decrease when flow reductions occurred at night, when fish are more likely to be actively swimming in the water column rather than seeking cover.

Sculpins and dace may be vulnerable to stranding as they are often associated with larger cobble substrates having interstitial spaces for them to hide or spawn under. Index sites with a high incidence of sculpins and dace stranding likely are comprised of areas with low gradients and cobble substrates. For example, Umatilla Dace have been historically observed stranded at 10 of the 21 stranding index sites that are surveyed in the LCR study area (BC Hydro Stranding database, unpublished). These areas include: Bear Creek (left bank); Fort Shepherd Launch (left bank); Gyro Park boat launch (Trail); Kootenay River Campground (left bank); Kootenay River (right bank) Norn's Creek Fan; Millennium Park; Tin Cup Rapids (left bank); and downstream of the Trail Bridge (left bank). Historical sites where higher numbers of stranded sculpin species are observed include: Genelle; Kootenay River (left and right banks); Norn's Creek Fan; and, Zuckerberg Island (left bank).

5.10 Which operations, and at what season, pose the highest risk of stranding or interference with the normal life cycles of sculpins and dace? (#4)

Although the present study did not observe stranding incidence throughout the entire LCR study area, the risk of stranding at index sites for adult sculpins during fall, winter and early spring and adult dace during winter and early spring flow reductions at HLK was low. Also, this operation did not seem to interfere with the normal life cycles of sculpins (and dace), since habitat use and movements were similar to what was observed outside of the flow reduction period in the fall and early spring, a time when these species are not actively spawning.

Critical life history periods for sculpins and dace include the spawning through larval rearing periods that occurs from June to late September. Male sculpins actively guarding nests (June to July in the LCR study area) may be at risk of stranding should their nest rock become dewatered as was observed in the unregulated Pass Creek. Recently emerged dace YOY using seasonally flooded terrestrial areas have been observed stranded in pools near Beaver Creek mouth as the LCR receded in summer (AMEC 2011).

A high stranding risk period has been identified between June 1 to September 30 in the LCR and lower Kootenay River while a low stranding risk period occurs between October 1 and May 31 (CLBMON-42 Lower Columbia River Fish Stranding Assessment and Ramping Protocol; Golder 2011). These risk periods have been defined by the day of the year that flow reductions occur and by river stage (Golder 2011). The risk of stranding for listed species (Columbia Sculpin, Shorthead Sculpin, Umatilla Dace) was observed to be higher during the low risk stranding period on the LCR (October 1 to May 31) at stranding index sites (Golder 2011). The October 1 to May 31 period of increased stranding risk for listed species likely corresponds to a period that would naturally not have much water level fluctuation and would have a longer wetted history, a factor that influences higher fish stranding in isolated pools (Irvine et al. 2008). Though Golder (2011) did not discuss life stage of listed species observed during the low risk stranding period, observations collected during this program suggest larval and juvenile life stages predominant nearshore catch during this periodas these smaller life stages are seeking out warmer water to actively feed and grow, which can make them prone to stranding.

Fish species using shallow water environments are particularly prone to changes in flows since these habitats are more likely to become dewatered compared to the thalweg. Bain et al. (1988) observed that species using shallow water habitats in the margins of a regulated river were reduced in abundance and sometimes absent from their study sites compared to an unregulated river with similar habitat characteristics and species assemblages. Fish using deeper, mainstem habitats had higher abundances in the regulated river (Bain et al. 1988). Flow fluctuations may also affect channel edge and backwater habitats, especially along vegetated stream reaches occupied by nesting and YOY fish (Stalnaker et al. 1996).

Further information will be collected and analyses conducted in Year 5 to determine risk of stranding or interference with normal life cycles during other periods that may be critical to sculpins and dace life history.

6.0 ASSESSMENT OF METHODS

The focus of the past four years has been to observe natural life history characteristics of target species in the unregulated Similkameen system (Year 1), Pass Creek (Year 2) and the Slocan River (Years 3-4) with concurrent sampling on the LCR study area. The majority of sampling for all systems was conducted in shallow, shoreline areas to focus efforts in areas prone to water level changes during flow fluctuations.

In Years 3 and 4, minnow traps were found to be the most successful method to capture Umatilla Dace adults, while backpack electrofishing was the most successful way to capture YOY and juvenile life stages of this species. Minnow traps may draw fish into the area as they are attracted to the bait, therefore habitat use information may not be representative of what Umatilla Dace are specifically using. However, minnow traps provided the best information available for habitats used at this time. In addition, minnow traps were set in deeper habitats than could be sampled by other methods, so that these habitats could be targeted to help answer questions related to this program. Boat electrofishing was also tried in Year 3, but was not determined to be a successful means of catching target sculpin and dace species because these fish were too small to capture effectively in deeper areas with higher water velocity and was not used in Year 4. PIT tagging and tracking continues to allow direct observations of sculpin movements during flow reductions, but dace observations are limited using this method. Accuracy of GPS units used at LCR index sites was good (generally within 2-4 m) which allowed movement rates to be calculated when direct field displacement measurements were not available. Further review of methods used during this program is also provided in AMEC (2010b).

7.0 RECOMMENDATIONS

The following are recommended to help address knowledge gaps that remain for this program:

- Assess sculpin and dace movement and habitat use before, during and following summer 2013, fall 2013 and winter 2014 HLK flow reductions, if they occur (Management Question (MQ) 1, 3 and 4).
- Conduct additional seasonal sculpin and dace movement and habitat use with PIT tracking surveys not associated with flow reductions to determine typical, seasonal movement rates in the LCR (MQ 2).
- Sample LCR_10.5L (LCR left bank upstream of the Kootenay River mouth) and LCR_24.5R (Genelle) index sites to compare sculpin spawning habitats and determine why low embryo survival occurs at LCR 24.5R, but has not been observed in other index sites at this time (MQ 4).
- Sample index sites on the Slocan River to verify and add to Umatilla Dace spawn timing and behaviour collected in Years 3 and 4 (MQ 2).
- Conduct targeted diel habitat use sampling during the summer, fall and winter period for sculpins and dace in the LCR and Slocan study areas (MQ 2).
- Tag adult Umatilla Dace during sampling on the Slocan River to determine site fidelity and potential movements within and outside index sites for compilation of natural movements for this species (MQ 2 and 4).

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PHOTOS

Digital photos and photo log sheet are provided on USB data stick with project files

APPENDIX A
Survey Summary

Table A1. Lower Columbia River (LCR) study area survey information, 2012.

Waterbody	Site Name[1]	Descriptive Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (hours)	EF Effort (seconds)[3]	Flow Reduction	Day/ Night	Water Temp (°C)	Comments[4]
LCR	LCR_10.5L	CLB LB US Koot Mouth	7-May-12	CL, CT, KM	EF1		2331	No	Day	6.2	PIT tagging.
LCR	LCR_24.5R	Genelle Index Site	7-May-12	CL, KM, CT	EF1		975	No	Day	6.1	
LCR	LCR_10.5L	CLB LB US Koot Mouth	5-Jun-12	CL, KF	SW1	0.5		No	Day	12	Poor visibility due to high turbidity following rain event (<1 m). Only one CC observed.
LCR	LCR_2.8L	Unk Trib Mouth Robson	5-Jun-12	CL, KF	SW1	1.5		No	Day	12.8	5 nests observed.
Kootenay River	Koot_0.5R	Kootenay River RB	27-Jun-12	CL, KF	EF1		643	No	Day	11.6	
Kootenay River	Koot_0.5R	Kootenay River RB	27-Jun-12	CL, KF	EF1		429	No	Day	14.5	
Kootenay River	LCR_2.8L	Unk Trib Mouth Robson	27-Jun-12	CL, KF	EF1		386	No	Day	11.9	
Kootenay River	LCR_47.5L	Beaver Creek Mouth	27-Jun-12	CL, KF	EF1		704	No	Day	16.5	Approximately 150 m. from regular mouth site due to high water.
Kootenay River	LCR_53.1L	Fort Sheppard Boat Launch	27-Jun-12	CL, KF	EF1		262	No	Day	13.5	
Kootenay River	Koot_0.3L	Kootenay Oxbow	17-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.7		No	Overnight	16	
LCR	LCR_10.3L	Tin Cup LB	17-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	20.5		No	Overnight	14.6	
LCR	LCR_2.8L	Unk Trib Mouth Robson	17-Jul-12	CL, KF	MT1, MT2, MT3, MT4	20.3		No	Overnight	14	
Kootenay River	Koot_0.5R	Kootenay River RB	15-Aug-12	CL, KF	EF1		322	No	Night	17.6	
Kootenay River	Koot_0.5R	Kootenay River RB	15-Aug-12	CL, KF	EF1		302	No	Night	18.6	Tried to EF this site at night, but due to bear activity, we were not able to fish.
Kootenay River	LCR_47.5L	Beaver Creek Mouth	15-Aug-12	CL, KF	EF1		121	No	Day	19.5	
LCR	LCR_53.1L	Fort Sheppard Boat Launch	15-Aug-12	CL, KF	EF1		671	No	Night	17	
LCR	LCR_53.1L	Fort Sheppard Boat Launch	15-Aug-12	CL, KF	EF1		696	No	Day	17.8	
Kootenay River	Koot_0.5R	Kootenay River RB	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.3		No	Overnight	18	
Kootenay River	LCR_11.0R	Zuckerberg Island under Bridge	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.4		No	Overnight	17.3	
LCR	LCR_47.5L	Beaver Creek Mouth	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.5		No	Overnight	17.4	
LCR	LCR_53.1L	Fort Sheppard Boat Launch	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.7		No	Overnight	18	
LCR	LCR_24.5R	Genelle Index Site	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.6		No	Overnight	19.1	
LCR	LCR_2.8L	Unk Trib Mouth Robson	30-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.6		No	Overnight	16.5	
LCR	LCR_10.5L	CLB LB US Koot Mouth	5-Sep-12	CL, KF	TR1	0.4		No	Day	16.3	No fish found.
Kootenay River	Koot_0.2R	Kootenay River Mouth RB	5-Sep-12	CL, KF	SW1	1.3		No	Day	17.5	
LCR	LCR_24.5R	Genelle Index Site	5-Sep-12	CL, KF	TR1	1.9		No	Day	16.7	
Kootenay River	Koot_0.5R	Kootenay River RB	14-Sep-12	CL, KF	EF1		1426	No	Day	17.2	
LCR	LCR_24.5R	Genelle Index Site	14-Sep-12	CL, KF	TR1	1.3		No	Day	15.6	Pit reader file 0. Pre flow reduction tracking.
Kootenay River	Koot_0.5R	Kootenay River RB	15-Sep-12	CL, KF	EF1		1333	Yes	Day	17.6	No VIE recaptured. Approximately 1 m. vertical drop.
LCR	LCR_24.5R	Genelle Index Site	15-Sep-12	CL, KF	TR1	1.2		Yes	Day	15.7	Approximately 1 m. vertical drop; additional 100 x 2 m. area tracked d/s of site. No alive fish found.

Table A1 continued

Waterbody	Site Name[1]	Descriptive Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (hours)	EF Effort (seconds)[3]	Flow Reduction	Day/ Night	Water Temp (°C)	Comments[4]
LCR	LCR_24.5R	Genelle Index Site	17-Sep-12	CL, KF	EF1		1725	No	Day	15.7	EF1- released 18-Sept-12 at 10:00. 1 tagged mortality from EF stress. UTM release location for all tagged fish: WP039, 11U, 0449984/5450695.
LCR	LCR_24.5R	Genelle Index Site	17-Sep-12	CL, KF	EF2		1446	No	Day	16.2	EF2 released 18-Sept-12 at 10:03. UTM release location for all tagged fish: WP039 - 11U 0449999/5450702.
LCR	LCR_10.5L	CLB LB US Koot Mouth	18-Sep-12	CL, KF	EF1		1302	No	Day	16.8	EF1 and EF2 released 19-Sept-12 at 9:00. EF2- 2 mortalities. UTM release location for all tagged fish: WP040, 11U, 0452625/5462900.
LCR	LCR_10.5L	CLB LB US Koot Mouth	18-Sep-12	CL, KF	EF2		1100	No	Day	16.8	EF1 and EF2 released 19-Sept-12 at 9:00. EF2- 2 mortalities. UTM release location for all tagged fish: WP040, 11U, 0452625/5462900.
LCR	LCR_10.5L	CLB LB US Koot Mouth	28-Sep-12	CL, KF	TR1	1.7		No	Day	15.3	Pre flow reduction, pit reader file 0.
LCR	LCR_10.5L	CLB LB US Koot Mouth	29-Sep-12	CL, KF	TR1	2.3		Yes	Day	16.3	Approx. 1 m. vertical drop in water level.
LCR	LCR_10.5L	CLB LB US Koot Mouth	4-Oct-12	CL, KF	TR1	1.3		No	Day	14.6	Pit reader file 1. Photo # 5- facing upstream; photo # 6- facing downstream.
LCR	LCR_24.5R	Genelle Index Site	4-Oct-12	CL, KF	TR1	1.8		No	Day	14.6	Pit reader file 2; Index site: 100 x 5 m.; additional 100 m. tracked upstream and downstream.
LCR	LCR_10.5L	CLB LB US Koot Mouth	26-Oct-12	CL, KF	TR1	1.5		No	Day	11.2	Pre flow reduction tracking.
LCR	LCR_10.5L	CLB LB US Koot Mouth	27-Oct-12	CL, KF	TR1	1.7		Yes	Day	11.2	Tracking post flow reduction. An estimated vertical drop of 0.75 m. and horizontal drop of 3-6 m.
Kootenay River	Koot_0.5R	Kootenay River RB	8-Nov-12	CL, KF	EF1	0.3		No	Night	9.2	
Kootenay River	Koot_0.5R	Kootenay River RB	8-Nov-12	CL, KF	EF1	0.5		No	Day	9.9	
LCR	LCR_10.5L	CLB LB US Koot Mouth	8-Nov-12	CL, KF	TR1	0.9		No	Night	9.6	
LCR	LCR_10.5L	CLB LB US Koot Mouth	8-Nov-12	CL, KF	TR1	1.2		No	Day	9.9	
LCR	LCR_24.5R	Genelle Index Site	8-Nov-12	CL, KF	TR1	1.4		No	Night	9.9	
LCR	LCR_24.5R	Genelle Index Site	8-Nov-12	CL, KF	TR1	1.3		No	Day	9.9	Abundant green algae on site.
LCR	LCR_24.5R	Genelle Index Site	9-Nov-12	CL, KF	EF1	0.8		No	Day	10	
LCR	LCR_10.5L	CLB LB US Koot Mouth	17-Dec-12	CL, KF	TR1	1.3		No	Day	5.5	No tagged fish found.
LCR	LCR_24.5R	Genelle Index Site	17-Dec-12	CL, KF	TR1	1.0		No	Day	5.8	
Kootenay River	Koot_0.5R	Kootenay River RB	22-Jan-13	CL, KF	EF1		912	No	Night	3.1	
Kootenay River	Koot_0.5R	Kootenay River RB	22-Jan-13	CL, KF	EF1		700	No	Day	3.1	Wadeable area is only the silted area; cobble bar not accessible.
LCR	LCR_10.5L	CLB LB US Koot Mouth	22-Jan-13	CL, KF	EF1		871	No	Day	3.9	Bad visibility due to wave action; Efished our index site since no fish were found last time and water level is higher.
LCR	LCR_10.5L	CLB LB US Koot Mouth	22-Jan-13	CL, KF	EF1		692	No	Night	3.7	
LCR	LCR_24.5R	Genelle Index Site	22-Jan-13	CL, KF	EF1	0.2	457	No	Day	3.9	EF battery died halfway through the site.
LCR	LCR_10.55L	CLB LB at Koot Mouth Point	7-Feb-13	CL, KF	EF1	0.7	1381	No	Day	4.4	7 CC captured, 3 observed; Efished additional 25 m. u/s; info on pit-tagging sheets; released at 11U 0452637/5462898 at 14:15.
Kootenay River	Koot_0.5R	Kootenay River RB	7-Feb-13	CL, KF	EF1	0.3	560	No	Day	4.6	Pre flow reduction; middle section not fished due to silt- not UDC habitat.
LCR	LCR_24.5R	Genelle Index Site	7-Feb-13	CL, KF	EF1	0.7	1945	No	Day	4.2	15 CC captured, 3 observed. Efished additional 25 m. upstream and downstream of site. Info on PIT tagging sheets. Release UTM: 11U 0450000/5450706 at 11:45.
LCR	LCR_24.5R	Genelle Index Site	8-Feb-13	KF, PV	TR1	1.7		Yes	Night	4.5	Linear drop of approximately 2 m.
LCR	LCR_10.5L	CLB LB US Koot Mouth	8-Feb-13	KF, PV	TR1	1.3		No	Day	4.1	Pre flow reduction; velocities estimated because Swoffer not functioning; pit reader file #1.
LCR	LCR_24.5R	Genelle Index Site	8-Feb-13	KF, PV	TR1	1.7		No	Day	4.8	Pit reader file #1.
LCR	LCR_10.5L	CLB LB US Koot Mouth	8-Feb-13	KF, PV	TR1	0.9		Yes	Day	4.1	Reduction approximately 1 m. linear.
Kootenay River	Koot_0.5R	Kootenay River RB	9-Feb-13	CL, KF	EF1	0.4	617	Yes	Day	4.3	
LCR	LCR_24.5R	Genelle Index Site	9-Feb-13	CL, KF	TR1	1.5		Yes	Day	4.5	Day 2 of flow reduction. Approx. 1 m. vertical drop overnight; approx. 1.75 m. drop overall; approx. 4 m. drop overall.
LCR	LCR_10.5L	CLB LB US Koot Mouth	9-Feb-13	CL, KF	TR1	1.3		Yes	Day	4.3	Day 2 of flow reduction. Final drop occurred at HLK dam at 10:00. Linear drop of approx. 4 m. from yesterday; approx. 1 m. vertical drop; overall approx. 1.5 m. vertical and 5-7 m. linear. Also tracked dewatered area: NFO.
LCR	LCR_10.5L	CLB LB US Koot Mouth	14-Feb-13	CL, KF	TR1	1.3		No	Day	4.3	Water level approximately 0.5 m. lower than last tracking survey.

Table A1 continued

Waterbody	Site Name[1]	Descriptive Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (hours)	EF Effort (seconds)[3]	Flow Reduction	Day/ Night	Water Temp (°C)	Comments[4]
LCR	LCR_24.5R	Genelle Index Site	14-Feb-13	CL, KF	TR1	1.7		No	Day	4.9	Water level approximately 0.5 m. lower than last tracking survey.
LCR	LCR_10.5L	CLB LB US Koot Mouth	16-Feb-13	CL, KF	TR1	1.5		Yes	Day	4.0	Flow reduction # 1. Flow reduction of approximately 2 m. linear drop, 0.5 m. vertical drop.
LCR	LCR_24.5R	Genelle Index Site	16-Feb-13	CL, KF	TR1	1.2		Yes	Day	4.2	Approximately 1 m. vertical drop and 2.5 m. linear drop.
LCR	LCR_24.5R	Genelle Index Site	21-Feb-13	CL, KF	TR1	1.3		No	Day	4.8	Tracked additional 50 m. upstream of index site.
LCR	LCR_10.5L	CLB LB US Koot Mouth	21-Feb-13	CL, KF	TR1	1.0		No	Day	4.9	Tracked additional 30 m. upstream of site- not included in site effort (10 mins extra).

Notes:

[1] LB= left downstream bank; RB= right downstream bank; US= upstream

[2] LP= Louise Porto, CL= Crystal Lawrence, KF= Katy Fraser, Pier van Dishoeck (AMEC); CT= Clint Tarala (Clint Tarala Fish & Wildlife); KM= Kristen Murphy (MFNLRO)

[3] EF= Backpack Electrofishing, MT= Minnow Trapping, TR= PIT Tag Tracking, SW= Snorkeling

Table A2. Slocan River study area survey information, 2012.

Waterbody	Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (Hours)	EF Effort (seconds)[3]	Day/ Night	Water Temp (°C)	Comments
Slocan River	Sloc_16.2R	8-May-12	CL, KF, LP	MT1, MT2, MT3, MT4, MT5, MT6, MT7, MT8	20.7		Overnight	8.5	
Slocan River	Sloc_30.7R	8-May-12	CL, KF, LP	MT1, MT2, MT3, MT4, MT5, MT6, MT7, MT8	22.1		Overnight	11.4	
Slocan River	Sloc_39.4R	8-May-12	CL, KF, LP	MT0, MT1, MT2, MT3, MT4, MT5, MT6, MT7, MT8, MT9	22.3		Overnight	9.7	
Slocan River	Sloc_16.2R	9-May-12	CL, KF, LP	EF1		611	Day	8.1	
Slocan River	Sloc_22.3R	9-May-12	CL, KF, LP	EF1		280	Day	8.8	
Slocan River	Sloc_37.8L	9-May-12	CL, KF, LP	EF1		698	Day	8.3	
Slocan River	Sloc_39.4L	9-May-12	CL, KF, LP	EF1		489	Day	8.3	
Slocan River	Sloc_37.8L	10-May-12	CL, KF	EF1		766	Night	6.5	
Slocan River	Sloc_39.4L	10-May-12	CL, KF	EF1		622	Night	8.5	
Slocan River	Sloc_16.2R	6-Jun-12	CL, KF	MT1, MT2, MT3, MT4	17.6		Overnight	6.8	
Slocan River	Sloc_30.7R	6-Jun-12	CL, KF	MT1, MT2, MT3, MT4	18.7		Overnight	8.3	
Slocan River	Sloc_37.8L	6-Jun-12	CL, KF	MT1, MT2, MT3, MT4, MT5	8.1		Overnight	8.3	
Slocan River	Sloc_37.8L	6-Jun-12	CL, KF	MT1	20.1		Overnight	8.3	
Slocan River	Sloc_39.4L	6-Jun-12	CL, KF	MT1, MT2, MT3, MT4	20.0		Overnight	8.6	
Slocan River	Sloc_16.2R	7-Jun-12	CL, KF	MT1, MT2, MT3, MT4	4.4		Day	6.8	
Slocan River	Sloc_16.2R	7-Jun-12	CL, KF	EF1		222	Day	6.8	
Slocan River	Sloc_30.7R	7-Jun-12	CL, KF	MT1, MT2, MT3, MT4	3.0		Day	6.8	
Slocan River	Sloc_37.8L	7-Jun-12	CL, KF	EF1		276	Day	7.2	
Slocan River	Sloc_39.4L	7-Jun-12	CL, KF	EF1		145	Day	7	
Slocan River	Sloc_16.2R	16-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	22.3		Overnight	11.8	
Slocan River	Sloc_16.2R	16-Jul-12	CL, KF	EF1		225	Overnight	11.8	
Slocan River	Sloc_30.7R	16-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	22.3		Overnight	12.6	
Slocan River	Sloc_37.6L	16-Jul-12	CL, KF	MT1, MT2, MT3, MT4	22.2		Overnight	12.8	
Slocan River	Sloc_39.4L	16-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	23.3		Overnight	12.9	
Slocan River	Sloc_43.1L	16-Jul-12	CL, KF	MT1, MT2, MT3, MT4, MT5	22.2		Overnight	13.4	
Slocan River	Sloc_43.1L	16-Jul-12	CL, KF	EF1		226	Overnight	13.4	
Slocan River	Sloc_30.7R	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.8		Day	19.8	
Slocan River	Sloc_30.7R	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	5.9		Dusk	20.7	
Slocan River	Sloc_30.7R	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	5.9		Night	20.4	
Slocan River	Sloc_37.8L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.8		Day	19.5	
Slocan River	Sloc_37.8L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	5.7		Dusk	20.3	
Slocan River	Sloc_37.8L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	6.0		Night	20.4	

Table A2 continued.

Waterbody	Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (Hours)	EF Effort (seconds)[3]	Day/ Night	Water Temp (°C)	Comments
Slocan River	Sloc_39.4L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.0		Day	19.7	
Slocan River	Sloc_39.4L	16-Aug-12	CL, KF	MT1	5.9		Day	20.4	
Slocan River	Sloc_39.4L	16-Aug-12	CL, KF	EF1	0.3		Dusk	20.4	
Slocan River	Sloc_39.4L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	5.9		Dusk	20.4	
Slocan River	Sloc_39.4L	16-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	5.8		Night	20.2	
Slocan River	Sloc_30.7R	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	6.2		Dawn	18.9	
Slocan River	Sloc_30.7R	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.2		Day	18.9	
Slocan River	Sloc_37.8L	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	6.3		Dawn	19.1	
Slocan River	Sloc_37.8L	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.5		Day	18.1	
Slocan River	Sloc_39.4L	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	2.7		Day	18.2	Downloaded temperature logger.
Slocan River	Sloc_39.4L	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6		194	Night	19	
Slocan River	Sloc_39.4L	17-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5, MT6	6.2		Night	19	
Slocan River	Sloc_30.7R	29-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	20.3		Overnight	17.4	
Slocan River	Sloc_37.8L	29-Aug-12	CL, KF	EF1		589	Night	16.4	
Slocan River	Sloc_37.8L	29-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	22.4		Overnight	16.4	
Slocan River	Sloc_16.2R	29-Aug-12	CL, KF	EF1		712	Night	16.4	
Slocan River	Sloc_16.2R	29-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	20.9		Overnight	16.4	
Slocan River	Sloc_39.4L	29-Aug-12	CL, KF	MT1, MT2, MT3, MT4, MT5	22.3		Overnight	16.9	
Slocan River	Sloc_16.2R	18-Sep-12	CL, KF	MT1, MT2, MT3, MT4, MT5	18.5		Overnight	16.4	
Slocan River	Sloc_22.3R	18-Sep-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.7		Overnight	16.1	
Slocan River	Sloc_37.8L	18-Sep-12	CL, KF	MT1, MT2, MT3, MT4, MT5	19.5		Overnight	16.4	
Slocan River	Sloc_39.4L	18-Sep-12	CL, KF	MT1, MT2, MT3, MT4, MT5	20.0		Overnight	16.4	
Slocan River	Sloc_37.8L	19-Sep-12	CL, KF	EF1	0.4		Day	13.5	
Slocan River	Sloc_39.4L	19-Sep-12	CL, KF	EF1	0.2		Day	13.5	
Slocan River	Sloc_16.2R	11-Oct-12	CL, KF	EF1	0.3		Day	10.8	
Slocan River	Sloc_22.3R	11-Oct-12	CL, KF	EF1		763	Day	9.5	
Slocan River	Sloc_30.2M	11-Oct-12	CL, KF	EF1		538	Day	12.5	Shorthead Sculpins were in sample; average depth = 0.1 m., average velocity = 0.25, substrate = gravel.
Slocan River	Sloc_37.8L	11-Oct-12	CL, KF	EF1		571	Day	12.7	
Slocan River	Sloc_39.4L	11-Oct-12	CL, KF	EF1		467	Day	12.7	

Table A2 continued.

Waterbody	Site Name[1]	Sample Date	Crew[2]	Survey Methods[3]	Effort (Hours)	EF Effort (seconds)[3]	Day/ Night	Water Temp (°C)	Comments
Slocan River	Sloc_16.2R	15-Nov-12	CL, KF	EF1		547	Day	6.2	
Slocan River	Sloc_16.2R	15-Nov-12	CL, KF	EF1		617	Night	5.9	
Slocan River	Sloc_30.7R	15-Nov-12	CL, KF	EF1		785	Night	6	
Slocan River	Sloc_30.7R	15-Nov-12	CL, KF	EF1		550	Day	6.4	
Slocan River	Sloc_37.8L	15-Nov-12	CL, KF	EF1		881	Day	6.7	
Slocan River	Sloc_37.8L	15-Nov-12	CL, KF	EF1		778	Night	6.1	
Slocan River	Sloc_39.4L	15-Nov-12	CL, KF	EF1		786	Night	7	
Slocan River	Sloc_39.4L	15-Nov-12	CL, KF	EF1		889	Day	6.8	
Slocan River	Sloc_16.2R	23-Jan-13	CL, KF	EF1		535	Night	0.6	
Slocan River	Sloc_16.2R	23-Jan-13	CL, KF	EF1		600	Day	1.3	
Slocan River	Sloc_37.8L	23-Jan-13	CL, KF	EF1		621	Day	1.9	
Slocan River	Sloc_37.8L	23-Jan-13	CL, KF	EF1		919	Night	1.5	
Slocan River	Sloc_39.4L	23-Jan-13	CL, KF	EF1		559	Day	1.9	Efished in silt (no fish caught) and along gravel fan (Longnose dace).
Slocan River	Sloc_39.4L	23-Jan-13	CL, KF	EF1		435	Night	1.9	

Notes:

[1] L= left downstream bank; R= right downstream bank; M= middle bank

[2] LP= Louise Porto, CL= Crystal Lawrence, KF= Katy Fraser (AMEC)

[3] EF= Backpack Electrofishing, MT= Minnow Trapping

APPENDIX B
Catch Per Unit Effort (CPUE) and Target Species Capture Data

Appendix B1. Summary of minnow trapping effort in the Lower Columbia (LCR) and Slocan river study areas, 2012-13.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Kootenay River	Koot_0.3L	Kootenay Oxbow	MT1	7/17/2012	7/17/2012 14:15	7/18/2012	7/18/2012 10:00	19.75	Overnight	1	0	Flooded Vegetation	4	16															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.3L	Kootenay Oxbow	MT2	7/17/2012	7/17/2012 14:15	7/18/2012	7/18/2012 10:00	19.75	Overnight	1.2	0	Flooded Vegetation	5	16															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.3L	Kootenay Oxbow	MT3	7/17/2012	7/17/2012 14:15	7/18/2012	7/18/2012 10:00	19.75	Overnight	1.3	0	Flooded Vegetation	5	16															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.3L	Kootenay Oxbow	MT4	7/17/2012	7/17/2012 14:15	7/18/2012	7/18/2012 10:00	19.75	Overnight	0.6	0	Flooded Vegetation	1	16															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.3L	Kootenay Oxbow	MT5	7/17/2012	7/17/2012 14:15	7/18/2012	7/18/2012 10:00	19.75	Overnight	0.6	0	Flooded Vegetation	1	16															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	MT1	8/30/2012	8/30/2012 13:30	8/31/2012	8/31/2012 8:45	19.25	Overnight	0.5	0	Silt	1.5	18														1	1	0.05	0.05	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	MT2	8/30/2012	8/30/2012 13:30	8/31/2012	8/31/2012 8:45	19.25	Overnight	0.5	0.05	Silt	2	18															0	0.00	0.00	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	MT3	8/30/2012	8/30/2012 13:30	8/31/2012	8/31/2012 8:45	19.25	Overnight	0.4	0	Flooded Vegetation	4	18	1							5						6	12	0.62	0.31	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	MT4	8/30/2012	8/30/2012 13:30	8/31/2012	8/31/2012 8:45	19.25	Overnight	0.3	0	Flooded Vegetation	5	18					2								1	1	4	0.21	0.05	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	MT5	8/30/2012	8/30/2012 13:30	8/31/2012	8/31/2012 8:45	19.25	Overnight	0.8	0.05	Flooded Vegetation	3	18															0	0.00	0.00	0.00	0.00
Total Effort (hrs), Catch per Species and Average CPUE for Kootenay River, 2012								195.00							1	0	0	0	2	0	0	5	0	0	0	0	1	8	17	0.09	0.04	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	MT1	8/30/2012	8/30/2012 15:50	8/31/2012	8/31/2012 11:20	19.50	Overnight	0.5	0.05	Silt	3	17.4															0	0.00	0.00	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	MT2	8/30/2012	8/30/2012 15:50	8/31/2012	8/31/2012 11:20	19.50	Overnight	0.3	0	Silt	4	17.4															0	0.00	0.00	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	MT3	8/30/2012	8/30/2012 15:50	8/31/2012	8/31/2012 11:20	19.50	Overnight	1	0	Flooded Vegetation	12	17.4													5		5	0.26	0.00	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	MT4	8/30/2012	8/30/2012 15:50	8/31/2012	8/31/2012 11:20	19.50	Overnight	0.4	0	Flooded Vegetation	5	17.4										1					1	0.05	0.00	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	MT5	8/30/2012	8/30/2012 15:50	8/31/2012	8/31/2012 11:20	19.50	Overnight					17.4															0	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	MT1	8/30/2012	8/30/2012 16:15	8/31/2012	8/31/2012 11:55	19.67	Overnight	0.5	0.05	Flooded Vegetation	4	18															0	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	MT2	8/30/2012	8/30/2012 16:15	8/31/2012	8/31/2012 11:55	19.67	Overnight	0.22	0	Flooded Vegetation	2	18															0	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	MT3	8/30/2012	8/30/2012 16:15	8/31/2012	8/31/2012 11:55	19.67	Overnight	0.25	0.3	Boulder	1	18															0	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	MT4	8/30/2012	8/30/2012 16:15	8/31/2012	8/31/2012 11:55	19.67	Overnight	0.4	0.3	Boulder	4	18															0	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	MT5	8/30/2012	8/30/2012 16:15	8/31/2012	8/31/2012 11:55	19.67	Overnight	1	0.05	Silt	5	18															0	0.00	0.00	0.00	0.00
LCR	LCR_25.1R	Genelle	MT1	8/30/2012	8/30/2012 15:05	8/31/2012	8/31/2012 10:40	19.58	Overnight	0.6	0.2	Flooded Vegetation	6	19.1															0	0.00	0.00	0.00	0.00
LCR	LCR_25.1R	Genelle	MT2	8/30/2012	8/30/2012 15:05	8/31/2012	8/31/2012 10:40	19.58	Overnight	0.4	0.05	Silt	7	19.1										1			3		4	0.20	0.00	0.00	0.00
LCR	LCR_25.1R	Genelle	MT3	8/30/2012	8/30/2012 15:05	8/31/2012	8/31/2012 10:40	19.58	Overnight	0.22	0	Silt	2	19.1													3		3	0.15	0.00	0.00	0.00
LCR	LCR_25.1R	Genelle	MT4	8/30/2012	8/30/2012 15:05	8/31/2012	8/31/2012 10:40	19.58	Overnight	0.7	0.05	Flooded Vegetation	10	19.1								1		2			8		11	0.56	0.00	0.00	0.00
LCR	LCR_25.1R	Genelle	MT5	8/30/2012	8/30/2012 15:05	8/31/2012	8/31/2012 10:40	19.58	Overnight	0.4	0	Flooded Vegetation	8	19.1															0	0.00	0.00	0.00	0.00
LCR	LCR_10.3L	Tin Cup LB	MT1	7/17/2012	7/17/2012 12:30	7/18/2012	7/18/2012 9:00	20.50	Overnight	0.8	0.05	Flooded Vegetation	3	14.6															0	0.00	0.00	0.00	0.00
LCR	LCR_10.3L	Tin Cup LB	MT2	7/17/2012	7/17/2012 12:30	7/18/2012	7/18/2012 9:00	20.50	Overnight	1	0	Flooded Vegetation	15	14.6															0	0.00	0.00	0.00	0.00
LCR	LCR_10.3L	Tin Cup LB	MT3	7/17/2012	7/17/2012 12:30	7/18/2012	7/18/2012 9:00	20.50	Overnight	1	0	Flooded Vegetation	15	14.6															0	0.00	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
LCR	LCR_10.3L	Tin Cup LB	MT4	7/17/2012	7/17/2012 12:30	7/18/2012	7/18/2012 9:00	20.50	Overnight	0.5	0.1	Flooded Vegetation	1	14.6															0	0.00	0.00	0.00	0.00
LCR	LCR_10.3L	Tin Cup LB	MT5	7/17/2012	7/17/2012 12:30	7/18/2012	7/18/2012 9:00	20.50	Overnight	0.3	0.4	Flooded Vegetation	1	14.6															0	0.00	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT1	7/17/2012	7/17/2012 13:15	7/18/2012	7/18/2012 9:30	20.25	Overnight	0.5	0.3	Flooded Vegetation	3	14	1				1										2	0.10	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT2	7/17/2012	7/17/2012 13:15	7/18/2012	7/18/2012 9:30	20.25	Overnight	0.3	0.2	Flooded Vegetation	3	14												1			1	0.05	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT3	7/17/2012	7/17/2012 13:15	7/18/2012	7/18/2012 9:30	20.25	Overnight	0.5	0	Flooded Vegetation	2	14	1									3					4	0.20	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT4	7/17/2012	7/17/2012 13:15	7/18/2012	7/18/2012 9:30	20.25	Overnight	1.2	0	Flooded Vegetation	4	14	1													1	2	0.10	0.05	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT1	8/30/2012	8/30/2012 14:00	8/31/2012	8/31/2012 9:35	19.58	Overnight	0.5	0	Flooded Vegetation	1	16.5										3					3	0.15	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT2	8/30/2012	8/30/2012 14:00	8/31/2012	8/31/2012 9:35	19.58	Overnight	0.4	0	Flooded Vegetation	1.2	16.5								1				1			2	0.10	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT3	8/30/2012	8/30/2012 14:00	8/31/2012	8/31/2012 9:35	19.58	Overnight	0.3	0.15	Flooded Vegetation	4	16.5												1			1	0.05	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT4	8/30/2012	8/30/2012 14:00	8/31/2012	8/31/2012 9:35	19.58	Overnight	0.5	0.2	Flooded Vegetation	15	16.5															0	0.00	0.00	0.00	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	MT5	8/30/2012	8/30/2012 14:00	8/31/2012	8/31/2012 9:35	19.58	Overnight	0.6	0.15	Flooded Vegetation	10	16.5															0	0.00	0.00	0.00	0.00
LCR	LCR_11.0R	Zuckerberg Island under Bridge	MT1	8/30/2012	8/30/2012 14:38	8/31/2012	8/31/2012 10:00	19.37	Overnight	0.25	0.1	Silt	3	17.3															0	0.00	0.00	0.00	0.00
LCR	LCR_11.0R	Zuckerberg Island under Bridge	MT2	8/30/2012	8/30/2012 14:38	8/31/2012	8/31/2012 10:00	19.37	Overnight	0.4	0.15	Silt	10	17.3															0	0.00	0.00	0.00	0.00
LCR	LCR_11.0R	Zuckerberg Island under Bridge	MT3	8/30/2012	8/30/2012 14:38	8/31/2012	8/31/2012 10:00	19.37	Overnight	0.4	0.02	Flooded Vegetation	5	17.3													1		1	0.05	0.00	0.00	0.00
LCR	LCR_11.0R	Zuckerberg Island under Bridge	MT4	8/30/2012	8/30/2012 14:38	8/31/2012	8/31/2012 10:00	19.37	Overnight	0.4	0.05	Silt	3	17.3															0	0.00	0.00	0.00	0.00
LCR	LCR_11.0R	Zuckerberg Island under Bridge	MT5	8/30/2012	8/30/2012 14:38	8/31/2012	8/31/2012 10:00	19.37	Overnight	0.8	0.05	Cobble	5	17.3															0	0.00	0.00	0.00	0.00
Total Effort (hrs), Catch per Species and Average CPUE for LCR, 2012								672.00							3	0	0	0	1	0	0	2	0	10	0	3	20	1	40	0.06	0.00	0.00	0.00
Total Effort (hrs), Catch per Species and Average CPUE for LCR Study Area, 2012								867.00							4	0	0	0	3	0	0	7	0	10	0	3	21	9	57	0.07	0.01	0.00	0.00
Slocan River	Sloc_16.2R	-	MT1	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.7	0.4	Boulder	1	8.5					1			1							2	0.10	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT2	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.3	0.1	Boulder	0.5	8.5								1						1	2	0.10	0.05	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.25	0.1	Boulder	1	8.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.4	0.4	Boulder	2	8.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT5	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	1	0.3	Boulder	8	8.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT6	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.15	0.01	Silt	0.5	8.5					1										1	0.05	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT7	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.3	0.3	Boulder	2.5	8.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT8	5/8/2012	5/8/2012 12:30	5/9/2012	5/9/2012 9:15	20.75	Overnight	0.35	0.3	Boulder	1.5	8.5										1					1	0.05	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT1	6/6/2012	6/6/2012 15:25	6/7/2012	6/7/2012 9:00	17.58	Overnight	0.4	0.05	Flooded Vegetation	0.5	6.8														1	1	0.06	0.06	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_16.2R	-	MT2	6/6/2012	6/6/2012 15:25	6/7/2012	6/7/2012 9:00	17.58	Overnight	0.3	0	Flooded Vegetation	2.5	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	6/6/2012	6/6/2012 15:25	6/7/2012	6/7/2012 9:00	17.58	Overnight	0.31	0.24	Flooded Vegetation	3	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	6/6/2012	6/6/2012 15:25	6/7/2012	6/7/2012 9:00	17.58	Overnight	0.4	0.05	Flooded Vegetation	0.5	6.8		1													1	0.06	0.00	0.06	0.00
Slocan River	Sloc_16.2R	-	MT1	6/7/2012	6/7/2012 9:50	6/7/2012	6/7/2012 14:15	4.42	Day	0.4	0.05	Flooded Vegetation	1	6.8														1	1	0.23	0.23	0.00	0.00
Slocan River	Sloc_16.2R	-	MT2	6/7/2012	6/7/2012 9:50	6/7/2012	6/7/2012 14:15	4.42	Day	0.3	0	Flooded Vegetation	2.5	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	6/7/2012	6/7/2012 9:50	6/7/2012	6/7/2012 14:15	4.42	Day	0.31	0.24	Flooded Vegetation	3	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	6/7/2012	6/7/2012 9:50	6/7/2012	6/7/2012 14:15	4.42	Day	0.4	0.05	Flooded Vegetation	0.5	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT1	7/16/2012	7/16/2012 10:10	7/17/2012	7/17/2012 8:30	22.33	Overnight	0.3	0.4	Sand	3	11.8					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT2	7/16/2012	7/16/2012 10:10	7/17/2012	7/17/2012 8:30	22.33	Overnight	1	0.3	Sand	1	11.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	7/16/2012	7/16/2012 10:10	7/17/2012	7/17/2012 8:30	22.33	Overnight	0.3	0.15	Flooded Vegetation	0.5	11.8					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	7/16/2012	7/16/2012 10:10	7/17/2012	7/17/2012 8:30	22.33	Overnight	0.4	0.6	Flooded Vegetation	2	11.8					2										2	0.09	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT5	7/16/2012	7/16/2012 10:10	7/17/2012	7/17/2012 8:30	22.33	Overnight	0.3	0.3	Woody Debris	0.5	11.8					2										2	0.09	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT1	8/29/2012	8/29/2012 12:05	8/30/2012	8/30/2012 9:00	20.92	Overnight	0.3	0.05	Boulder	3.5	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT2	8/29/2012	8/29/2012 12:05	8/30/2012	8/30/2012 9:00	20.92	Overnight	0.25	0	Boulder	2	16.4										1					1	0.05	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	8/29/2012	8/29/2012 12:05	8/30/2012	8/30/2012 9:00	20.92	Overnight	0.5	0.3	Boulder	4	16.4														4	4	0.19	0.19	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	8/29/2012	8/29/2012 12:05	8/30/2012	8/30/2012 9:00	20.92	Overnight	1	0.15	Boulder	3	16.4														1	1	0.05	0.05	0.00	0.00
Slocan River	Sloc_16.2R	-	MT5	8/29/2012	8/29/2012 12:05	8/30/2012	8/30/2012 9:00	20.92	Overnight	0.3	0.05	Boulder	1.5	16.4								8							8	0.38	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT1	9/18/2012	9/18/2012 15:15	9/19/2012	9/19/2012 9:45	18.50	Overnight	0.8	0.6	Boulder	10	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT2	9/18/2012	9/18/2012 15:15	9/19/2012	9/19/2012 9:45	18.50	Overnight	0.2	0.5	Boulder	2.2	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT3	9/18/2012	9/18/2012 15:15	9/19/2012	9/19/2012 9:45	18.50	Overnight	0.2	0	Cobble	1.5	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT4	9/18/2012	9/18/2012 15:15	9/19/2012	9/19/2012 9:45	18.50	Overnight	0.3	0.2	Cobble	5	16.4								1							1	0.05	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	MT5	9/18/2012	9/18/2012 15:15	9/19/2012	9/19/2012 9:45	18.50	Overnight	0.4	0.2	Boulder	4	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_22.3R	-	MT1	9/18/2012	9/18/2012 14:40	9/19/2012	9/19/2012 10:20	19.67	Overnight	0.22	0.1	Cobble	2.2	16.1											2				2	0.10	0.00	0.00	0.00
Slocan River	Sloc_22.3R	-	MT2	9/18/2012	9/18/2012 14:40	9/19/2012	9/19/2012 10:20	19.67	Overnight	0.2	0.05	Cobble	1.5	16.1															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_22.3R	-	MT3	9/18/2012	9/18/2012 14:40	9/19/2012	9/19/2012 10:20	19.67	Overnight	0.15	0.15	Cobble	3	16.1															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_22.3R	-	MT4	9/18/2012	9/18/2012 14:40	9/19/2012	9/19/2012 10:20	19.67	Overnight	0.3	0.2	Cobble	3	16.1															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_22.3R	-	MT5	9/18/2012	9/18/2012 14:40	9/19/2012	9/19/2012 10:20	19.67	Overnight	0.8	0.4	Cobble	5	16.1														1	1	0.05	0.05	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	0.5	0	Silt	2	11.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	1	0	Silt	4	11.4										1				1	2	0.09	0.05	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_30.7R	-	MT3	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	0.4	0	Aquatic Macrophytes	0.25	11.4										1					1	0.05	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	1	0	Silt	0.25	11.4										9			2		11	0.50	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	1.5	0	Woody Debris	2	11.4										3					3	0.14	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT6	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	0.7	0	Woody Debris	2	11.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT7	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	1.5	0	Silt	3	11.4						1				1					2	0.09	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT8	5/8/2012	5/8/2012 13:30	5/9/2012	5/9/2012 11:38	22.13	Overnight	1.5	0	Silt	2	11.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	6/6/2012	6/6/2012 16:05	6/7/2012	6/7/2012 10:45	18.67	Overnight	0.83	0.08	Flooded Vegetation	1	8.3												1	1	1	3	0.16	0.05	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	6/6/2012	6/6/2012 16:05	6/7/2012	6/7/2012 10:45	18.67	Overnight	0.48	0	Flooded Vegetation	0.5	8.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	6/6/2012	6/6/2012 16:05	6/7/2012	6/7/2012 10:45	18.67	Overnight	0.62	0.05	Flooded Vegetation	1.5	8.3										1					1	0.05	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	6/6/2012	6/6/2012 16:05	6/7/2012	6/7/2012 10:45	18.67	Overnight	0.62	0.05	Flooded Vegetation	1	8.3								1							1	0.05	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	6/7/2012	6/7/2012 10:45	6/7/2012	6/7/2012 13:45	3.00	Day	0.83	0.08	Flooded Vegetation	1	6.8														1	1	0.33	0.33	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	6/7/2012	6/7/2012 10:45	6/7/2012	6/7/2012 13:45	3.00	Day	0.48	0	Flooded Vegetation	0.5	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	6/7/2012	6/7/2012 10:45	6/7/2012	6/7/2012 13:45	3.00	Day	0.62	0.05	Flooded Vegetation	1.5	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	6/7/2012	6/7/2012 10:45	6/7/2012	6/7/2012 13:45	3.00	Day	0.62	0.05	Flooded Vegetation	1	6.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	7/16/2012	7/16/2012 10:40	7/17/2012	7/17/2012 9:00	22.33	Overnight	0.5	0.05	Flooded Vegetation	4	12.6								1						2	3	0.13	0.09	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	7/16/2012	7/16/2012 10:40	7/17/2012	7/17/2012 9:00	22.33	Overnight	1	0.1	Flooded Vegetation	0.5	12.6								1							1	0.04	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	7/16/2012	7/16/2012 10:40	7/17/2012	7/17/2012 9:00	22.33	Overnight	0.6	0.01	Flooded Vegetation	1	12.6					3										3	0.13	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	7/16/2012	7/16/2012 10:40	7/17/2012	7/17/2012 9:00	22.33	Overnight	0.3	0.1	Flooded Vegetation	10	12.6															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	7/16/2012	7/16/2012 10:40	7/17/2012	7/17/2012 9:00	22.33	Overnight	0.7	0.2	Woody Debris	11	12.6															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	0.3	0.2	Boulder	0.2	19.8										5		5	2	2	14	2.75	0.39	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	0.4	0	Gravel	1	19.8												2	2	2	6	1.18	0.39	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	1.5	0.05	Sand	5	19.8										1				1	2	0.39	0.20	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	1.2	0	Woody Debris	0	19.8										1		2			3	0.59	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	0.4	0.2	Sand	0.2	19.8										1					1	0.20	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT6	8/16/2012	8/16/2012 9:55	8/16/2012	8/16/2012 15:00	5.08	Day	1	0.05	Aquatic Macrophytes	6	19.8										2		1			3	0.59	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	0.3	0.2	Boulder	0.2	20.7										1				2	3	0.51	0.34	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	0.4	0	Gravel	1	20.7										4		4			8	1.35	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	1.5	0.05	Sand	5	20.7										1					1	0.17	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	1.2	0	Woody Debris	1	20.7										2					2	0.34	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_30.7R	-	MT5	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	0.4	0.2	Sand	0.2	20.7										1					1	0.17	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT6	8/16/2012	8/16/2012 15:00	8/16/2012	8/16/2012 20:55	5.92	Dusk	1	0.05	Aquatic Macrophytes	6	20.7										1				2	3	0.51	0.34	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	0.3	0.2	Boulder	0.2	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	0.4	0	Gravel	1	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	1.5	0.05	Sand	5	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	1.2	0	Woody Debris	1	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	0.4	0.2	Sand	0.2	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT6	8/16/2012	8/16/2012 20:55	8/17/2012	8/17/2012 2:50	5.92	Night	1	0.05	Aquatic Macrophytes	6	20.4													1		1	0.17	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	0.3	0.2	Boulder	0.2	18.9										4				2	6	0.97	0.32	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	0.4	0	Gravel	1	18.9										3					3	0.49	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	1.5	0.05	Sand	5	18.9										6			3		9	1.46	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	1.2	0	Woody Debris	1	18.9										2			1		3	0.49	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	0.4	0.2	Sand	0.2	18.9													1		1	0.16	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT6	8/17/2012	8/17/2012 2:50	8/17/2012	8/17/2012 9:00	6.17	Dawn	1	0.05	Aquatic Macrophytes	6	18.9										13			2		15	2.43	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT1	8/29/2012	8/29/2012 14:15	8/30/2012	8/30/2012 10:30	20.25	Overnight	0.2	0	Aquatic Macrophytes	3	17.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT2	8/29/2012	8/29/2012 14:15	8/30/2012	8/30/2012 10:30	20.25	Overnight	0.8	0	Cobble	1	17.4										8		1	6		15	0.74	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	MT3	8/29/2012	8/29/2012 14:15	8/30/2012	8/30/2012 10:30	20.25	Overnight	0.5	0.2	Cobble	1	17.4										3	1			3	7	0.35	0.15	0.00	0.00
Slocan River	Sloc_30.7R	-	MT4	8/29/2012	8/29/2012 14:15	8/30/2012	8/30/2012 10:30	20.25	Overnight	1.4	0	Silt	5	17.4										2			1	1	4	0.20	0.05	0.00	0.00
Slocan River	Sloc_30.7R	-	MT5	8/29/2012	8/29/2012 14:15	8/30/2012	8/30/2012 10:30	20.25	Overnight	1	0	Silt	2.5	17.4										2		2	9		13	0.64	0.00	0.00	0.00
Slocan River	Sloc_37.6L	-	MT1	7/16/2012	7/16/2012 12:05	7/17/2012	7/17/2012 10:15	22.17	Overnight	0.4	0.1	Sand	2	12.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.6L	-	MT2	7/16/2012	7/16/2012 12:05	7/17/2012	7/17/2012 10:15	22.17	Overnight	1.2	0.1	Flooded Vegetation	8	12.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.6L	-	MT3	7/16/2012	7/16/2012 12:05	7/17/2012	7/17/2012 10:15	22.17	Overnight	0.4	0	Flooded Vegetation	3	12.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.6L	-	MT4	7/16/2012	7/16/2012 12:05	7/17/2012	7/17/2012 10:15	22.17	Overnight	0.6	0	Flooded Vegetation	4	12.8															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	6/6/2012	6/6/2012 16:55	6/7/2012	6/7/2012 13:00	20.08	Overnight	1	0	Flooded Vegetation	1.5	8.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT2	6/6/2012	6/6/2012 16:55	6/7/2012	6/7/2012 13:00	20.08	Overnight	0.7	0	Flooded Vegetation	2	8.3										1				1	2	0.10	0.05	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	6/6/2012	6/6/2012 16:55	6/7/2012	6/7/2012 13:00	20.08	Overnight	0.4	0	Flooded Vegetation	3	8.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	6/6/2012	6/6/2012 16:55	6/7/2012	6/7/2012 13:00	20.08	Overnight	0.2	0	Flooded Vegetation	2	8.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	6/6/2012	6/6/2012 16:55	6/7/2012	6/7/2012 13:00	20.08	Overnight	0.3	0	Flooded Vegetation	1	8.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	1.1	0.05	Aquatic Macrophytes	2	19.5															0	0.00	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]																Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_37.8L	-	MT2	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	0.8	0	Silt	0.5	19.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	0.2	0	Silt	0	19.5															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	0.2	0	Flooded Vegetation	2	19.5										4					4	0.75	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	0.2	0	Aquatic Macrophytes	2.5	19.5								1		2					3	0.56	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT6	8/16/2012	8/16/2012 10:15	8/16/2012	8/16/2012 15:35	5.33	Day	2	0	Aquatic Macrophytes	4	19.5					1					2			1		4	0.75	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	1.1	0.05	Aquatic Macrophytes	2	20.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT2	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	0.8	0	Silt	0.5	20.3									1	7		1		3	12	2.12	0.53	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	0.2	0	Silt	0	20.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	0.2	0	Flooded Vegetation	2	20.3															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	0.2	0	Aquatic Macrophytes	2.5	20.3										1					1	0.18	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT6	8/16/2012	8/16/2012 15:35	8/16/2012	8/16/2012 21:15	5.67	Dusk	2	0	Aquatic Macrophytes	4	20.3	1														1	0.18	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	1.1	0.05	Aquatic Macrophytes	2	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT2	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	0.8	0	Silt	0.5	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	0.2	0	Silt	0	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	0.2	0	Flooded Vegetation	2	20.4														2	2	0.33	0.33	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	0.2	0	Aquatic Macrophytes	2.5	20.4										1					1	0.17	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT6	8/16/2012	8/16/2012 21:15	8/17/2012	8/17/2012 3:15	6.00	Night	2	0	Aquatic Macrophytes	4	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	1.1	0.05	Aquatic Macrophytes	2	19.1													1	1	2	0.32	0.16	0.00	0.00
Slocan River	Sloc_37.8L	-	MT2	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	0.8	0	Silt	0.5	19.1										1					1	0.16	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	0.2	0	Silt	0	19.1															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	0.2	0	Flooded Vegetation	2	19.1														1	1	0.16	0.16	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	0.2	0	Aquatic Macrophytes	2.5	19.1															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT6	8/17/2012	8/17/2012 3:15	8/17/2012	8/17/2012 9:30	6.25	Dawn	2	0	Aquatic Macrophytes	4	19.1										5				1	6	0.96	0.16	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	8/29/2012	8/29/2012 13:20	8/30/2012	8/30/2012 11:45	22.42	Overnight	0.35	0.05	Aquatic Macrophytes	0.5	16.4										2			1		3	0.13	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT2	8/29/2012	8/29/2012 13:20	8/30/2012	8/30/2012 11:45	22.42	Overnight	0.4	0	Aquatic Macrophytes	1.2	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	8/29/2012	8/29/2012 13:20	8/30/2012	8/30/2012 11:45	22.42	Overnight	1.2	0	Aquatic Macrophytes	5	16.4										2					2	0.09	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	8/29/2012	8/29/2012 13:20	8/30/2012	8/30/2012 11:45	22.42	Overnight	0.3	0	Aquatic Macrophytes	3	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	8/29/2012	8/29/2012 13:20	8/30/2012	8/30/2012 11:45	22.42	Overnight	1	0	Silt	4	16.4										9			2		11	0.49	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT1	9/18/2012	9/18/2012 15:48	9/19/2012	9/19/2012 11:15	19.45	Overnight	0.5	0	Aquatic Macrophytes	2.5	16.4															0	0.00	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_37.8L	-	MT2	9/18/2012	9/18/2012 15:48	9/19/2012	9/19/2012 11:15	19.45	Overnight	0.5	0	Silt	4	16.4										4					4	0.21	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT3	9/18/2012	9/18/2012 15:48	9/19/2012	9/19/2012 11:15	19.45	Overnight	1.5	0.3	Gravel	8	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT4	9/18/2012	9/18/2012 15:48	9/19/2012	9/19/2012 11:15	19.45	Overnight	1	0.1	Gravel	7	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	MT5	9/18/2012	9/18/2012 15:48	9/19/2012	9/19/2012 11:15	19.45	Overnight	0.4	0.02	Silt	2	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	6/6/2012	6/6/2012 16:30	6/7/2012	6/7/2012 12:30	20.00	Overnight	0.8	0	Flooded Vegetation	1	8.6					1										1	0.05	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	6/6/2012	6/6/2012 16:30	6/7/2012	6/7/2012 12:30	20.00	Overnight	0.6	0.05	Flooded Vegetation	2.5	8.6	1														1	0.05	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	6/6/2012	6/6/2012 16:30	6/7/2012	6/7/2012 12:30	20.00	Overnight	0.52	0	Flooded Vegetation	1.5	8.6					1										1	0.05	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	6/6/2012	6/6/2012 16:30	6/7/2012	6/7/2012 12:30	20.00	Overnight	0.9	0	Flooded Vegetation	1.5	8.6										1					1	0.05	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	7/16/2012	7/16/2012 11:15	7/17/2012	7/17/2012 10:30	23.25	Overnight	1.3	0	Flooded Vegetation	5	12.9					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	7/16/2012	7/16/2012 11:15	7/17/2012	7/17/2012 10:30	23.25	Overnight	1	0	Flooded Vegetation	3	12.9															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	7/16/2012	7/16/2012 11:15	7/17/2012	7/17/2012 10:30	23.25	Overnight	1	0.2	Flooded Vegetation	5	12.9															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	7/16/2012	7/16/2012 11:15	7/17/2012	7/17/2012 10:30	23.25	Overnight	0.2	0.2	Flooded Vegetation	5	12.9					2										2	0.09	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	7/16/2012	7/16/2012 11:15	7/17/2012	7/17/2012 10:30	23.25	Overnight	0.2	0	Flooded Vegetation	0.5	12.9															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	0.4	0	Gravel	1	19.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	1.2	0.1	Gravel	4	19.7	1													2	3	0.53	0.35	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	1	0	Silt	2	19.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	1	0.05	Boulder	1	19.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	1.2	0.05	Silt	3	19.7										1			3	1	5	0.88	0.18	0.00	0.00
Slocan River	Sloc_39.4L	-	MT6	8/16/2012	8/16/2012 10:20	8/16/2012	8/16/2012 16:00	5.67	Day	0.6	0.05	Aquatic Macrophytes	1.5	19.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	0.4	0	Gravel	1	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	1.2	0.1	Gravel	4	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	1	0	Silt	2	20.4										1					1	0.17	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	1	0.05	Boulder	1	20.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	1.2	0.05	Silt	3	20.4	1				1										2	0.34	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT6	8/16/2012	8/16/2012 16:00	8/16/2012	8/16/2012 21:53	5.88	Dusk	0.6	0.05	Aquatic Macrophytes	1.5	20.4	1														1	0.17	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	0.4	0	Gravel	1	20.2															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	1.2	0.1	Gravel	4	20.2															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	1	0	Silt	2	20.2															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	1	0.05	Boulder	1	20.2															0	0.00	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_39.4L	-	MT5	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	1.2	0.05	Silt	3	20.2															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT6	8/16/2012	8/16/2012 21:53	8/17/2012	8/17/2012 3:40	5.78	Night	0.6	0.05	Aquatic Macrophytes	1.5	20.2															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	0.4	0	Gravel	1	19															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	1.2	0.1	Gravel	4	19															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	1	0	Silt	2	19															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	1	0.05	Boulder	1	19															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	1.2	0.05	Silt	3	19					1									1	2	0.32	0.16	0.00	0.00
Slocan River	Sloc_39.4L	-	MT6	8/17/2012	8/17/2012 3:40	8/17/2012	8/17/2012 9:50	6.17	Dawn	0.6	0.05	Aquatic Macrophytes	1.5	19															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	8/29/2012	8/29/2012 13:45	8/30/2012	8/30/2012 12:00	22.25	Overnight	0.8	0	Silt	0.5	16.9															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	8/29/2012	8/29/2012 13:45	8/30/2012	8/30/2012 12:00	22.25	Overnight	1	0	Cobble	3	16.9										1					1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	8/29/2012	8/29/2012 13:45	8/30/2012	8/30/2012 12:00	22.25	Overnight	0.7	0	Aquatic Macrophytes	1	16.9															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	8/29/2012	8/29/2012 13:45	8/30/2012	8/30/2012 12:00	22.25	Overnight	0.4	0	Aquatic Macrophytes	2	16.9										9			1		10	0.45	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	8/29/2012	8/29/2012 13:45	8/30/2012	8/30/2012 12:00	22.25	Overnight	0.25	0	Aquatic Macrophytes	1	16.9										1				1	2	0.09	0.04	0.00	0.00
Slocan River	Sloc_39.4L	-	MT1	9/18/2012	9/18/2012 16:12	9/19/2012	9/19/2012 12:10	19.97	Overnight	0.5	0	Silt	2.5	16.4					1					1					2	0.10	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT2	9/18/2012	9/18/2012 16:12	9/19/2012	9/19/2012 12:10	19.97	Overnight	0.2	0	Aquatic Macrophytes	0.75	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT3	9/18/2012	9/18/2012 16:12	9/19/2012	9/19/2012 12:10	19.97	Overnight	1	0.05	Silt	2	16.4										4					4	0.20	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT4	9/18/2012	9/18/2012 16:12	9/19/2012	9/19/2012 12:10	19.97	Overnight	0.4	0.02	Aquatic Macrophytes	1.5	16.4					1					3		1			5	0.25	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	MT5	9/18/2012	9/18/2012 16:12	9/19/2012	9/19/2012 12:10	19.97	Overnight	0.8	0.01	Cobble	3	16.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT0	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1	0	Silt	0.5	9.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT1	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.2	0	Gravel	0.5	9.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT2	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.8	0	Silt	1	9.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT3	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.8	0	Silt	7	9.7					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT4	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	0.7	0	Silt	0.1	9.7										1					1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT5	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.2	0	Silt	1.5	9.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT6	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.8	0	Silt	4	9.7					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT7	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.3	0	Silt	0.5	9.7					1										1	0.04	0.00	0.00	0.00
Slocan River	Sloc_39.4R	-	MT8	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	0.25	0	Flooded Vegetation	2	9.7					2					2		2		1	7	0.31	0.04	0.00	0.00
Slocan River	Sloc_39.4R	-	MT9	5/8/2012	5/8/2012 14:05	5/9/2012	5/9/2012 12:23	22.30	Overnight	1.5	0	Silt	5	9.7															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_43.1L	-	MT1	7/16/2012	7/16/2012 12:30	7/17/2012	7/17/2012 10:45	22.25	Overnight	0.4	0	Flooded Vegetation	7	13.4												3			3	0.13	0.00	0.00	0.00

Appendix B1 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Method[2]	Set Date	Set Time	Pull Date	Pull Time	Effort (Hrs)	Set Type	Depth (m)	Velocity (m/s)	Substrate	Distance to Shore	Water Temp.	Fish Captures[3]															Catch-per-unit-	Umatilla Dace	Columbia Sculpin	Shorthead Sculpin
															CAS	CBA	CC	CCN	CRH	CSU	DC	LNC	MW	NSC	RB	RSC	SU	UDC	Total				
Slocan River	Sloc_43.1L	-	MT2	7/16/2012	7/16/2012 12:30	7/17/2012	7/17/2012 10:45	22.25	Overnight	0.8	0	Flooded Vegetation	8	13.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_43.1L	-	MT3	7/16/2012	7/16/2012 12:30	7/17/2012	7/17/2012 10:45	22.25	Overnight	0.8	0	Flooded Vegetation	2.5	13.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_43.1L	-	MT4	7/16/2012	7/16/2012 12:30	7/17/2012	7/17/2012 10:45	22.25	Overnight	1.1	0	Flooded Vegetation	4	13.4															0	0.00	0.00	0.00	0.00
Slocan River	Sloc_43.1L	-	MT5	7/16/2012	7/16/2012 12:30	7/17/2012	7/17/2012 10:45	22.25	Overnight	1	0	Flooded Vegetation	2	13.4															0	0.00	0.00	0.00	0.00
Total Effort (hrs), Catch per Species and Average CPUE for Slocan River, 2012								2696.73							5	1	0	0	26	1	0	15	1	147	3	25	40	44	308	0.11	0.02	0.00	0.00

Notes:

1 L= left downstream bank; R= right downstream bank

2 MT= Minnow Trapping

3 CAS= prickly sculpin; CBA= Columbia sculpin; CC= sculpin sp.; CCN= shorthead sculpin; CRH= torrent sculpin; DC= dace sp.; LNC= longnose dace; MW= mountain whitefish; NSC= northern pikeminnow; RB=

Appendix B2. Summary of electrofishing effort in the Lower Columbia (LCR) and Slocan river study areas, 2012-13.

Waterbody	Site[1]	Descriptive Site Name[1]	Date	Method[2]	Set Type	EF Effort (Seconds)	Site Length (m)	Site Width (m)	Site Area (m^2)	Water Temp. (°C)	Fish Captures[3]														Catch-per-unit-effort	Umatilla Dace CPUE	Catch per m^2	Umatilla Dace catch	Columbia Sculpin catch per	Shorthead Sculpin catch per
											CAS	CBA	CC	CCN	CRH	DC	LNC	NSC	RB	RSC	SU	UDC	UNK	Total						
Kootenay River	Koot_0.5R	Kootenay River RB	3/30/2012	EF1	Day	362	75	4	300	8.9							9					14		23	0.06	0.04	0.08	0.05	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	6/27/2012	EF1	Day	643	30	1	30	11.6				1	1		10					4		16	0.02	0.01	0.53	0.13	0.00	0.03
Kootenay River	Koot_0.5R	Kootenay River RB	6/27/2012	EF1	Day	429	30	1	30	14.5				1	1		5					1		8	0.02	0.00	0.27	0.03	0.00	0.03
Kootenay River	Koot_0.5R	Kootenay River RB	8/15/2012	EF1	Day	302	40	2	80	18.6	1					1					1000	3		1005	3.33	0.01	12.56	0.04	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	8/15/2012	EF1	Night	322	40	2	80	17.6					5		4				1000	5		1014	3.15	0.02	12.68	0.06	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	9/14/2012	EF1	Day	1426	50	25	1250	17.2							16					1		17	0.01	0.00	0.01	0.00	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	9/15/2012	EF1	Day	1333	50	25	1250	17.6	9	1		1			19					7		37	0.03	0.01	0.03	0.01	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	11/8/2012	EF1	Day	1024	30	10	300	9.9	4											2		6	0.01	0.00	0.02	0.01	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	11/8/2012	EF1	Night	966	30	10	300	9.2			2							1				3	0.00	0.00	0.01	0.00	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	1/22/2013	EF1	Day	700	100	4	400	3.1	2									1	1	14		18	0.03	0.02	0.05	0.04	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	1/22/2013	EF1	Night	912	100	4	400	3.1	1									1		13		15	0.02	0.01	0.04	0.03	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	2/7/2013	EF1	Day	560	75	8	600	4.6										1	2	23		26	0.05	0.04	0.04	0.04	0.00	0.00
Kootenay River	Koot_0.5R	Kootenay River RB	2/9/2013	EF1	Day	617	35	5	175	6.3											10	2		12	0.02	0.00	0.07	0.01	0.00	0.00
Total Effort (EF Seconds), Site Area, Catch and CPUE for Kootenay River, 2012-13						9596			5195		17	1	2	3	7	1	63	0	0	4	2013	89	0	2200	0.23	0.01	0.42	0.02	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	6/27/2012	EF1	Day	704	50	2	100	16.5							8			6		9		23	0.03	0.01	0.23	0.09	0.00	0.00
LCR	LCR_47.5L	Beaver Creek Mouth	8/15/2012	EF1	Day	121	10	3	30	19.5						1	53			1	200			255	2.11	0.00	8.50	0.00	0.00	0.00
LCR	LCR_10.55L	CLB LB at Koot Mouth Point	2/7/2013	EF1	Day	1381	100	4	400	4.4				2	5									7	0.01	0.00	0.02	0.00	0.00	0.01
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/28/2012	EF1	Day	3292	350	3	1050	4.4	1	2		4	3									10	0.00	0.00	0.01	0.00	0.00	0.00
LCR	LCR_10.5L	CLB LB US Koot Mouth	5/7/2012	EF1	Day	2331	400	2	800	6.2	2	3		10	6		2							23	0.01	0.00	0.03	0.00	0.00	0.01
LCR	LCR_10.5L	CLB LB US Koot Mouth	9/18/2012	EF1	Day	1302	75	5	375	16.8	4	7	1	25	26									63	0.05	0.00	0.17	0.00	0.02	0.07
LCR	LCR_10.5L	CLB LB US Koot Mouth	9/18/2012	EF2	Day	1100	75	5	375	16.8	1			15	12								1	29	0.03	0.00	0.08	0.00	0.00	0.04
LCR	LCR_10.5L	CLB LB US Koot Mouth	1/22/2013	EF1	Day	871	100	4	400	3.9	1											1		2	0.00	0.00	0.01	0.00	0.00	0.00
LCR	LCR_10.5L	CLB LB US Koot Mouth	1/22/2013	EF1	Night	692	100	4	400	3.7			1											1	0.00	0.00	0.00	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	6/27/2012	EF1	Day	262	20	2	40	13.5					1		2					1		4	0.02	0.00	0.10	0.03	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	8/15/2012	EF1	Day	696	50	3	150	17.8	1						2		2					5	0.01	0.00	0.03	0.00	0.00	0.00
LCR	LCR_53.1L	Fort Sheppard Boat Launch	8/15/2012	EF1	Night	671	50	3	150	17					1		1		25		1	3		31	0.05	0.00	0.21	0.02	0.00	0.00
LCR	LCR_25.1R	Genelle	9/17/2012	EF1	Day	1725	100	4	400	15.7	2	40	1	11	13		41					11		119	0.07	0.01	0.30	0.03	0.10	0.03
LCR	LCR_25.1R	Genelle	9/17/2012	EF2	Day	1446	75	4	300	16.2		18	2	17	3		12					4		56	0.04	0.00	0.19	0.01	0.06	0.06
LCR	LCR_25.1R	Genelle	11/9/2012	EF1	Day	1224	100	4	400	10	3				2		6					2		13	0.01	0.00	0.03	0.01	0.00	0.00
LCR	LCR_24.5R	Genelle Index Site	3/28/2012	EF1	Day	3525	400	2	800	4.1		3		1	10		1							15	0.00	0.00	0.02	0.00	0.00	0.00
LCR	LCR_24.5R	Genelle Index Site	5/7/2012	EF1	Day	975	200	3	600	6.1	2	3		10	6		2							23	0.02	0.00	0.04	0.00	0.01	0.02
LCR	LCR_24.5R	Genelle Index Site	1/22/2013	EF1	Day	457	50	3	150	3.9			2		2		1							5	0.01	0.00	0.03	0.00	0.00	0.00
LCR	LCR_24.5R	Genelle Index Site	2/7/2013	EF1	Day	1945	150	3	450	4.2		7		2	6									15	0.01	0.00	0.03	0.00	0.02	0.00
LCR	LCR_2.8L	Unk Trib Mouth Robson	6/27/2012	EF1	Day	386	30	3	90	11.9										1		1		2	0.01	0.00	0.02	0.01	0.00	0.00
Total Effort (EF Seconds), Site Area, Catch and CPUE for LCR, 2012-13						25106			7460		17	83	7	97	96	1	131	0	27	8	201	32	1	701	0.03	0.00	0.09	0.00	0.01	0.01
Total Effort (EF Seconds), Site Area, Catch and CPUE for LCR Study Area, 2012-13						34702			12655		34	84	9	100	103	2	194	0	27	12	2214	121	1	2901	0.08	0.00	0.23	0.01	0.01	0.01
Slocan River	Sloc_16.2R	-	5/9/2012	EF1	Day	611	100	5	500	8.1		1	1	3	2		7							14	0.02	0.00	0.03	0.00	0.00	0.01
Slocan River	Sloc_16.2R	-	6/7/2012	EF1	Day	222	30	1	30	6.8					1									1	0.00	0.00	0.03	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	7/16/2012	EF1	Day	225	30	1	30	11.8		2			3		3							8	0.04	0.00	0.27	0.00	0.07	0.00

Appendix B2 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Date	Method[2]	Set Type	EF Effort (Seconds)	Site Length (m)	Site Width (m)	Site Area (m^2)	Water Temp. (°C)	Fish Captures[3]														Catch-per-unit-effort	Umatilla Dace CPUE	Catch per m^2	Umatilla Dace catch	Columbia Sculpin catch per	Shorthead Sculpin catch per
											CAS	CBA	CC	CCN	CRH	DC	LNC	NSC	RB	RSC	SU	UDC	UNK	Total						
Slocan River	Sloc_16.2R	-	8/29/2012	EF1	Day	712	50	3	150	16.4				5	7		8					1		21	0.03	0.00	0.14	0.01	0.00	0.03
Slocan River	Sloc_16.2R	-	10/11/2012	EF1	Day	626	100	4	400	10.8							8					1		9	0.01	0.00	0.02	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	11/15/2012	EF1	Day	547	50	2	100	6.2			10				2							12	0.02	0.00	0.12	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	11/15/2012	EF1	Night	617	50	2	100	5.9			10								1			11	0.02	0.00	0.11	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	1/23/2013	EF1	Day	600	100	2	200	1.3			15				1							16	0.03	0.00	0.08	0.00	0.00	0.00
Slocan River	Sloc_16.2R	-	1/23/2013	EF1	Night	535	100	2	200	0.6												1		1	0.00	0.00	0.01	0.01	0.00	0.00
Slocan River	Sloc_22.3R	-	5/9/2012	EF1	Day	280	40	5	200	8.8			1	4			7							12	0.04	0.00	0.06	0.00	0.00	0.02
Slocan River	Sloc_22.3R	-	10/11/2012	EF1	Day	763	30	8	240	9.5							8							8	0.01	0.00	0.03	0.00	0.00	0.00
Slocan River	Sloc_30.2M	-	10/11/2012	EF1	Day	538	50	3	150	12.5							6							6	0.01	0.00	0.04	0.00	0.00	0.00
Slocan River	Sloc_30.7R	-	11/15/2012	EF1	Day	550	50	2	100	6.4							4					19		23	0.04	0.03	0.23	0.19	0.00	0.00
Slocan River	Sloc_30.7R	-	11/15/2012	EF1	Night	785	30	2	60	6							3					9		12	0.02	0.01	0.20	0.15	0.00	0.00
Slocan River	Sloc_37.8L	-	5/9/2012	EF1	Day	698	50	3	150	8.3					3		3			1	2	2		11	0.02	0.00	0.07	0.01	0.00	0.00
Slocan River	Sloc_37.8L	-	5/10/2012	EF1	Night	766	50	3	150	6.5												5		5	0.01	0.01	0.03	0.03	0.00	0.00
Slocan River	Sloc_37.8L	-	6/7/2012	EF1	Day	276	30	3	90	7.2					2									2	0.01	0.00	0.02	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	8/29/2012	EF1	Day	589	30	2	60	16.4					1		3	1		3	20			28	0.05	0.00	0.47	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	9/19/2012	EF1	Day	444	50	3	150	13.5			20				13							33	0.07	0.00	0.22	0.00	0.00	0.00
Slocan River	Sloc_37.8L	-	10/11/2012	EF1	Day	571	100	4	400	12.7						1	40					2		43	0.08	0.00	0.11	0.01	0.00	0.00
Slocan River	Sloc_37.8L	-	11/15/2012	EF1	Day	881	75	3	225	6.7							6					3		9	0.01	0.00	0.04	0.01	0.00	0.00
Slocan River	Sloc_37.8L	-	11/15/2012	EF1	Night	778	75	3	225	6.1			25				6			25	10	4		70	0.09	0.01	0.31	0.02	0.00	0.00
Slocan River	Sloc_37.8L	-	1/23/2013	EF1	Day	621	100	4	400	1.9					1	1	4					5		11	0.02	0.01	0.03	0.01	0.00	0.00
Slocan River	Sloc_37.8L	-	1/23/2013	EF1	Night	919	100	4	400	1.5							1					1		2	0.00	0.00	0.01	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	5/9/2012	EF1	Day	489	50	4	200	8.3			1				1							2	0.00	0.00	0.01	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	5/10/2012	EF1	Night	622	50	4	200	8.5			20				9			8				37	0.06	0.00	0.19	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	6/7/2012	EF1	Day	145	10	3	30	7														0	0.00	0.00	0.00	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	8/16/2012	EF1	Day	231	30	3	90	20.4					5						5			10	0.04	0.00	0.11	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	8/17/2012	EF1	Night	194	30	3	90	19					2					5				7	0.04	0.00	0.08	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	9/19/2012	EF1	Day	344	40	5	200	13.5			25	1			4							30	0.09	0.00	0.15	0.00	0.00	0.01
Slocan River	Sloc_39.4L	-	10/11/2012	EF1	Day	467	40	2	80	12.7							4					3		7	0.01	0.01	0.09	0.04	0.00	0.00
Slocan River	Sloc_39.4L	-	11/15/2012	EF1	Day	889	75	2	150	6.8			10				27			5	8	3		53	0.06	0.00	0.35	0.02	0.00	0.00
Slocan River	Sloc_39.4L	-	11/15/2012	EF1	Night	786	75	2	150	7							20			100		2		122	0.16	0.00	0.81	0.01	0.00	0.00
Slocan River	Sloc_39.4L	-	1/23/2013	EF1	Day	559	100	3	300	1.9				1	7		20			1				29	0.05	0.00	0.10	0.00	0.00	0.00
Slocan River	Sloc_39.4L	-	1/23/2013	EF1	Night	435	100	4	400	1.9							6					1		7	0.02	0.00	0.02	0.00	0.00	0.00
Slocan River	Sloc_43.1L	-	7/16/2012	EF1	Day	226	20	2	40	13.4														0	0.00	0.00	0.00	0.00	0.00	0.00
Total Effort (EF Seconds), Site Area, Catch and CPUE for Slocan River, 2012-13						19541			6640		0	3	138	14	34	2	224	1	0	148	46	62	0	672	0.03	0.00	0.10	0.01	0.00	0.00

Notes:

[1] LB or L= left downstream bank; RB or R= right downstream bank; M= middle downstream bank; US= upstream; DS= downstream

[2] EF= Backpack Electrofishing

[3] CAS= prickly sculpin; CBA= Columbia sculpin; CC= sculpin sp.; CCN= shorthead sculpin; CRH= torrent sculpin; DC= dace sp.; LNC= longnose dace; NSC= northern pikeminnow; RSC= redside shiner; SU= sucker sp.; UDC= Umatilla dace; UNK= Unknown sp.

Appendix B3. Summary of snorkeling, PIT tag tracking and other effort in the Lower Columbia (LCR) and Slocan river study areas, 2012-13.

Waterbody	Site[1]	Descriptive Site Name[1]	Date	Method[2]	Set Date/Time	Pull Date/Time	Effort (Hrs)	Set Type	Site Length (m)	Site Width (m)	Site Area (m^2)	Depth (m)	Water Temp. (°C)	Fish Captures[3]											Catch-per-unit-effort (CPUE)	Umatilla Dace CPUE	Catch per m^2	Umatilla Dace catch per m^2	Columbia Sculpin catch per m^3	Shorthead Sculpin catch per m^3
														CAS	CBA	CC	CCN	CRH	DC	LNC	RSC	UDC	UNK	Total						
LCR	LCR_10.5L	CLB LB US Koot Mouth	6/5/2012	SW1	6/5/2012 10:15	6/5/2012 10:45	0.5	Day	75	3	225		12											0	0.00	0.00	0.00	0.000	0.000	0.000
LCR	LCR_2.8L	Unk Trib Mouth Robson	6/5/2012	SW1	6/5/2012 11:15	6/5/2012 12:45	3.0	Day	50	6	300		12.8	2	1	8		7						18	6.00	0.00	0.06	0.000	0.003	0.000
Kootenay River	Koot_0.2R	Kootenay River Mouth RB	9/5/2012	SW1	9/5/2012 13:45	9/5/2012 15:00	2.5	Day	100	5	500		17.5	8	1	64	2	22		27	1			125	50.00	0.00	0.25	0.000	0.002	0.004
Total Snorkelling Effort (hrs), Area, Catch per Species and Average CPUE for LCR Study Area, 2012							6.0				1025			10	2	72	2	29	0	27	1	0	0	143	23.83	0.00	0.14	0.000	0.002	0.002
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/29/2012	TR1	3/29/2012 14:04	3/29/2012 15:34	1.50	Day	150	3	450		3.8				1	2						3	2.00	0.00	0.01	0.000	0.000	0.002
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/29/2012	TR2	3/29/2012 16:12	3/29/2012 16:40	0.47	Day	50	3	150		3.8				1	1						2	4.29	0.00	0.01	0.000	0.000	0.007
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/30/2012	TR1	3/30/2012 9:15	3/30/2012 10:20	1.08	Day	100	3	300		3.9	1			1	1						3	2.77	0.00	0.01	0.000	0.000	0.003
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/30/2012	TR2	3/30/2012 11:45	3/30/2012 12:38	0.88	Day	100	3	300		3.9	1			1	2						4	4.53	0.00	0.01	0.000	0.000	0.003
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/31/2012	TR1	3/31/2012 9:00	3/31/2012 10:15	1.25	Day	100	4	400		4.5	1	1		2	2						6	4.80	0.00	0.02	0.000	0.003	0.005
LCR	LCR_10.5L	CLB LB US Koot Mouth	3/31/2012	TR2	3/31/2012 10:40	3/31/2012 11:53	1.22	Day	75	4	300		4.5	1	1		2	2						6	4.93	0.00	0.02	0.000	0.003	0.007
LCR	LCR_10.5L	CLB LB US Koot Mouth	4/1/2012	TR1	4/1/2012 8:32	4/1/2012 10:01	1.48	Day	75	4	300		4.2	1	1		1	2						5	3.37	0.00	0.02	0.000	0.003	0.003
LCR	LCR_10.5L	CLB LB US Koot Mouth	4/13/2012	TR1	4/13/2012 8:55	4/13/2012 10:25	1.50	Day	150	5	750		5.4	1				1						2	1.33	0.00	0.00	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	4/13/2012	TR2	4/13/2012 10:45	4/13/2012 11:30	0.75	Day	80	5	400		5.4	1				1						2	2.67	0.00	0.01	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	9/5/2012	TR1	9/5/2012 12:55	9/5/2012 13:20	0.42	Day	50	4	200		16.3											0	0.00	0.00	0.00	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	9/28/2012	TR1	9/28/2012 15:15	9/28/2012 16:55	1.67	Day	100	5	500		15.3	1			6	6					1	14	8.40	0.00	0.03	0.000	0.000	0.012
LCR	LCR_10.5L	CLB LB US Koot Mouth	9/29/2012	TR1	9/29/2012 10:30	9/29/2012 12:45	2.25	Day	100	5	500		16.3	1			9	5						15	6.67	0.00	0.03	0.000	0.000	0.018
LCR	LCR_10.5L	CLB LB US Koot Mouth	10/4/2012	TR1	10/4/2012 9:50	10/4/2012 11:05	1.25	Day	100	5	500		14.6	1			7							8	6.40	0.00	0.02	0.000	0.000	0.014
LCR	LCR_10.5L	CLB LB US Koot Mouth	10/26/2012	TR1	10/26/2012 12:45	10/26/2012 14:15	1.50	Day	100	4	400		11.2				2	1						3	2.00	0.00	0.01	0.000	0.000	0.005
LCR	LCR_10.5L	CLB LB US Koot Mouth	10/27/2012	TR1	10/27/2012 11:35	10/27/2012 13:15	1.67	Day	100	4	400		11.2				6	3						9	5.40	0.00	0.02	0.000	0.000	0.015
LCR	LCR_10.5L	CLB LB US Koot Mouth	11/8/2012	TR1	11/8/2012 13:20	11/8/2012 14:30	1.17	Day	100	4	400		9.9				2	2						4	3.43	0.00	0.01	0.000	0.000	0.005
LCR	LCR_10.5L	CLB LB US Koot Mouth	11/8/2012	TR1	11/8/2012 19:35	11/8/2012 20:30	0.92	Night	100	4	400		9.6					3						3	3.27	0.00	0.01	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	12/17/2012	TR1	12/17/2012 14:15	12/17/2012 15:30	1.25	Day	100	4	400		5.5											0	0.00	0.00	0.00	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	2/8/2013	TR1	2/8/2013 9:40	2/8/2013 11:00	1.33	Day	100	4	400		4.1					1						1	0.75	0.00	0.00	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	2/8/2013	TR1	2/8/2013 15:20	2/8/2013 16:15	0.92	Day	100	5	500		4.1					1						1	1.09	0.00	0.00	0.000	0.000	0.000
LCR	LCR_10.5L	CLB LB US Koot Mouth	2/9/2013	TR1	2/9/2013 11:30	2/9/2013 12:47	1.28	Day	100	5	500		4.3				3	6						9	7.01	0.00	0.02	0.000	0.000	0.006
LCR	LCR_10.5L	CLB LB US Koot Mouth	2/16/2013	TR1	2/16/2013 11:25	2/16/2013 12:55	1.50	Day	100	5	500		4				3	5						8	5.33	0.00	0.02	0.000	0.000	0.006

Appendix B3 continued.

Waterbody	Site[1]	Descriptive Site Name[1]	Date	Method[2]	Set Date/Time	Pull Date/Time	Effort (Hrs)	Set Type	Site Length (m)	Site Width (m)	Site Area (m^2)	Depth (m)	Water Temp. (°C)	Fish Captures[3] CAS	CBA	CC	CCN	CRH	DC	LNC	RSC	UDC	UNK	Total	Catch-per-unit-effort (CPUE)	Umatilla Dace CPUE	Catch per m^2	Umatilla Dace catch per m^2	Columbia Sculpin catch per m^3	Shorthead Sculpin catch per m^3
LCR	LCR_10.5L	CLB LB US Koot Mouth	2/21/2013	TR1	2/21/2013 10:10	2/21/2013 11:10	1.00	Day	100	5	500		3.9				1	1						2	2.00	0.00	0.00	0.000	0.000	0.002
LCR	LCR_25.1R	Genelle	9/5/2012	TR1	9/5/2012 9:35	9/5/2012 11:27	1.87	Day	150	3	450		16.7					4						4	2.14	0.00	0.01	0.000	0.000	0.000
LCR	LCR_25.1R	Genelle	9/14/2012	TR1	9/14/2012 9:45	9/14/2012 11:00	1.25	Day	125	4	500		15.6					4						4	3.20	0.00	0.01	0.000	0.000	0.000
LCR	LCR_25.1R	Genelle	9/15/2012	TR1	9/15/2012 12:15	9/15/2012 13:25	1.17	Day	124	4	496		15.7											0	0.00	0.00	0.00	0.000	0.000	0.000
LCR	LCR_25.1R	Genelle	10/4/2012	TR1	10/4/2012 13:00	10/4/2012 14:45	1.75	Day	100	5	500		14.6	1			1					1		3	1.71	0.57	0.01	0.002	0.000	0.002
LCR	LCR_25.1R	Genelle	11/8/2012	TR1	11/8/2012 9:45	11/8/2012 11:00	1.25	Day	100	4	400		9.9				1							1	0.80	0.00	0.00	0.000	0.000	0.003
LCR	LCR_25.1R	Genelle	11/8/2012	TR1	11/8/2012 17:30	11/8/2012 18:55	1.42	Night	100	4	400		9.9	1				1						2	1.41	0.00	0.01	0.000	0.000	0.000
LCR	LCR_25.1R	Genelle	12/17/2012	TR1	12/17/2012 10:45	12/17/2012 11:45	1.00	Day	100	4	400		5.8					1						1	1.00	0.00	0.00	0.000	0.000	0.000
LCR	LCR_24.5R	Genelle Index Site	3/29/2012	TR1	3/29/2012 9:51	3/29/2012 11:20	1.48	Day	200	2	400		4		1		1	4						6	4.04	0.00	0.02	0.000	0.003	0.003
LCR	LCR_24.5R	Genelle Index Site	3/29/2012	TR2	3/29/2012 12:12	3/29/2012 12:43	0.52	Day	50	3	150		4		1		1	4		1				7	13.55	0.00	0.05	0.000	0.007	0.007
LCR	LCR_24.5R	Genelle Index Site	3/30/2012	TR1	3/30/2012 14:15	3/30/2012 15:09	0.90	Day	150	3	450		4.6				1	2		1				4	4.44	0.00	0.01	0.000	0.000	0.002
LCR	LCR_24.5R	Genelle Index Site	3/31/2012	TR1	3/31/2012 13:35	3/31/2012 14:15	0.67	Day	75	4	300		4.2				1	3		1				5	7.50	0.00	0.02	0.000	0.000	0.003
LCR	LCR_24.5R	Genelle Index Site	3/31/2012	TR2	3/31/2012 14:35	3/31/2012 15:35	1.00	Day	150	3	450		4.2				1	4		1				6	6.00	0.00	0.01	0.000	0.000	0.002
LCR	LCR_24.5R	Genelle Index Site	4/1/2012	TR1	4/1/2012 12:02	4/1/2012 13:04	1.03	Day	150	3	450		4.3	1	1		1	2						5	4.84	0.00	0.01	0.000	0.002	0.002
LCR	LCR_24.5R	Genelle Index Site	4/13/2012	TR1	4/13/2012 12:43	4/13/2012 13:30	0.78	Day	75	5	375		5.9	1				1						2	2.55	0.00	0.01	0.000	0.000	0.000
LCR	LCR_24.5R	Genelle Index Site	4/13/2012	TR2	4/13/2012 14:23	4/13/2012 14:46	0.38	Day	40	5	200		5.9	1				1						2	5.22	0.00	0.01	0.000	0.000	0.000
LCR	LCR_24.5R	Genelle Index Site	2/8/2013	TR1	2/8/2013 11:50	2/8/2013 13:30	1.67	Day	100	5	500		4.8		3			2					1	6	3.60	0.00	0.01	0.000	0.006	0.000
LCR	LCR_24.5R	Genelle Index Site	2/8/2013	TR1	2/8/2013 17:00	2/8/2013 18:40	1.67	Day	100	5	500		4.5		3		1	3						7	4.20	0.00	0.01	0.000	0.006	0.002
LCR	LCR_24.5R	Genelle Index Site	2/9/2013	TR1	2/9/2013 14:20	2/9/2013 15:50	1.50	Day	100	5	500		4.5	1	6		1	2		1				11	7.33	0.00	0.02	0.000	0.012	0.002
LCR	LCR_24.5R	Genelle Index Site	2/14/2013	TR1	2/14/2013 12:10	2/14/2013 13:55	1.75	Day	100	5	500		4.9	1	3		1	4		1		1		11	6.29	0.57	0.02	0.002	0.006	0.002
LCR	LCR_24.5R	Genelle Index Site	2/16/2013	TR1	2/16/2013 14:55	2/16/2013 16:10	1.25	Day	100	5	500		4.2	1	3		1	4		1		1		11	8.80	0.80	0.02	0.002	0.006	0.002
LCR	LCR_24.5R	Genelle Index Site	2/21/2013	TR1	2/21/2013 12:15	2/21/2013 13:30	1.25	Day	100	5	500		3.8	1	3			2				1		7	5.60	0.80	0.01	0.002	0.006	0.000
Total Tracking Effort (hrs), Site Area, Catch per Species and Average CPUE for LCR Index Sites, 2012-13							53.80				18371			19	27	0	60	96	0	7	0	4	2	215	4.00	0.07	0.01	0.000	0.001	0.003
LCR	LCR_8.3R	-	10/23/2012	RB1								2.3					1							1						
LCR	LCR_9.0L	-	10/23/2012	RB1								7.1					1							1						

Notes:

[1] LB or L= left downstream bank; RB or R= right downstream bank; US= upstream; DS= downstream; CLB = Columbia River

[2] SW = Snorkeling; TR= PIT Tracking; RB= Rock Basket

[3] CAS= prickly sculpin; CBA= Columbia sculpin; CC= sculpin sp.; CCN= shorthead sculpin; CRH= torrent sculpin; DC= dace sp.; LNC= longnose dace; RSC= redside shiner; UDC= Umatilla dace; UNK= Unknown sp.

Table B4. Individual fish capture information for target sculpin and dace species captured in the lower Columbia and Slocan river study areas, 2012-2013.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		30		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		40		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		25		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		32		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		31		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		30		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		33		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CAS		25		YOY	Alive	Unknown	No	1		1	0	Sand	100	3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CBA		26		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	1		1.3	0	Cobble	80	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		35		YOY	Alive	Unknown	No	1		1.3	0	Sand	100	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		30		YOY	Alive	Unknown	No	5		1.5	0	Cobble	20	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		35		YOY	Alive	Unknown	No	5		1.5	0	Cobble	20	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	10		1.2	0	Cobble	10	3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		30		YOY	Alive	Unknown	No	10		1	0	Cobble	10	4	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	5		1	0	Silt	100	4	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		30		YOY	Alive	Unknown	No	1		0.8	0	Boulder	25	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		20		YOY	Alive	Unknown	No	10		1	0	Silt	100	5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		20		YOY	Alive	Unknown	No	1		1.4	0	Sand	0	2.5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	1		1	0	Cobble	0	2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	2		1	0	Cobble	0	1.5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		20		YOY	Alive	Unknown	No	1		1.2	0	Cobble	0	2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		20		YOY	Alive	Unknown	No	3		1.2	0	Cobble	0	2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	2		0.4	0	Silt	0	1.3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		20		YOY	Alive	Unknown	No	3		1.2	0.1	Cobble	10	3	Run
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CC		25		YOY	Alive	Unknown	No	3		0.8	0.2	Cobble	5		Run
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CCN		18		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CCN		50		Adult	Alive	Unknown	No	1		1.2	0	Cobble	5	3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		26		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		28		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		20		YOY	Alive	Unknown	No	1							
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		55		Adult	Alive	Unknown	No	1		1	0	Cobble	5	3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		30		YOY	Alive	Unknown	No	1		1.3	0	Cobble	0	2.5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		40		YOY	Alive	Unknown	No	1		0.8	0	Cobble	0	1.2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		30		YOY	Alive	Unknown	No	5		0.8	0	Cobble	0	1.2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		35		YOY	Alive	Unknown	No	7		1.2	0	Cobble	0	2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		45		Juvenile	Alive	Unknown	No	1		0.5	0	Silt	0	1.5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		28		YOY	Alive	Unknown	No	1		1	0.2	Boulder	25	3.5	Run
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		30		YOY	Alive	Unknown	No	1		1	0.1	Cobble	10	3	Run
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	CRH		35		YOY	Alive	Unknown	No	1		1.2	0.2	Cobble	5		Run
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		30		YOY	Alive	Unknown	No	1		1.5	0	Gravel	100	6	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		30		YOY	Alive	Unknown	No	1		1.2	0	Cobble	25	4	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		25		YOY	Alive	Unknown	No	1		1	0	Gravel	100	3	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		25		YOY	Alive	Unknown	No	1		0.8	0	Sand	100	4	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		20		YOY	Alive	Unknown	No	1		1.2	0	Silt	100	6	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		25		YOY	Alive	Unknown	No	8		0.8	0	Cobble	0	1.2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		30		YOY	Alive	Unknown	No	2		0.8	0	Cobble	0	1.2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		25		YOY	Alive	Unknown	No	5		0.8	0	Cobble	5	1.5	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		27		YOY	Alive	Unknown	No	4		0.6	0	Cobble	5	1.4	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		40		Juvenile	Alive	Unknown	No	1		0.7	0	Sand	0	2	Pool
Kootenay River	Koot_0.2R	9/5/2012	No	SW1	Day	LNC		20		YOY	Alive	Unknown	No	2		0.8	0	Silt	0	1.4	Pool
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	CCN		47		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	CRH		55		Adult	Alive	Unknown	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		37		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		35		YOY	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		40		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		38		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		46		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		41		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		40		Juvenile	Alive	Unknown	Unknown	2							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		43		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	LNC		31		YOY	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	UDC		25		YOY	Alive	Unknown	Unknown	1		0.4	0	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	UDC		26		YOY	Alive	Unknown	Unknown	1		0.4	0	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	UDC		25		YOY	Alive	Unknown	Unknown	1		0.4	0	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	6/27/2012	No	EF1	Day	UDC		39		Juvenile	Alive	Unknown	Unknown	1		0.3	0.05	Flooded Vegetation		0.5	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Day	CAS		80		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	CRH				Unknown	Alive	Unknown	Unknown	5							
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Day	DC		12		YOY	Alive	No	Unknown	1		0.2	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	LNC		49		Adult	Alive	Unknown	Unknown	1		0.5	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	LNC		50		Adult	Alive	Unknown	Unknown	1		0.3	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	LNC		44		Juvenile	Alive	Unknown	Unknown	1		0.2	0.05	Flooded Vegetation		0.5	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	LNC		48		Adult	Alive	Unknown	Unknown	1		0.5	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Day	UDC		41		Juvenile	Alive	No	Unknown	1		0.2	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Day	UDC		36		Juvenile	Alive	No	Unknown	1		0.3	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Day	UDC		46		Adult	Alive	No	Unknown	1		0.2	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	UDC		45		Juvenile	Alive	No	Unknown	1		0.2	0.05	Flooded Vegetation		0.5	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	UDC		50		Adult	Alive	No	Unknown	1		0.2	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	UDC		46		Adult	Alive	No	Unknown	1		0.4	0.05	Flooded Vegetation		0.5	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	UDC		44		Juvenile	Alive	No	Unknown	1		0.5	0.05	Flooded Vegetation		1	
Kootenay River	Koot_0.5R	8/15/2012	No	EF1	Night	UDC		46		Adult	Alive	No	Unknown	1		0.3	0.05	Flooded Vegetation		0.5	
Kootenay River	Koot_0.5R	8/30/2012	No	MT1	Overnight	UDC		50		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	CAS		89		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	LNC		53		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	LNC		55		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	LNC		36		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	LNC		33		YOY	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	LNC		35		YOY	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC		50		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC	3D9.1C2D23ADC5	59	2.5	Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC	3D9.1C2D23B203	54	2	Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC	3D9.1C2D239BAB	53	2	Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC		49		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT3	Overnight	UDC		37		Juvenile	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT4	Overnight	CRH		70		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT4	Overnight	CRH		68		Adult	Alive	Unknown	Unknown	1							
Kootenay River	Koot_0.5R	8/30/2012	No	MT4	Overnight	UDC		48		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		30		YOY	Dead	No	Unknown	1	Mortality.						
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	4							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		29		YOY	Dead	No	Unknown	1	Mortality.						
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		29		YOY	Alive	No	Unknown	2							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		33		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	3							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		31		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		34		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		25		YOY	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/14/2012	No	EF1	Day	UDC		28		YOY	Alive	No	Unknown	1		0.5	0.1	Gravel		10	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		31		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		45		Juvenile	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		34		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		39		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		32		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		34		YOY	Alive	No	Unknown	2							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		28		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CAS		27		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CBA		48		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	CCN		104		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		24		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		22		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		26		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		33		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		33		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		18		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		33		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		32		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		16		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		27		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		27		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		38		Juvenile	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		24		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	LNC		28		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		23		YOY	Alive	No	Unknown	1		0.3	0	Gravel		5	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		27		YOY	Alive	No	Unknown	1		0.2	0	Cobble		2	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		27		YOY	Alive	No	Unknown	1		0.3	0	Gravel		5	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		24		YOY	Alive	No	Unknown	1		0.1	0	Gravel		1	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		18		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		0.4	0.05	Gravel		4	
Kootenay River	Koot_0.5R	9/15/2012	Yes	EF1	Day	UDC		16		YOY	Alive	No	Unknown	1		0.1	0	Gravel		1	
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	CAS		46		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	CAS		42		Juvenile	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	CAS		47		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	CAS		40		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Night	CC		50		Adult	Alive	Unknown	Unknown	2	Observed only.						
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	1		0.1	0	Cobble		1.5	
Kootenay River	Koot_0.5R	11/8/2012	No	EF1	Day	UDC		35		YOY	Alive	No	Unknown	1		0.5	0.1	Cobble		8	
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	CAS		42		Juvenile	Alive	No	Unknown	1		0.1	0	Cobble		0.5	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	CAS		32		YOY	Alive	No	Unknown	1		0.3	0	Gravel		0.5	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	CAS		40		YOY	Alive	No	Unknown	1							
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		26		YOY	Alive	No	Unknown	2		0.1	0	Silt		0.25	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		33		YOY	Alive	No	Unknown	1		0.2	0	Silt		0.15	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		31		YOY	Alive	No	Unknown	1		0.3	0	Flooded Vegetation		0.15	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		24		YOY	Alive	No	Unknown	3		0.1	0	Flooded Vegetation		0.2	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		28		YOY	Alive	No	Unknown	1		0.2	0	Flooded Vegetation		0.2	Pool

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		27		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		0.25	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		20		YOY	Alive	No	Unknown	1		0.2	0	Silt		0.5	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	2		0.1	0	Silt		0.1	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		23		YOY	Alive	No	Unknown	1		0.3	0	Gravel		0.2	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		0.2	0	Gravel		0.3	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		23		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		0.5	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		29		YOY	Alive	No	Unknown	2		0.2	0	Flooded Vegetation		0.4	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		23		YOY	Alive	No	Unknown	2		0.2	0	Silt		0.3	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		25		YOY	Alive	No	Unknown	2		0.1	0	Flooded Vegetation		0.2	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		27		YOY	Alive	No	Unknown	2		0.1	0	Flooded Vegetation		0.1	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		24		YOY	Alive	No	Unknown	2		0.2	0	Flooded Vegetation		0.1	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		34		YOY	Alive	No	Unknown	1		0.3	0	Silt		0.2	Pool
Kootenay River	Koot_0.5R	1/22/2013	No	EF1	Night	UDC		28		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		0.3	Pool
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	1		0.05		Silt		0.15	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		26		YOY	Alive	No	Unknown	3		0.1		Silt		0.2	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		28		YOY	Alive	No	Unknown	4		0.15		Silt		0.3	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		32		YOY	Alive	No	Unknown	1		0.2		Silt		0.1	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		30		YOY	Alive	No	Unknown	1		0.08		Silt		0.05	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		24		YOY	Alive	No	Unknown	1		0.12		Silt		0.2	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		33		YOY	Alive	No	Unknown	1		0.09		Silt		0.15	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	2		0.15		Silt		0.05	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		27		YOY	Alive	No	Unknown	6		0.05		Silt		0.2	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	1		0.2		Silt		0.1	
Kootenay River	Koot_0.5R	2/7/2013	No	EF1	Day	UDC		23		YOY	Alive	No	Unknown	2		0.08		Silt		0.15	
Kootenay River	Koot_0.5R	2/9/2013	Yes	EF1	Day	UDC		28		YOY	Alive	No	Unknown	1		0.2	0	Gravel		1	
Kootenay River	Koot_0.5R	2/9/2013	Yes	EF1	Day	UDC		24		YOY	Alive	No	Unknown	1		0.25	0	Cobble		2.5	
Kootenay River	Koot_10.4L	8/2/2012	No	MT2	Overnight	UDC		50		Adult	Alive	No	Unknown	1							
Kootenay River	Koot_10.4L	8/3/2012	No	EF1	Day	CRH				Unknown	Alive	Unknown	Unknown	10							
Kootenay River	Koot_10.4L	8/3/2012	No	EF1	Day	UDC		31		YOY	Alive	No	Unknown	1		0.3	0.1	Cobble		1.5	
Kootenay River	Koot_16.3R	8/2/2012	No	EF1	Overnight	UDC		57		Adult	Alive	No	Unknown	1		0.3	0	Flooded Vegetation		1.5	Pool
Kootenay River	Koot_16.3R	8/2/2012	No	MT2	Overnight	UDC		43		Juvenile	Alive	No	Unknown	1							
Kootenay River	Koot_16.3R	8/2/2012	No	MT3	Overnight	LNC		45		Juvenile	Dead	Unknown	Unknown	1							
Kootenay River	Koot_16.5L	8/2/2012	No	EF1	Day	CRH				Unknown	Alive	Unknown	Unknown	4							
Kootenay River	Koot_16.5L	8/2/2012	No	EF1	Day	UDC		30		YOY	Alive	No	Unknown	1		0.2	0.1	Flooded Vegetation		0.25	
Kootenay River	Koot_16.5L	8/2/2012	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		0.4	0.4	Cobble		1	
Kootenay River	Koot_18.7L	8/2/2012	No	MT1	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
Kootenay River	Koot_19.1R	8/2/2012	No	MT1	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
Kootenay River	Koot_19.1R	8/2/2012	No	MT2	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
Kootenay River	Koot_4.1R	8/3/2012	No	EF1	Day	CRH				Unknown	Alive	Unknown	Unknown	10							
Kootenay River	Koot_4.1R	8/3/2012	No	EF1	Day	LNC				Unknown	Alive	Unknown	Unknown	1							
Kootenay River	Koot_8.0R	8/2/2012	No	MT1	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CCN	3D9.1C2D313485	78	5.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CCN	3D9.1C2D312FFE	76	5.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CRH	3D9.1C2D313787	86	7.4	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CRH	3D9.1C2D315B3D	73	5.2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CRH	3D9.1C2D3131FB	75	4.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CRH	3D9.1C2D313C6E	81	6.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.55L	2/7/2013	No	EF1	Day	CRH	3D9.1C2D312F3F	75	4.4	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CAS	3D9.1C2D63A6E8	105	10	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CAS	3D9.1C2D23C3DB	52	1.2	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CBA	3D9.1C2D63B050	84	8.6	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CBA	3D9.1C2D693DFF	86	9.3	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CBA	3D9.1C2D639E67	89	10.2	Adult	Alive	Yes	Unknown	1	Milting.						

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D69401D	97	14.3	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D63ACD8	87	10.1	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D69312D	79	7.5	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D63A93A	64	4.1	Adult	Alive	No	Unknown	1	Eggs observed.						
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D2353D4	47	1.1	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D240EA0	55	1.6	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN		47	1	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN	3D9.1C2D2CB369	52	1.4	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN		49	1.1	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CCN		42	0.7	Juvenile	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D63A5E9	74	3.9	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D621FED	82	6.1	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D63A8C0	72	4.4	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D6931A5	71	3.6	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D63A1B7	68	3.2	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	CRH	3D9.1C2D693487	63	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	LNC		44	0.6	Juvenile	Alive	No	Unknown	1							
LCR	LCR_10.5L	5/7/2012	No	EF1	Day	LNC		41	0.5	Juvenile	Alive	No	Unknown	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CAS		35		YOY	Alive	Unknown	No	3							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CAS	3D9.1C2D23C2D1	45	0.8	Juvenile	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D314795	61	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D313BEC	60	2.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D313D6E	65	3.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D31399B	51	1.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D3137B8	68	4.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D3152AF	60	2.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CBA	3D9.1C2D31341B	60	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CC		44	1.1	Juvenile	Alive	Unknown	No	1	No tag.						
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN		25		YOY	Alive	Unknown	No	5							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN		35		YOY	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313CC6	58	2.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313382	73	5.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D3137D6	85	8.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D312F92	63	2.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313036	86	9.2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D3137B8	59	3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D3139A5	54	2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D315D93	62	3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D314862	60	2.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D315BB3	62	2.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D315A46	62	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D3131F2	52	1.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D315A8C	66	3.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D314BA3	53	1.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313C1F	65	3.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D31368A	63	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D315A7C	62	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313611	53	2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CCN	3D9.1C2D313969	61	3.2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH		25		YOY	Alive	Unknown	No	2							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH		30		YOY	Alive	Unknown	No	3							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH		46		Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH		32		YOY	Alive	Unknown	No	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313BDC	62	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313BDC	62	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D312D30	65	3.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D315A4C	60	3.2	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313D09	69	4.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D315A54	60	3.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D31392F	69	4.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313B2A	102	16.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D31345E	70	4.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313A71	73	5.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D315426	66	3.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D3132D6	66	3.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D31342A	70	4.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D31359B	70	4.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313AF6	72	6.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D313286	63	2.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D312D35	60	2.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D31542E	64	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF1	Day	CRH	3D9.1C2D3133F4	63	3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day						Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CAS		52	1.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313270	62	3.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313899	83	8.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313B3E	55	2.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D312CBE	51	1.9	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D31340A	90	10.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D23B3DB	45	1.5	Juvenile	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D23B9F8	50	1.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D312F6C	62	3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D3130F4	75	6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313D12	68	3.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D23AD25	44	1.2	Juvenile	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313805	67	4.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313439	64	3.1	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D313053	60	3.3	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CCN	3D9.1C2D23A30D	52	1.8	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH		36		YOY	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH		32		YOY	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D31348E	88	9.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D312FEB	81	6.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D312FF9	64	3.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D315DA3	58	2.6	Adult	Alive	Unknown	No	1	Tagging mortality.						
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D3159B6	72	4.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D313D5F	94	12.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D312DA8	69	3.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D312DCA	67	3.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D312D13	68	4.5	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/18/2012	No	EF2	Day	CRH	3D9.1C2D31350B	64	3.6	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	9/28/2012	No	TR1	Day		3D9.1BF13AA09A				Unknown	Unknown	No	1	Not our fish.	0.14	0.2	Cobble	5	0.5	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CAS	3D9.1C2D23C2D1	45		Juvenile	Unknown	Unknown	No	1		0.48	0.02	Cobble	10	2	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D63A57B	76		Adult	Alive	Unknown	No	1		0.45	0.02	Cobble	5	1.5	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D313D12	68		Adult	Unknown	Unknown	No	1		0.8	0.27	Cobble	10	3.5	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D314BA3	53		Adult	Unknown	Unknown	No	1		0.91	0.31	Cobble	5	4	Run

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D313439	64		Adult	Unknown	Unknown	No	1		0.28	0.02	Cobble	5	0.8	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Unknown	Unknown	No	1		0.5	0.06	Cobble	5	2	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Unknown	Unknown	No	1		0.18	0.03	Cobble	5	1.5	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	Unknown	No	1		0.55	0.05	Cobble	10	2	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D315A4C	60		Adult	Unknown	Unknown	No	1		0.47	0.03	Cobble	10	2	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D3132D6	66		Adult	Unknown	Unknown	No	1		0.6	0.12	Cobble	10	3	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D312D35	60		Adult	Unknown	Unknown	No	1	Dewatered- not relocated day 2.	0.55	0.02	Cobble	10	3	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D315A54	60		Adult	Unknown	Unknown	No	1	Dewatered- not relocated day 2.	0.16	0.02	Cobble	5	0.2	Run
LCR	LCR_10.5L	9/28/2012	No	TR1	Day	CRH	3D9.1C2D3133F4	63		Adult	Unknown	Unknown	No	1		0.6	0.12	Cobble	10	3	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day		3D9.1BF13AA09A				Dead	No	No	1	Not our tag.						
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CAS	3D9.1C2D23C2D1	45		Juvenile	Alive	Unknown	No	1		0.85	0.3	Cobble	10	4.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D6939AB	88		Adult	Alive	Unknown	No	1		0.61	0.04	Cobble	10	3.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D63A57B	76		Adult	Alive	Unknown	No	1		0.18	0.03	Cobble	10	0.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D313D12	68		Adult	Alive	Unknown	No	1		0.3	0.1	Cobble	5	1.2	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D62CCD7	64		Adult	Unknown	Unknown	No	1		0.43	0.3	Cobble	10	4	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D315D93	63		Adult	Unknown	Unknown	No	1		0.67	0.2	Cobble	10	4	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D3139A5	54		Adult	Unknown	Unknown	No	1		0.53	0.2	Cobble	5	3.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Alive	Unknown	No	1		0.21	0	Gravel	5	0.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Alive	Unknown	No	1		0.2	0	Cobble	0	0.5	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CCN	3D9.1C2D313439	64		Adult	Alive	Unknown	No	1		0.02	0	Boulder	0	0.1	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CRH	3D9.1C2D69390B	81		Adult	Unknown	Unknown	No	1		0.18	0.01	Cobble	10	1.8	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CRH	3D9.1C2D31348E	88		Adult	Alive	Unknown	No	1		1.03	0.03	Boulder	5	12	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	Unknown	No	1		0.55	0.01	Cobble	10	3	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CRH	3D9.1C2D31350B	64		Adult	Unknown	Unknown	No	1		0.28	0	Cobble	10	0.8	Run
LCR	LCR_10.5L	9/29/2012	Yes	TR1	Day	CRH	3D9.1C2D3132D6	66		Adult	Alive	Unknown	No	1		0.2	0.05	Cobble	5	1.2	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CAS	3D9.1C2D23C2D1	45		Juvenile	Alive	Unknown	No	1		0.28	0	Cobble	20	2.5	Pool
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D313D12	68		Adult	Unknown	Unknown	No	1		0.78	0.05	Cobble	10	3	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D3131F2	52		Adult	Unknown	Unknown	No	1		0.8	0.6	Cobble	5	4	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D313CC6	58		Adult	Unknown	Unknown	No	1		0.63	0.6	Cobble	5	4	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D313036	86		Adult	Unknown	Unknown	No	1		0.71	0.6	Cobble	10	4	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D314BA3	53		Adult	Unknown	Unknown	No	1		0.71	0.6	Cobble	10	4	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D315BB3	62		Adult	Unknown	Unknown	No	1		0.83	0.6	Cobble	5	4	Run
LCR	LCR_10.5L	10/4/2012	No	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Dead	Unknown	No	1	Dead tag.						
LCR	LCR_10.5L	10/26/2012	No	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Dead	Unknown	No	1	Likely dead.						
LCR	LCR_10.5L	10/26/2012	No	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Alive	Unknown	No	1		0.15	0.14	Cobble	10	0.5	Run
LCR	LCR_10.5L	10/26/2012	No	TR1	Day	CRH	3D9.1C2D312D35	60		Adult	Unknown	Unknown	No	1		0.72	0.07	Cobble	5	2.2	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D313B3E	55		Adult	Alive	Unknown	No	1		0.68	0.04	Cobble	5	5	Pool
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D313CC6	58		Adult	Alive	Unknown	No	1		0.62	0.62	Gravel	5	4	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D313439	64		Adult	Unknown	Unknown	No	1		0.62	0.26	Gravel	5	3	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D314BA3	53		Adult	Unknown	Unknown	No	1		0.7	0.57	Cobble	5	4	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D315BB3	62		Adult	Alive	Unknown	No	1		0.87	0.53	Cobble	5	6	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Alive	Unknown	No	1		0.18	0.17	Cobble	5	1	Run
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CRH	3D9.1C2D31348E	88		Adult	Alive	Unknown	No	1		0.56	0.02	Cobble	10	6	Pool
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	Unknown	No	1		0.35	0.02	Cobble	5	2	Pool
LCR	LCR_10.5L	10/27/2012	Yes	TR1	Day	CRH	3D9.1C2D312D35	60		Adult	Alive	Unknown	No	1		0.17	0.02	Cobble	5	0.8	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Day	CCN	3D9.1C2D313CC6	58		Adult	Alive	No	No	1		0.63	0.37	Cobble	10	5	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Day	CCN	3D9.1C2D313439	64		Adult	Alive	No	No	1		0.53	0.03	Cobble	5	4	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	No	No	1		0.4	0.02	Cobble	10	3	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Day	CRH	3D9.1C2D315A54	60		Adult	Alive	No	No	1		0.63	0.16	Cobble	5	3	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Night	CRH	3D9.1C2D312DA8	69		Adult	Unknown	No	No	1		0.4	0.02	Cobble	10	3	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Night	CRH	3D9.1C2D313D5F	94		Adult	Unknown	No	No	1		0.78	0.36	Cobble	10	6	Run
LCR	LCR_10.5L	11/8/2012	No	TR1	Night	CRH	3D9.1C2D315A54	60		Adult	Unknown	No	No	1		0.5	0.04	Cobble	10	2	Run
LCR	LCR_10.5L	1/22/2013	No	EF1	Day	CAS		51		Adult	Alive	Unknown	No	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_10.5L	1/22/2013	No	EF1	Night	CC		60		Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	1/22/2013	No	EF1	Day	UDC		28		YOY	Alive	Unknown	No	1		0.5	0	Gravel		1	Pool
LCR	LCR_10.5L	2/8/2013	No	TR1	Day	CRH	3D9.1C2D3131FB	75	4.7	Adult	Alive	Unknown	No	1							
LCR	LCR_10.5L	2/8/2013	Yes	TR1	Day	CRH	3D9.1C2D315B3D	73		Adult	Unknown	Unknown	No	1		1.3	0.3	Cobble	10	3.5	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Unknown	Unknown	No	1		0.42	0	Cobble	10	2.5	Pool
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CCN	3D9.1C2D6939AB	88		Adult	Unknown	Unknown	No	1		0.34	0.15	Boulder	5	1	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Alive	Unknown	No	1		1.02	0.1	Gravel	40	5	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D315A54	60		Adult	Alive	Unknown	No	1		0.45	0	Cobble	5	2.5	Pool
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D313787	86		Adult	Alive	Unknown	No	1		0.34	0	Cobble	5	1.5	Pool
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Unknown	Unknown	No	1		0.95	0.3	Cobble	5	4.5	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D315B3D	73		Adult	Unknown	Unknown	No	1		0.32	0.1	Cobble	5	1	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D313C6E	81		Adult	Unknown	Unknown	No	1		0.57	0	Cobble	5	2.5	Run
LCR	LCR_10.5L	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D312D35	60		Adult	Unknown	Unknown	No	1		1.1	0.05	Cobble	5	5	Run
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Alive	Unknown	No	1		0.49	0.01	Cobble	10	2	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CCN	3D9.1C2D23B9F8	50		Adult	Unknown	Unknown	No	1		0.12	0.04	Cobble	5	0.25	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Unknown	Unknown	No	1		0.8	0.01	Gravel	50	3	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CRH	3D9.1C2D312F3F	75		Adult	Unknown	Unknown	No	1		0.65	0.01	Cobble	40	4	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CRH	3D9.1C2D315A54	60		Adult	Alive	Unknown	No	1		0.47	0.03	Cobble	5	3	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	Unknown	No	1		0.8	0.39	Cobble	25	5	Run
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CRH	3D9.1C2D315B3D	73		Adult	Unknown	Unknown	No	1		0.42	0.05	Cobble	25	2	Pool
LCR	LCR_10.5L	2/14/2013	No	TR1	Day	CRH	3D9.1C2D312D35	60		Adult	Alive	Unknown	No	1		0.81	0.03	Gravel	5	3	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CCN	3D9.1C2D313899	83		Adult	Alive	Unknown	No	1		0.2	0.01	Cobble	5	1.5	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CCN	3D9.1C2D313CC6	58		Adult	Alive	Unknown	No	1		0.67	0.1	Cobble	5	3	Run
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CCN	3D9.1C2D313C1F	65		Adult	Dead	Unknown	No	1	Dead tag.	0.21	0.01	Sand	75	1	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D312F3F	75		Adult	Unknown	Unknown	No	1		0.24	0.02	Cobble	40	1	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D3131FB	75		Adult	Alive	Unknown	No	1		0.12	0.01	Boulder	10	1	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D313C6E	81		Adult	Alive	Unknown	No	1		0.59	0.01	Cobble	50	2.5	Pool
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D312DA8	69		Adult	Alive	Unknown	No	1		0.4	0.13	Cobble	24	3	Run
LCR	LCR_10.5L	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D315B3D	73		Adult	Alive	Unknown	No	1		0.15	0.01	Cobble	5	0.5	Pool
LCR	LCR_10.5L	2/21/2013	No	TR1	Day	CCN	3D9.1C2D313CC6	58		Adult	Alive	Unknown	No	1		0.45	0.01	Cobble	5	4	Pool
LCR	LCR_10.5L	2/21/2013	No	TR1	Day	CRH	3D9.1C2D313C6E	81		Adult	Alive	Unknown	No	1		0.56	0.03	Cobble	30	6	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CAS		45		Juvenile	Alive	Unknown	No	1		1.2	0	Cobble	0	4	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CAS		70		Adult	Alive	Unknown	No	1		1.5	0	Boulder	5	6	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CBA		55		Adult	Alive	Unknown	No	1		1	0	Cobble	0	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		50		Adult	Alive	Unknown	No	1		1.2	0	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		62		Adult	Alive	Unknown	No	1		1	0	Cobble	10	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		70		Adult	Alive	Unknown	No	1		1	0	Cobble	10	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		85		Adult	Alive	Unknown	No	1		1.4	0.1	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		40		Juvenile	Alive	Unknown	No	1		1.5	0.1	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		40		Juvenile	Alive	Unknown	No	1		1.2	0.1	Cobble	5	4	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		50		Adult	Alive	Unknown	Yes	1		1.1	0.1	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CC		70		Adult	Alive	Unknown	Yes	1		1.2	0	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		40		YOY	Alive	Unknown	No	1		1.2	0	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		65		Adult	Alive	Unknown	No	1		1.5	0	Cobble	5	7	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		35		YOY	Alive	Unknown	No	1		0.8	0.1	Cobble	10	3	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		35		YOY	Alive	Unknown	No	1		1	0.1	Cobble	5	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		40		YOY	Alive	Unknown	No	2		1	0	Cobble	0	5	Pool
LCR	LCR_2.8L	6/5/2012	No	SW1	Day	CRH		65		Adult	Alive	Unknown	Yes	1		1.2	0	Cobble	5	5	Pool
LCR	LCR_2.8L	6/27/2012	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		1	0	Flooded Vegetation		4	
LCR	LCR_2.8L	7/17/2012	No	MT1	Overnight	CAS		65		Adult	Alive	Unknown	Unknown	1							
LCR	LCR_2.8L	7/17/2012	No	MT1	Overnight	CRH		53		Adult	Alive	Unknown	Unknown	1							
LCR	LCR_2.8L	7/17/2012	No	MT3	Overnight	CAS		62		Adult	Alive	Unknown	Unknown	1							
LCR	LCR_2.8L	7/17/2012	No	MT4	Overnight	CAS		57		Adult	Alive	Unknown	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_2.8L	7/17/2012	No	MT4	Overnight	UDC		55		Adult	Alive	Unknown	Unknown	1							
LCR	LCR_2.8L	8/30/2012	No	MT2	Overnight	LNC		52		Adult	Alive	Unknown	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CAS	3D9.1C2D239BF9	56	1.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA	3D9.1C2D6429F2	81	6.3	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA	3D9.1C2D69374A	81	7.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA	3D9.1C2D636A8C	86	9.6	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA	3D9.1C2D639FD5	61	2.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA		33	0.3	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA		37	0.4	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA		52	0.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CBA		54	0.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D69441D	67	8.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D6932CB	83	7.7	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D69300F	78	6.6	Adult	Alive	Yes	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D63A41B	83	7.2	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D694265	75	5.9	Adult	Alive	No	Unknown	1	Eggs observed.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D63AEE2	81	7.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D69338F	86	8.7	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D693121	80	7.6	Adult	Alive	Yes	Unknown	1	Milting.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D693A53	62	3.6	Adult	Alive	No	Unknown	1	Eggs observed.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D23BDF8	59	2.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN	3D9.1C2D23C209	56	2.3	Adult	Dead	No	Unknown	1	Tagging mortality, eggs observed.						
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		33	0.1	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		41	0.6	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		32	0.3	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		35	0.5	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		32	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		35	0.5	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CCN		51	0.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D693B01	66	2.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D63AB4E	85	6.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D63AE41	67	3.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D694B0E	68	3.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D693EB5	85	7.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D25B6E5	75	5.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH	3D9.1C2D69316E	86	7.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		37	0.6	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		31	0.3	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		37	0.5	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		36	0.6	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		53	0.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		55	0.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		57	0.1	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	CRH		58	0.1	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		46	0.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		29	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		38	0.5	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		41	0.7	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		38	0.5	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		35	0.5	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		42	0.6	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		41	0.7	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		40	0.6	Juvenile	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		38	0.5	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		46	0.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		42	0.7	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		30	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		44	0.6	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		39	0.5	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	5/7/2012	No	EF1	Day	LNC		56	0.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	8/30/2012	No	MT4	Overnight	LNC		45		Juvenile	Alive	Unknown	Unknown	1							
LCR	LCR_24.5R	9/5/2012	No	TR1	Day	CRH	3D9.1C2D63AAAF	64		Adult	Alive	Unknown	No	1		0.92	0.54	Cobble	10	2	Run
LCR	LCR_24.5R	9/5/2012	No	TR1	Day	CRH	3D9.1C2D694B0E	68		Adult	Unknown	Unknown	No	1		0.58	0.09	Cobble	10	2	Pool
LCR	LCR_24.5R	9/5/2012	No	TR1	Day	CRH	3D9.1C2D63698E			Unknown	Alive	Unknown	No	1		0.45	0.19	Cobble	0	1.5	Run
LCR	LCR_24.5R	9/5/2012	No	TR1	Day	CRH	3D9.1C2D63A22D	60		Adult	Unknown	Unknown	No	1		0.57	0.44	Cobble	5	1.5	Run
LCR	LCR_24.5R	9/14/2012	No	TR1	Day	CRH	3D9.1C2D63AAAF	64		Adult	Dead	Unknown	No	1		0.43	0.43	Cobble	5	1.5	Run
LCR	LCR_24.5R	9/14/2012	No	TR1	Day	CRH	3D9.1C2D694B0E	68		Adult	Dead	Unknown	No	1		0.23	0	Sand	100	0.5	Pool
LCR	LCR_24.5R	9/14/2012	No	TR1	Day	CRH	3D9.1C2D63698E			Unknown	Dead	Unknown	No	1							
LCR	LCR_24.5R	9/14/2012	No	TR1	Day	CRH	3D9.1C2D63A22D	60		Adult	Dead	Unknown	No	1		0.15	0.08	Cobble	5	0.3	Run
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CAS		28		YOY	Alive	Unknown	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CAS	3D9.1C2D693A54	70	4.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		25		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		24		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		25		YOY	Alive	No	Unknown	3							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		35		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		22		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		26		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		23		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D693A8A	77	7.1	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D622776	81	8.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D63A8A4	85	9.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D62DIEB	79	6.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D694540	90	11.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D69409C	79	6.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D639FB8	86	10.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D693DF2	96	12.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D31364F	89	10.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D312D2D	80	8	Adult	Alive	No	Unknown	1	EF mortality.						
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23BA7D	52	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D3132F6	79	7.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D239D2E	50	2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D315ABC	70	5.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23A08F	54	1.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D314831	84	8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23F35C	59	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D312C84	59	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D314FB2	69	5.1	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D313427	55	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D234D0F	50	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D313B37	70	5.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D313954	75	5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D313133	65	4.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23C27E	59	2.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23C311	52	2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23BDCF	55	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D23C28B	54	2	Adult	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D237795	48	1.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA	3D9.1C2D313412	66	3.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CBA		47	1.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CC		17		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D693348	87	9.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D6943B8	55	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D63A19D	92	12	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D313A3F	75	5.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D315456	60	3.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D3138C4	65	2.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D31301F	57	2.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D313C03	70	5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D23A9E6	54	2.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN	3D9.1C2D23B6AA	50	1.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CCN		45		Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		23		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		32		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		27		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		37		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		30		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH		80		Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH	3D9.1C2D611F49	72	5.4	Adult		No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH	3D9.1C2D31325F	102	16.9	Adult		No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH	3D9.1C2D23A9B6	60	2.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH	3D9.1C2D313D9B	73	5.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	CRH	3D9.1C2D31593B	76	5.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		27		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		23		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		35		YOY	Alive	No	Unknown	5							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		33		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		31		YOY	Alive	No	Unknown	4							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		36		Juvenile	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		22		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		39		Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		54		Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		37		Juvenile	Alive	No	Unknown	3							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	7							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		34		YOY	Alive	No	Unknown	2							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		38		Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC	3D9.1C2D639FB3	56	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC	3D9.1C2D62E778	55	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC	3D9.1C2D639B4C	56	1.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC	3D9.1C2D239ABE	54	2.1	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC	3D9.1C2D23BE7E	50	1.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	LNC		45	1.8	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC		47		Adult	Alive	No	Unknown	1		0.2	0	Cobble		1	
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D63B15B	62	2.8	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D693B54	52	2.2	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D23B289	50	1.6	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC		45	1.2	Juvenile				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D636D9B	55	2.1	Adult				1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D234AEC	49	1.2	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D639FC2	57	2.5	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D69391A	57	2.2	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC	3D9.1C2D2CA229	54	1.5	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF1	Day	UDC		50	2.1	Adult				1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D312D0A	90	10.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D3139A4	83	8.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D314BD6	82	7.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D312FFB	78	7.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D315C40	79	8.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D3132A5	88	10	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D23AA5D	50	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D3133B5	58	2.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D315A46	89	11.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D313B4B	53	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D31357B	82	7.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D313548	59	3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D3136DD	90	10.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D313560	59	2.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D313626	52	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D235A8D	53	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D23A861	53	1.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CBA	3D9.1C2D23BE26	49	1.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CC		25	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CC		27	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2DB15D4C	80	6.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313493	56	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D3138C7	64	4.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D312CAC	58	2.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D23F2AF	51	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313C3D	86	9.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313474	58	2.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D23AFBF	50	1.8	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D23C4AF	52	1.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313C70	71	5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D3139BC	85	9.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D3134F4	90	8.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D312D28	77	7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313C3F	67	3.6	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D3132B2	86	6.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D239B70	54	2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CCN	3D9.1C2D313BD4	59	2.9	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CRH	3D9.1C2D3139E1	68	4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CRH	3D9.1C2D313BF3	96	13	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	CRH	3D9.1C2D313629	69	4.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		51	1.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		51	1.5	Adult	Dead	No	Unknown	1	Mortality.						
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D3138E9	60	2.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		31	0.2	YOY	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D234A94	53	1.7	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D23C32A	50	1.2	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		48	1.5	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D313214	57	1.9	Adult	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D3134E5	59	2.4	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		45	1	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC		40	0.9	Juvenile	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	LNC	3D9.1C2D240854	49	1.3	Adult	Alive	No	Unknown	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	UDC	3D9.1C2D315D7D	61	2	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	UDC	3D9.1C2D3147D2	58	2.4	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	UDC	3D9.1C2D313729	57	2.3	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	9/17/2012	No	EF2	Day	UDC	3D9.1C2D312EE0	55	2.5	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	10/4/2012	No	TR1	Day	CAS	3D9.1C2D693A54	70		Adult	Alive	Unknown	No	1		0.38	0.2	Cobble	0	1.5	Pool
LCR	LCR_24.5R	10/4/2012	No	TR1	Day	CCN	3D9.1C2D63AABE	79		Adult	Unknown	Unknown	No	1	Likely dead.	0.16	0	Cobble	5	0.5	Pool
LCR	LCR_24.5R	10/4/2012	No	TR1	Day	UDC	3D9.1C2D312EE0	55		Adult	Unknown	No	No	1		0.31	0	Cobble	20	0.5	Pool
LCR	LCR_24.5R	11/8/2012	No	TR1	Night	CAS	3D9.1C2D693A54	70		Adult	Unknown	No	No	1		0.2	0.15	Cobble	5	0.5	Pool
LCR	LCR_24.5R	11/8/2012	No	TR1	Day	CCN	3D9.1C2D63AABE	79		Adult	Alive	Unknown	No	1		0.05	0.01	Gravel	5	0.25	Pool
LCR	LCR_24.5R	11/8/2012	No	TR1	Night	CRH	3D9.1C2D313629	69		Adult	Unknown	No	No	1		0.8	0.17	Cobble	10	2.5	Run
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	CAS		45		Juvenile	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	CAS		48		Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	CAS		40		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	CRH		35		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	CRH		36		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		32		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		29		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		36		Juvenile	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		33		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		30		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	LNC		35		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	UDC		33		YOY	Alive	No	No	1		0.3	0.02	Cobble		1.5	Pool
LCR	LCR_24.5R	11/9/2012	No	EF1	Day	UDC		32		YOY	Alive	No	No	1		0.3	0.02	Cobble		1.5	pool
LCR	LCR_24.5R	12/17/2012	No	TR1	Day	CRH	3D9.1C2D63A22D	60		Adult	Unknown	Unknown	No	1		0.36	0.29	Cobble	5	1.5	Run
LCR	LCR_24.5R	1/22/2013	No	EF1	Day	CC		70		Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	1/22/2013	No	EF1	Day	CC		45		Juvenile	Alive	Unknown	No	1							
LCR	LCR_24.5R	1/22/2013	No	EF1	Day	CRH		31		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	1/22/2013	No	EF1	Day	CRH		68		Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	1/22/2013	No	EF1	Day	LNC		30		YOY	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D313D91	80	6	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D312F14	94	10.8	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D315976	92	10.8	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D31317A	95	10	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D313615	72	4.9	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D3135AB	63	3.1	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CBA	3D9.1C2D313880	73	5.4	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CCN	3D9.1C2D315532	83	8	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CCN	3D9.1C2D315BF9	78	5.7	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D312D15	85	7	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D314B8E	87	7.7	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D3133AD	80	5.7	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D315B85	71	4.3	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D313E9D	85	7.8	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/7/2013	No	EF1	Day	CRH	3D9.1C2D31384A	77	5.5	Adult	Alive	Unknown	No	1							
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CBA	3D9.1C2D3135AB	63		Adult	Alive	Unknown	No	1		0.6	0.5	Cobble	10	1.2	Run
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Alive	Unknown	No	1		0.15	0.1	Cobble	10	3.8	Run
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CBA	3D9.1C2D312F14	94		Adult	Alive	Unknown	No	1		0.2	0.2	Cobble	10	2	Run
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CBA	3D9.1C2D315976	92		Adult	Unknown	Unknown	No	1		0.15	0.05	Cobble	10	0.2	Pool
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CBA	3D9.1C2D312F14	94		Adult	Unknown	Unknown	No	1		0.15	0.05	Cobble	10	1.2	Pool

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Unknown	Unknown	No	1		0.15	0.1	Cobble	10	1.8	Run
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CCN	3D9.1C2D69441D	67		Adult	Unknown	Unknown	No	1		1.4	0.3	Cobble	10	2.5	Run
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CRH	3D9.1C2D63AAAF	64		Adult	Dead	Unknown	No	1		0.3	0.3	Cobble	5	1.2	Run
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CRH	3D9.1C2D694B0E	68		Adult	Alive	Unknown	No	1		0.15	0	Cobble	2	0.5	Pool
LCR	LCR_24.5R	2/8/2013	No	TR1	Day	CRH	3D9.1C2D312D15	85		Adult	Alive	Unknown	No	1		0.58	0.19	Cobble	10	1.8	Run
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CRH	3D9.1C2D694B0E	68		Adult	Unknown	Unknown	No	1		1.15	0	Cobble	2	1.5	Pool
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CRH	3D9.1C2D315B85	71		Adult	Alive	Unknown	No	1		0.2	0.05	Cobble	15	0.2	Run
LCR	LCR_24.5R	2/8/2013	Yes	TR1	Day	CRH	3D9.1C2D63A22D	60		Adult	Alive	Unknown		1	Missed fish. In pit tag reader file, but no habitat info.						
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CAS	3D9.1C2D693A54	70		Adult	Unknown	Unknown	No	1		0.35	0.05	Cobble	10	2.2	Pool
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D23F35C	59		Adult	Alive	Unknown	No	1		1.1	0.5	Cobble	10	3.2	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D315976	92		Adult	Alive	Unknown	No	1		0.2	0.05	Cobble	5	1.1	Pool
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D3135AB	63		Adult	Alive	Unknown	No	1		0.75	0.4	Cobble	5	3	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D313D91	80		Adult	Alive	Unknown	No	1		0.5	0.4	Cobble	5	2	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Alive	Unknown	No	1		0.2	0.25	Cobble	10	1	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CBA	3D9.1C2D313615	72		Adult	Alive	Unknown	No	1		0.05	0	Cobble	10	0.1	Pool
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CCN	3D9.1C2D69441D	67		Adult	Alive	Unknown	No	1		0.2	0.25	Cobble	10	1.5	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D315B85	71		Adult	Alive	Unknown	No	1		0.3	0.05	Cobble	10	1.2	Pool
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	CRH	3D9.1C2D3139E1	68		Adult	Unknown	Unknown	No	1		0.4	0.5	Cobble	15	2.5	Run
LCR	LCR_24.5R	2/9/2013	Yes	TR1	Day	LNC	3D9.1C2D239ABE	54		Adult	Unknown	Unknown	No	1		0.4	0.05	Cobble	5	2.6	Pool
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CAS	3D9.1C2D693A54	70		Adult	Alive	Unknown	No	1		0.68	0.01	Cobble	10	3.2	Pool
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Alive	Unknown	No	1		0.1	0.24	Cobble	5	0.4	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CBA	3D9.1C2D313D91	80		Adult	Alive	Unknown	No	1		0.62	0.37	Cobble	10	2.5	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CBA	3D9.1C2D312F14	94		Adult	Unknown	Unknown	No	1		0.95	0.23	Cobble	10	2.3	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CCN	3D9.1C2D69441D	67		Adult	Unknown	Unknown	No	1		0.34	0.09	Cobble	5	1.1	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CRH	3D9.1C2D312D15	85		Adult	Unknown	Unknown	No	1		0.58	0.19	Cobble	10	1.8	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CRH	3D9.1C2D315B85	71		Adult	Unknown	Unknown	No	1		0.23	0.07	Cobble	5	1.1	Pool
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	CRH	3D9.1C2D3139E1	68		Adult	Unknown	Unknown	No	1		0.68	0.19	Cobble	10	2.5	Run
LCR	LCR_24.5R	2/14/2013	No	TR1	Day	LNC	3D9.1C2D239ABE	54		Adult	Unknown	Unknown	No	1		0.63	0.08	Cobble	10	2.8	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CAS	3D9.1C2D693A54	70		Adult	Alive	Unknown	No	1		0.2	0.05	Cobble	10	0.3	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CBA	3D9.1C2D313548	59		Adult	Unknown	Unknown	No	1		0.65	0.03	Cobble	5	1.8	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Alive	Unknown	No	1		0.15	0	Cobble	5	0.2	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CBA	3D9.1C2D312F14	94		Adult	Unknown	Unknown	No	1		0.35	0	Cobble	5	1.5	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CCN	3D9.1C2D69441D	67		Adult	Dead	Unknown	No	1	Dead tag.						
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D313629	69		Adult	Alive	Unknown	No	1		0.25	0	Cobble	5	0.2	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D312D15	85		Adult	Alive	Unknown	No	1		0.05	0	Cobble	5	0.1	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D315B85	71		Adult	Alive	Unknown	No	1		0.2	0	Cobble	5	0.6	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	CRH	3D9.1C2D3139E1	68		Adult	Alive	Unknown	No	1		0.15	0.1	Cobble	10	0.3	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	LNC	3D9.1C2D239ABE	54		Adult	Alive	Unknown	No	1		0.15	0.05	Cobble	10	0.25	Pool
LCR	LCR_24.5R	2/16/2013	Yes	TR1	Day	UDC	3D9.1C2D693B54	52		Adult	Unknown	Unknown	No	1		0.46	0	Cobble	10	1.5	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CAS	3D9.1C2D693A54	70		Adult	Alive	Unknown	No	1		0.2	0.05	Cobble	10	0.3	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CBA	3D9.1C2D69409C	79		Adult	Unknown	Unknown	No	1		0.78	0.01	Boulder	5	1	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CBA	3D9.1C2D31317A	95		Adult	Alive	Unknown	No	1		0.15	0	Cobble	5	0.2	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CBA	3D9.1C2D315976	92		Adult	Alive	Unknown	No	1		0.15	0	Boulder	0	1.3	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CRH	3D9.1C2D315B85	71		Adult	Alive	Unknown	No	1		0.22	0	Cobble	5	1.1	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	CRH	3D9.1C2D3139E1	68		Adult	Alive	Unknown	No	1		0.15	0	Cobble	10	0.3	Pool
LCR	LCR_24.5R	2/21/2013	No	TR1	Day	UDC	3D9.1C2D693B54	52		Adult	Unknown	Unknown	No	1		0.46	0	Cobble	10	1.5	Pool
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1		0.1	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		35		YOY	Alive	No	Unknown	1		0.05	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		45		Juvenile	Alive	No	Unknown	1		0.05	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		45		Juvenile	Alive	No	Unknown	1		0.15	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		38		Juvenile	Alive	No	Unknown	1		0.1	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		37		Juvenile	Alive	No	Unknown	1		0.05	0	Flooded Vegetation		1	

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		31		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	1		0.1	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		31		YOY	Alive	No	Unknown	1		0.05	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		37		Juvenile	Alive	No	Unknown	1		0.1	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		39		Juvenile	Alive	No	Unknown	1		0.15	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		34		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		39		Juvenile	Alive	No	Unknown	1		0.05	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		38		Juvenile	Alive	No	Unknown	1		0.08	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		0.15	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		29		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		1	
LCR	LCR_47.5L	6/27/2012	No	EF1	Day	UDC		37		Juvenile	Alive	No	Unknown	1		0.05	0.1	Flooded Vegetation		1	
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	DC		18		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		25		YOY	Alive	No	Unknown	3							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		20		YOY	Alive	No	Unknown	2							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		22		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		21		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		36		Juvenile	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		35		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		20		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC		25		YOY	Alive	No	Unknown	1							
LCR	LCR_47.5L	8/15/2012	No	EF1	Day	LNC				Unknown	Alive	No	Unknown	40							
LCR	LCR_53.1L	6/27/2012	No	EF1	Day	CRH		45		Juvenile	Alive	No	Unknown	1							
LCR	LCR_53.1L	6/27/2012	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	1							
LCR	LCR_53.1L	6/27/2012	No	EF1	Day	LNC		34		YOY	Alive	No	Unknown	1							
LCR	LCR_53.1L	6/27/2012	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	1		0.1	0	Flooded Vegetation		0.5	
LCR	LCR_53.1L	8/15/2012	No	EF1	Day	CAS		60		Adult	Alive	No	Unknown	1							
LCR	LCR_53.1L	8/15/2012	No	EF1	Night	CRH				Unknown	Alive	Unknown	Unknown	1							
LCR	LCR_53.1L	8/15/2012	No	EF1	Day	LNC		43		Juvenile	Alive	No	Unknown	1							
LCR	LCR_53.1L	8/15/2012	No	EF1	Day	LNC		17		YOY	Alive	No	Unknown	1							
LCR	LCR_53.1L	8/15/2012	No	EF1	Night	LNC		34		YOY	Alive	Unknown	Unknown	1							
LCR	LCR_53.1L	8/15/2012	No	EF1	Night	UDC		68		Adult	Alive	No	Unknown	1		0.2	0	Flooded Vegetation		1	
LCR	LCR_53.1L	8/15/2012	No	EF1	Night	UDC		41		Juvenile	Alive	No	Unknown	1		0.3	0.05	Boulder		1	
LCR	LCR_53.1L	8/15/2012	No	EF1	Night	UDC		39		Juvenile	Alive	No	Unknown	1		0.3	0.05	Boulder		1	
LCR	LCR_8.3R	10/23/2012	No	RB1		CCN				Unknown				1							
LCR	LCR_9.0L	10/23/2012	No	RB1		CCN				Unknown				1							
Slocan River	Sloc_16.2R	5/8/2012	No	MT1	Overnight	CRH		92		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/8/2012	No	MT1	Overnight	LNC		77		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/8/2012	No	MT2	Overnight	LNC		73		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/8/2012	No	MT2	Overnight	UDC		58		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/8/2012	No	MT6	Overnight	CRH		116		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CBA				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CCN		70		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CCN		56		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CCN		74		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CRH		74		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	CRH		73		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		47		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		23		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		32		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		37		Juvenile	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	5/9/2012	No	EF1	Day	LNC		25		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	6/6/2012	No	MT1	Overnight	UDC	3D9.1C2D693B6B	88	9.6	Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	6/6/2012	No	MT4	Overnight	CBA		100		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	6/7/2012	No	EF1	Day	CRH		45		Juvenile	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	6/7/2012	No	MT1	Day	UDC		47		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	CBA		50		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	CBA		42		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	CRH		84		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	CRH		42		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	CRH		46		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	LNC		58		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	LNC		50		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	EF1	Overnight	LNC		40		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT1	Overnight	CRH		100		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT3	Overnight	CRH		106		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT4	Overnight	CRH		75		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT4	Overnight	CRH		100		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT5	Overnight	CRH		102		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	7/16/2012	No	MT5	Overnight	CRH		111		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	CCN				Unknown	Alive	Unknown	Unknown	5							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	CRH				Unknown	Alive	Unknown	Unknown	7							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		54		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		57		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		46		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		39		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		58		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		48		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		67		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	LNC		49		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	EF1	Overnight	UDC		76		Adult	Alive	No	Unknown	1		0.3	0.1	Boulder		1.5	
Slocan River	Sloc_16.2R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D313A1F	69	3.9	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D23BFB4	62	2.7	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D23B29D	55	2	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D23BF95	60	2.8	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT4	Overnight	UDC	3D9.1C2D23A0D7	55	2.2	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		40		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		44		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		45		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		60		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		58		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		42		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		65		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	8/29/2012	No	MT5	Overnight	LNC		52		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	9/18/2012	No	MT4	Overnight	LNC		63		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		22		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		30		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		33		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		29		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		50		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	LNC		55		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	10/11/2012	No	EF1	Day	UDC		20		YOY	Alive	No	Unknown	1		0.25	0.05	Cobble		1.5	

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_16.2R	11/15/2012	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	10							
Slocan River	Sloc_16.2R	11/15/2012	No	EF1	Night	CC				Unknown	Alive	Unknown	Unknown	10							
Slocan River	Sloc_16.2R	11/15/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	11/15/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	1/23/2013	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	15							
Slocan River	Sloc_16.2R	1/23/2013	No	EF1	Day	LNC		27		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_16.2R	1/23/2013	No	EF1	Night	UDC		23		YOY	Alive	Unknown	Unknown	1		0.3	0	Boulder		2	Pool
Slocan River	Sloc_22.3R	5/9/2012	No	EF1	Day	CC		13		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_22.3R	5/9/2012	No	EF1	Day	CCN				Unknown	Alive	No	Unknown	4							
Slocan River	Sloc_22.3R	5/9/2012	No	EF1	Day	LNC		45		Juvenile	Alive	Unknown	Unknown	3							
Slocan River	Sloc_22.3R	5/9/2012	No	EF1	Day	LNC		50		Adult	Alive	Unknown	Unknown	3							
Slocan River	Sloc_22.3R	5/9/2012	No	EF1	Day	LNC		65		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	9/18/2012	No	MT5	Overnight	UDC		50		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		46		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		19		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		50		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_22.3R	10/11/2012	No	EF1	Day	LNC		31		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		32		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		45		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		33		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		34		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.2M	10/11/2012	No	EF1	Day	LNC		54		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	5/8/2012	No	MT2	Overnight	UDC		55		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	5/8/2012	No	MT7	Overnight	CRH				Unknown	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	6/6/2012	No	MT1	Overnight	UDC	3D9.1C2D692DC9	67	3.6	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	6/6/2012	No	MT4	Overnight	LNC	3D9.1C2D693A68	72	4.5	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	6/7/2012	No	MT1	Day	UDC		51		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT1	Overnight	LNC		34		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT1	Overnight	UDC	3D9.1C2D313649	83	7.1	Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT1	Overnight	UDC	3D9.1C2D313BE0	75	6.4	Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT2	Overnight	LNC	3D9.1C2D313662	73	4.8	Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT3	Overnight	CRH		110		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	7/16/2012	No	MT3	Overnight	CRH		103		Adult	Alive	Unknown	Unknown	2							
Slocan River	Sloc_30.7R	8/16/2012	No	MT1	Day	UDC		58		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		1	
Slocan River	Sloc_30.7R	8/16/2012	No	MT1	Day	UDC		51		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		1	
Slocan River	Sloc_30.7R	8/16/2012	No	MT1	Dusk	UDC		54		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		0.2	
Slocan River	Sloc_30.7R	8/16/2012	No	MT1	Dusk	UDC		57		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		0.2	
Slocan River	Sloc_30.7R	8/16/2012	No	MT2	Day	UDC		56		Adult	Alive	No	Unknown	1		0.4	0	Gravel		1	
Slocan River	Sloc_30.7R	8/16/2012	No	MT2	Day	UDC		58		Adult	Alive	No	Unknown	1		0.4	0	Gravel		1	
Slocan River	Sloc_30.7R	8/16/2012	No	MT3	Day	UDC		56		Adult	Alive	No	Unknown	1		1.5	0.05	Sand		5	
Slocan River	Sloc_30.7R	8/16/2012	No	MT6	Dusk	UDC		65		Adult	Alive	No	Unknown	1		1	0.05	Aquatic Macrophytes		6	
Slocan River	Sloc_30.7R	8/16/2012	No	MT6	Dusk	UDC		70		Adult	Alive	No	Unknown	1		1	0.05	Aquatic Macrophytes		6	
Slocan River	Sloc_30.7R	8/17/2012	No	MT1	Dawn	UDC		62		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		0.2	
Slocan River	Sloc_30.7R	8/17/2012	No	MT1	Dawn	UDC		58		Adult	Alive	No	Unknown	1		0.3	0.2	Boulder		0.2	
Slocan River	Sloc_30.7R	8/17/2012	No	MT4	Dawn	UDC		38		Juvenile	Alive	No	Unknown	1		1.2	0	Woody Debris		1	
Slocan River	Sloc_30.7R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D239B49	53	1.5	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D23A808	57	2.1	Adult	Alive	No	Unknown	1							
Slocan River	Sloc_30.7R	8/29/2012	No	MT3	Overnight	UDC	3D9.1C2D239867	54	1.9	Adult	Alive	No	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_30.7R	8/29/2012	No	MT4	Overnight	UDC		45		Juvenile	Dead	Unknown	Unknown	1	Mortality.						
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	LNC		26		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	LNC		22		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	5		0.1	0.05	Cobble		0.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		28		YOY	Alive	No	Unknown	2		0.2	0.1	Gravel		1	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		24		YOY	Alive	No	Unknown	3		0.3	0.2	Cobble		1.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		21		YOY	Alive	No	Unknown	2		0.4	0.05	Gravel		1	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		26		YOY	Alive	No	Unknown	2		0.3	0.1	Cobble		0.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	2		0.2	0.2	Cobble		1	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		31		YOY	Alive	No	Unknown	1		0.1	0.1	Cobble		1.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		23		YOY	Alive	No	Unknown	1		0.2	0.05	Cobble		1	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Day	UDC		27		YOY	Alive	No	Unknown	1		0.3	0.1	Cobble		0.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		28		YOY	Alive	No	Unknown	1		0.1	0.15	Gravel		0.3	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		23		YOY	Alive	No	Unknown	2		0.2	0.1	Cobble		0.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		25		YOY	Alive	No	Unknown	2		0.3	0.05	Cobble		1	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		26		YOY	Alive	No	Unknown	1		0.1	0	Cobble		0.5	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		27		YOY	Alive	No	Unknown	1		0.4	0.05	Cobble		0.3	
Slocan River	Sloc_30.7R	11/15/2012	No	EF1	Night	UDC		24		YOY	Alive	No	Unknown	2		0.3	0.1	Cobble		1	
Slocan River	Sloc_37.8L	5/9/2012	No	EF1	Day	CRH		30		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_37.8L	5/9/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_37.8L	5/9/2012	No	EF1	Day	UDC		27		YOY	Alive	Unknown	Unknown	1		0.2	0	Silt		0.5	
Slocan River	Sloc_37.8L	5/9/2012	No	EF1	Day	UDC		51		Adult	Alive	Unknown	Unknown	1		0.3	0	Flooded Vegetation		1	
Slocan River	Sloc_37.8L	5/10/2012	No	EF1	Night	UDC		66		Adult	Alive	Unknown	Unknown	1		0.5	0.3	Flooded Vegetation		0.5	
Slocan River	Sloc_37.8L	5/10/2012	No	EF1	Night	UDC		47		Adult	Alive	Unknown	Unknown	1		1	0	Silt		3	
Slocan River	Sloc_37.8L	5/10/2012	No	EF1	Night	UDC		65		Adult	Alive	Unknown	Unknown	1		0.3	0.05	Flooded Vegetation		1	
Slocan River	Sloc_37.8L	5/10/2012	No	EF1	Night	UDC		56		Adult	Alive	Unknown	Unknown	1		0.5	0	Silt		2	
Slocan River	Sloc_37.8L	5/10/2012	No	EF1	Night	UDC		89		Adult	Alive	Unknown	Unknown	1		0.5	0	Flooded Vegetation		1	
Slocan River	Sloc_37.8L	6/7/2012	No	EF1	Day	CRH		45		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	6/7/2012	No	EF1	Day	CRH		90		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/16/2012	No	MT2	Dusk	UDC		54		Adult	Alive	No	Unknown	1		0.8	0	Silt		0	
Slocan River	Sloc_37.8L	8/16/2012	No	MT2	Dusk	UDC		74		Adult	Alive	Yes	Unknown	1	Milting; slight red colour on lips and orange colour at base of pectoral and pelvic fins.	0.8	0	Silt		0	
Slocan River	Sloc_37.8L	8/16/2012	No	MT2	Dusk	UDC		95		Adult	Alive	No	Unknown	1		0.8	0	Silt		0	
Slocan River	Sloc_37.8L	8/16/2012	No	MT4	Night	UDC		87		Adult	Alive	Yes	Unknown	1	Milting; small amount of orange on lips.	0.2	0	Flooded Vegetation		2	
Slocan River	Sloc_37.8L	8/16/2012	No	MT4	Night	UDC		84		Adult	Alive	No	Unknown	1		0.2	0	Flooded Vegetation		2	
Slocan River	Sloc_37.8L	8/16/2012	No	MT6	Dusk	CAS		85		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/17/2012	No	MT1	Dawn	UDC		54		Adult	Alive	No	Unknown	1		1.1	0.05	Aquatic Macrophytes		2	
Slocan River	Sloc_37.8L	8/17/2012	No	MT2	Day	UDC		75		Adult	Alive	Yes	Unknown	1	Milting; orange on lips and insertions of pelvic and pectoral fins.	0.8	0	Silt		0.5	
Slocan River	Sloc_37.8L	8/17/2012	No	MT4	Dawn	UDC		89		Adult	Alive	Yes	Unknown	1	Milting; orange at top of lips and end of pectoral and pelvic fins.	0.2	0	Flooded Vegetation		2	
Slocan River	Sloc_37.8L	8/17/2012	No	MT5	Day	LNC		55		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/17/2012	No	MT6	Day	CRH				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/17/2012	No	MT6	Dawn	UDC		79		Adult	Alive	No	Unknown	1		2	0	Aquatic Macrophytes		4	

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_37.8L	8/29/2012	No	EF1	Overnight	CRH		22		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/29/2012	No	EF1	Overnight	LNC		19		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/29/2012	No	EF1	Overnight	LNC		22		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	8/29/2012	No	EF1	Overnight	LNC		25		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	20							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		55		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		30		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		33		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	4							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_37.8L	9/19/2012	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	DC		18		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	6							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		29		YOY	Alive	Unknown	Unknown	4							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		30		YOY	Alive	Unknown	Unknown	6							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		27		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		32		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		37		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	6							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		31		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		32		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		26		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	LNC		22		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	UDC		23		YOY	Alive	No	Unknown	1		0.3	0	Aquatic Macrophytes		2	
Slocan River	Sloc_37.8L	10/11/2012	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	1		0.2	0	Silt		1	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	CC				Unknown	Alive	Unknown	Unknown	25							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	LNC		21		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	LNC		23		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	LNC		29		YOY	Alive	Unknown	Unknown	1	Mortality.						
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		27		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		25		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		21		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	LNC		19		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	UDC		21		YOY	Alive	No	Unknown	1		0.3	0	Gravel		2	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	UDC		23		YOY	Alive	No	Unknown	1		0.1	0.1	Gravel		0.5	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Day	UDC		24		YOY	Alive	Unknown	Unknown	1		0.2	0.2	Gravel		1	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	UDC		24		YOY	Alive	No	Unknown	1		0.1	0.05	Gravel		1	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	UDC		21		YOY	Alive	No	Unknown	1		0.2	0.1	Gravel		1.5	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	UDC		22		YOY	Alive	No	Unknown	1		0.1	0.1	Cobble		1	
Slocan River	Sloc_37.8L	11/15/2012	No	EF1	Night	UDC		22		YOY	Alive	No	Unknown	1		0.05	0	Gravel		0.5	
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	CRH		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	DC		18		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	LNC		27		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Night	LNC		28		YOY	Alive	Unknown	Unknown	1							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	UDC		24		YOY	Alive	Unknown	Unknown	1		0.1	0	Silt		0.25	Pool
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	UDC		24		YOY	Alive	Unknown	Unknown	1		0.15	0.1	Gravel		0.5	Run
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	UDC		23		YOY	Alive	Unknown	Unknown	1		0.2	0	Silt		0.25	Pool
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	UDC		23		YOY	Alive	Unknown	Unknown	1		0.25	0	Gravel		0.5	Pool
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Day	UDC		26		YOY	Alive	Unknown	Unknown	1		0.3	0	Gravel		0.25	Pool
Slocan River	Sloc_37.8L	1/23/2013	No	EF1	Night	UDC		26		YOY	Alive	Unknown	Unknown	1		0.2	0.05	Gravel		0.5	Pool
Slocan River	Sloc_39.4L	5/9/2012	No	EF1	Day	CC		20		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	5/9/2012	No	EF1	Day	LNC		35		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	5/10/2012	No	EF1	Night	CC				Unknown	Alive	Unknown	Unknown	20							
Slocan River	Sloc_39.4L	5/10/2012	No	EF1	Night	LNC				Unknown	Alive	Unknown	Unknown	9							
Slocan River	Sloc_39.4L	6/6/2012	No	MT1	Overnight	CRH		85		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	6/6/2012	No	MT2	Overnight	CAS		45		Juvenile	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	6/6/2012	No	MT3	Overnight	CRH		35		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	7/16/2012	No	MT1	Overnight	CRH		86		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	7/16/2012	No	MT4	Overnight	CRH		89		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	7/16/2012	No	MT4	Overnight	CRH		65		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/16/2012	No	EF1	Dusk	CRH				Unknown	Alive	Unknown	Unknown	5							
Slocan River	Sloc_39.4L	8/16/2012	No	MT2	Day	UDC		64		Adult	Alive	No	Unknown	1		0.4	0	Gravel		1	
Slocan River	Sloc_39.4L	8/16/2012	No	MT2	Day	UDC		70		Adult	Alive	No	Unknown	1		0.4	0	Gravel		1	
Slocan River	Sloc_39.4L	8/16/2012	No	MT5	Dusk	CAS				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/16/2012	No	MT5	Dusk	CRH				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/16/2012	No	MT5	Day	UDC		77		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	8/16/2012	No	MT6	Dusk	CAS				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/17/2012	No	EF1	Dawn	CRH				Unknown	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	8/17/2012	No	MT2	Day	CAS				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/17/2012	No	MT5	Dawn	CRH				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	8/17/2012	No	MT5	Dawn	UDC		74		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	8/29/2012	No	MT5	Overnight	UDC	3D9.1C2D63A941	88	8.3	Adult	Alive	No with colour	Unknown	1	Reddish upper lips; orange at pelvic and pectoral fin insertions; soft abdomen.						
Slocan River	Sloc_39.4L	9/18/2012	No	MT1	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	9/18/2012	No	MT4	Overnight	CRH				Unknown	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	9/19/2012	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	25							
Slocan River	Sloc_39.4L	9/19/2012	No	EF1	Day	CCN		70		Adult	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	9/19/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_39.4L	9/19/2012	No	EF1	Day	LNC		35		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	LNC		20		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	LNC		27		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	LNC		30		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	UDC		19		YOY	Alive	No	Unknown	1		0.1	0	Aquatic Macrophytes		0.5	
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	1		0.15	0	Silt		0.5	
Slocan River	Sloc_39.4L	10/11/2012	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	1		0.1	0	Aquatic Macrophytes		1	
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	CC				Unknown	Alive	Unknown	Unknown	10							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		29		YOY	Alive	Unknown	Unknown	4							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		27		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		25		YOY	Alive	Unknown	Unknown	14							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		28		YOY	Alive	Unknown	Unknown	3							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		26		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		29		YOY	Alive	Unknown	Unknown	3							

Table B4 continued.

Waterbody[1]	Site Name[2]	Sample Date	Flow Reduction	Survey Method[3]	Time of Day	Species[4]	PIT Number	Length (mm)	Weight (g)	Life Stage[5]	Status	Spawning Condition	Nest Present	Count	Comments	Depth (m)	Average Velocity (m/s)	Substrate	Substrate Embed-edness (%)	Distance to Shore (m)	Habitat Type
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		23		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		25		YOY	Alive	Unknown	Unknown	4							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		30		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		28		YOY	Alive	Unknown	Unknown	4							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		26		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		27		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		22		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	LNC		31		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	UDC		25		YOY	Alive	No	Unknown	1		0.1	0.1	Gravel		1	
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	UDC		22		YOY	Alive	No	Unknown	1		0.2	0	Silt		1	
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Day	UDC		27		YOY	Alive	No	Unknown	1		0.2	0.2	Gravel		2	
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	UDC		28		YOY	Alive	No	Unknown	1		0.2	0.1	Gravel		1.5	
Slocan River	Sloc_39.4L	11/15/2012	No	EF1	Night	UDC		21		YOY	Alive	No	Unknown	1		0.1	0.05	Gravel		1	
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CCN		33		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		65		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		70		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		67		Adult	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		34		YOY	Alive	No	Unknown	2							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		32		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	CRH		30		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		30		YOY	Alive	No	Unknown	3							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		24		YOY	Alive	No	Unknown	3							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		25		YOY	Alive	No	Unknown	4							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		28		YOY	Alive	No	Unknown	3							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		26		YOY	Alive	No	Unknown	3							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		27		YOY	Alive	No	Unknown	2							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		32		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Day	LNC		29		YOY	Alive	No	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Night	LNC		28		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Night	LNC		25		YOY	Alive	Unknown	Unknown	2							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Night	LNC		24		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Night	LNC		26		YOY	Alive	Unknown	Unknown	1							
Slocan River	Sloc_39.4L	1/23/2013	No	EF1	Night	UDC		28		YOY	Alive	Unknown	Unknown	1		0.15	0	Gravel		1.5	Pool
Slocan River	Sloc_39.4R	41037	No	MT3	Overnight	CRH				Unknown	Alive	No	Unknown	1							
Slocan River	Sloc_39.4R	41037	No	MT6	Overnight	CRH				Unknown	Alive	No	Unknown	1							
Slocan River	Sloc_39.4R	41037	No	MT7	Overnight	CRH				Unknown	Alive	No	Unknown	1							
Slocan River	Sloc_39.4R	41037	No	MT8	Overnight	CRH				Unknown	Alive	No	Unknown	2							
Slocan River	Sloc_39.4R	41037	No	MT8	Overnight	UDC	3D9.1C2D63AB38	93	9.4	Adult	Alive	No with colour	Unknown	1	Orange coloured pelvic/lips.						

[1] LCR= Lower Columbia River

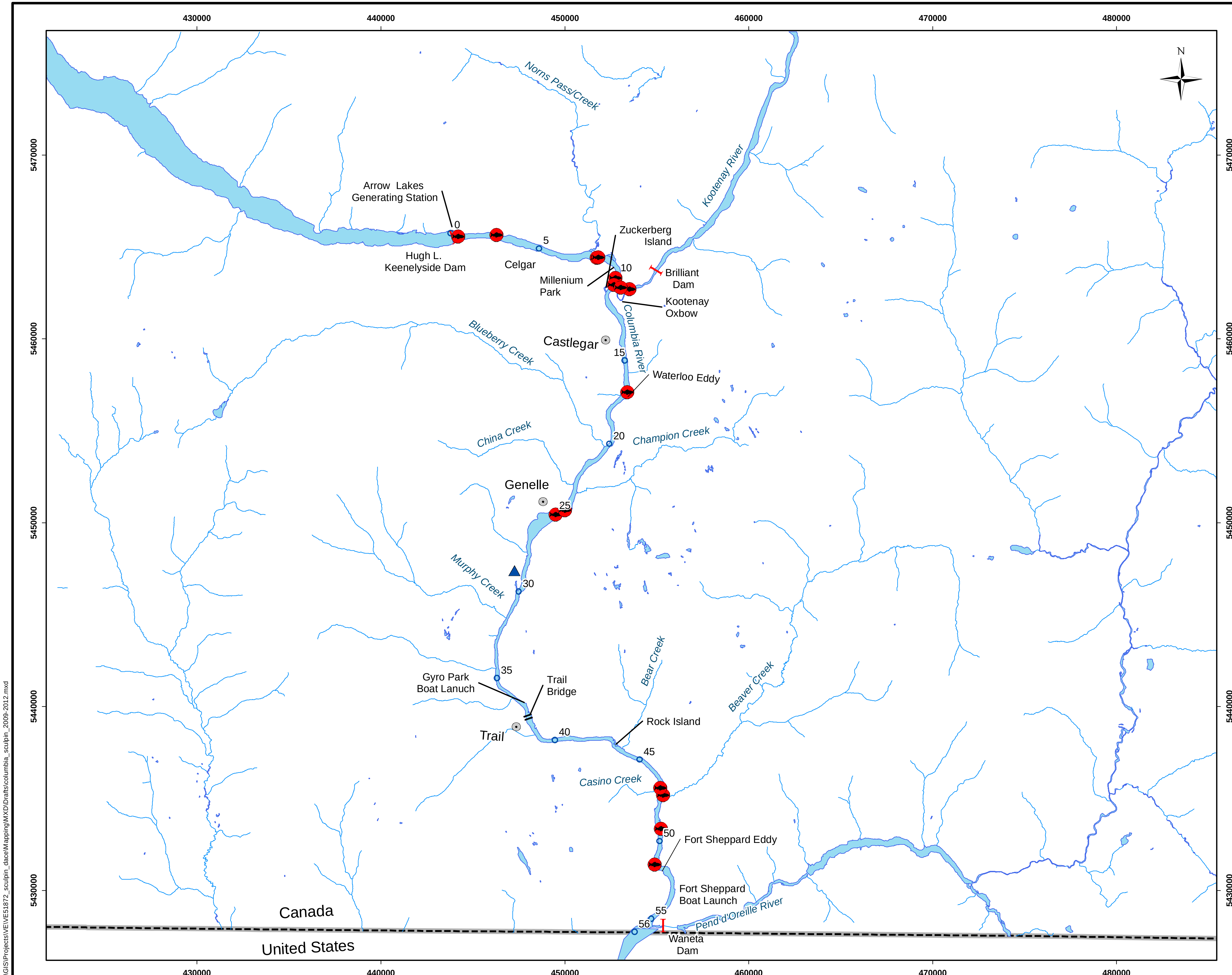
[2] LB or L= left downstream bank; RB or R= right downstream bank; M= middle downstream bank; US= upstream; DS= downstream

[3] EF = Backpack electrofishing; MT = Minnow Trapping; SW = Snorkeling; TR = PIT tag tracking

[4] CAS= prickly sculpin; CBA= Columbia sculpin; CC= sculpin sp.; CCN= shorthead sculpin; CRH= torrent sculpin; DC= dace sp.; LNC= longnose dace; NSC= northern pikeminnow; RSC= redside shiner; SU= sucker sp.; UDC= Umatilla dace; UNK= Unknown sp.

[5] YOY = Young of the year

APPENDIX C
Lower Columbia River Distribution Maps



Legend

- Present Study (2009-2012)
- River Km
- Birchbank Water Survey Canada Station
- Dam
- City / Town
- River
- Lake

Scale: 1:200,000

4 2 0 4 8

Kilometres

Reference

Freshwater Atlas scale 1:20,000.

CLIENT:

BC Hydro

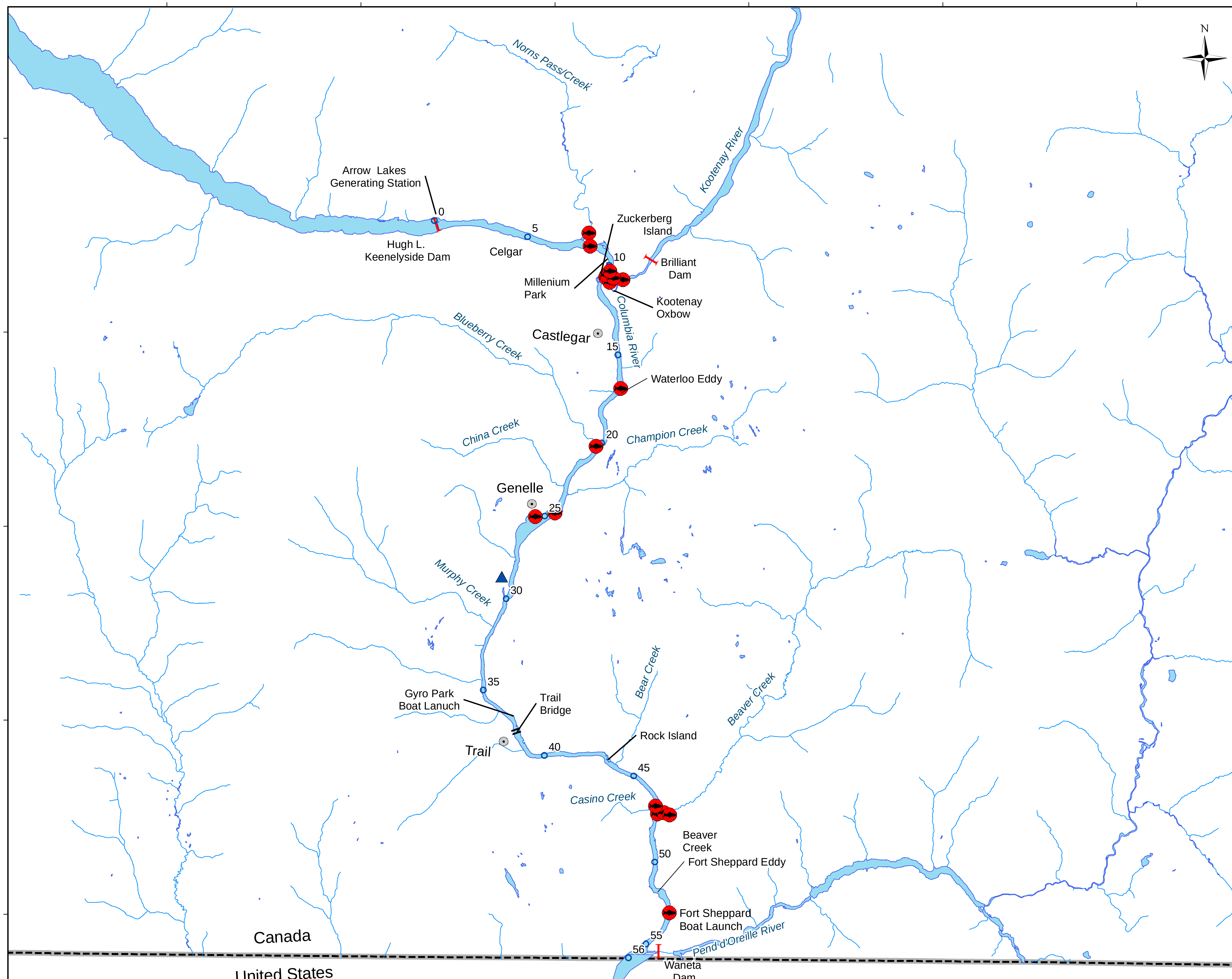
PROJECT:

Lower Columbia River Sculpin and
Dace Life History Assessment (CLBMON-43)

Columbia Sculpin Past &
Present Distribution

DATE: January, 2013	ANALYST: AA	**Figure** C1
JOB No: VE51872	QA/QC: MY	PDF FILE: columbia_sculpin_2009-2012.pdf
GIS FILE: columbia_sculpin_2009-2012.mxd		
PROJECTION: UTM Zone 11	DATUM: NAD83	

amec



Legend

- Present Study (2009-2012)
- River Km
- Birchbank Water Survey Canada Station
- Dam
- City / Town
- River
- Lake

Scale: 1:200,000

4 2 0 4 8

Kilometres

Reference

Freshwater Atlas scale 1:20,000.

CLIENT:	BC Hydro
PROJECT:	Lower Columbia River Sculpin and Dace Life History Assessment (CLBMON-43)
	Shorthead Sculpin Past & Present Distribution

DATE: January, 2013	ANALYST: AA	Figure C2
JOB No: VE51872	QA/QC: MY	PDF FILE: shorthead_sculpin_2009-2012.pdf
GIS FILE: shorthead_sculpin_2009-2012.mxd		
PROJECTION: UTM Zone 11	DATUM: NAD83	amec

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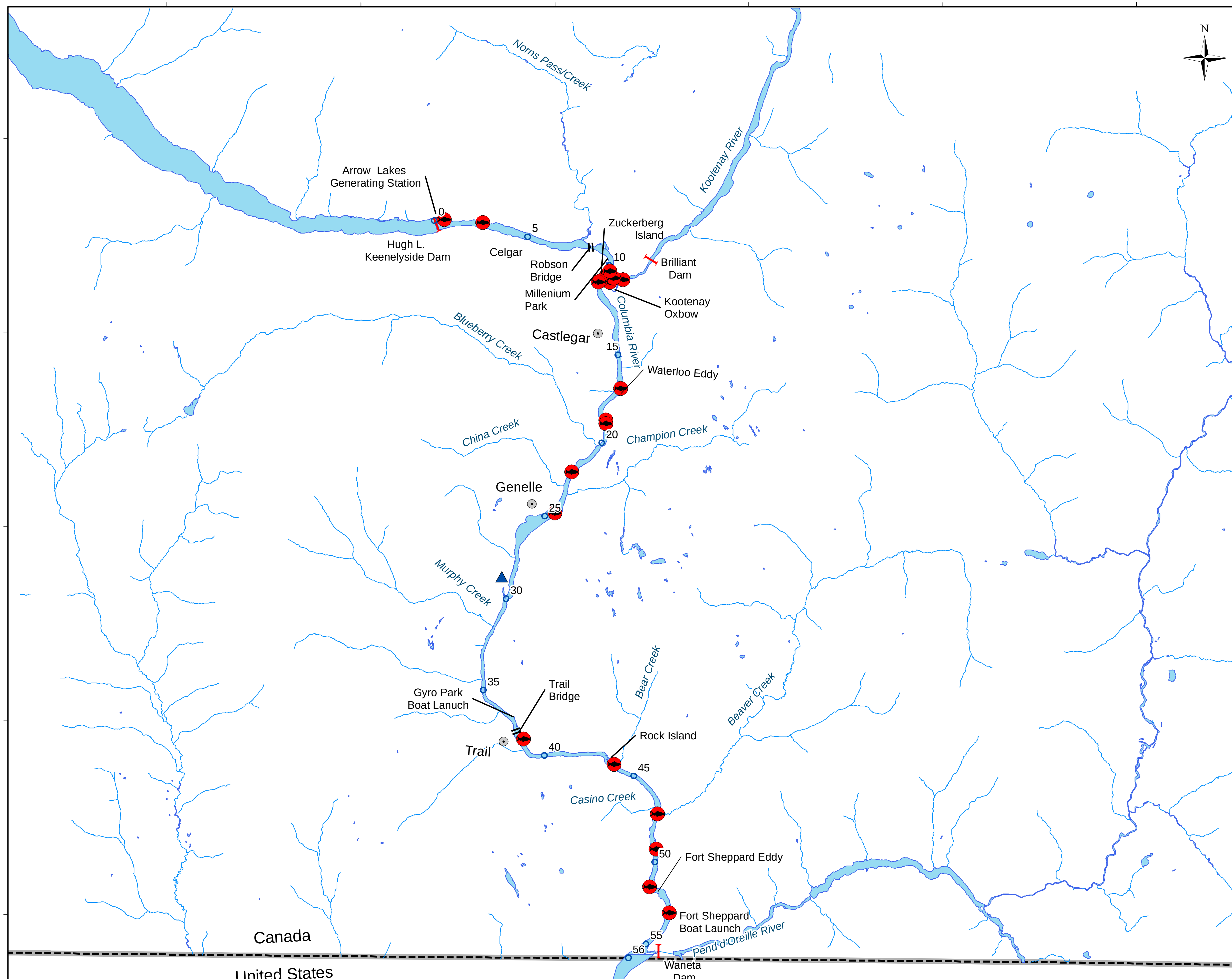


Legend

- Present Study (2009-2012)
- River Km
- Birchbank Water Survey Canada Station
- Dam
- City / Town
- River
- Lake

Scale: 1:200,000

4 2 0 4 8

Kilometres

Reference

Freshwater Atlas scale 1:20,000.

CLIENT:	BC Hydro
PROJECT:	Lower Columbia River Sculpin and Dace Life History Assessment (CLBMON-43)
	Umatilla Dace Past & Present Distribution
DATE: January, 2013	ANALYST: AA
JOB No: VE51872	QA/QC: MY
GIS FILE: umatilla_dace_2009-2012.mxd	PDF FILE: umatilla_dace_2009-2012.pdf
PROJECTION: UTM Zone 11	DATUM: NAD83

Figure C3

amec

Y:\GIS\Projects\VE51872_sculpin_dace\Mapping\MXD\Drafts\umatilla_dace_2009-2012.mxd

APPENDIX D
Sculpin and Dace Spawning Data

Table D1. Habitat characteristics of locations in which Umatilla dace displaying spawning colouration were captured in the Slocan River, 2012.

Location[1]	Sample Date	Set Type	Survey Method[2]	Water Temperature (°C)	Water Depth (m)	Average Velocity (m/s)	Substrate Type	Distance to Shore (m)	Fork Length (mm)	Sex[3]	Ripe	Comments
Sloc_37.8L	8/16/2012	Day	MT	18.1	0.80	0	Silt	0.5	75	M	Yes	Milting; orange on lips and insertions of pelvic and pectoral fins.
Sloc_37.8L	8/16/2012	Dusk	MT	20.3	0.80	0	Silt	0.5	74	M	Yes	Milting; slight red colour on lips and orange colour at base of pectoral and pelvic fins.
Sloc_37.8L	8/16/2012	Night	MT	20.4	0.20	0	Flooded Vegetation	2	87	M	Yes	Milting; small amount of orange on lips.
Sloc_37.8L	8/17/2012	Dawn	MT	19.1	0.20	0	Flooded Vegetation	2	89	M	Yes	Milting; orange at top of lips and end of pectoral and pelvic fins.
Sloc_39.4L	8/29/2012	Overnight	MT	16.9	0.25	0	Aquatic Macrophytes	1	88	UNK	No with colour	Reddish upper lips; orange at pelvic and pectoral fin insertions; soft abdomen.

Notes:

1 L= Left downstream bank

2 MT= Minnow Trap

3 M= Male, UNK= Unknown

Table D2. Habitat and life history information for sculpin nests located in the lower Columbia River, 2011

Location[1]	Sample Date	Water Temp (°C)	Survey Method	Species Code[2]	Habitat Type	Water Depth (m)	Average Velocity (m/s)	Distance to Shore (m)	Substrate Type	% Embedded	Nest Rock Dimensions (cm)	Number of Egg Masses	Number of Eggs	Egg Diameter (mm)	Egg Stage	Comments
LCR_2.8L	6/5/2012	12.8	SW1	CC	Pool	1.2	0	5	Cobble	5	10x23x8	1	10	-	Dead	Nest 1; very few eggs observed. Possibly an abondoned nest.
LCR_2.8L	6/5/2012	12.8	SW1	CRH	Pool	1.2	0	5	Cobble	5	20x12x8	3	-	-	Eyed but not moving	Nest 2; clump 1= eyed and pink, about 40 eggs, 0 dead, spawned 2 weeks ago; Clump 2= pink uneyed, about 200 eggs, 1% dead, 1 week old; Clump 3= yellow, fresh, about 120 eggs, 0 dead.
LCR_2.8L	6/5/2012	12.8	SW1	CC	Pool	0.9	0.1	5	Cobble	5	20x20x12	1	80	-	Pale orange and milky	Nest 3; fresh (few days), no dead eggs.
LCR_2.8L	6/5/2012	12.8	SW1	CC	Pool	1.8	0.1	8	Cobble	10	20x10x10	2	-	-	Pink and milky	Nest 4; no fish observed, unknown amount dead (too deep).
LCR_2.8L	6/5/2012	12.8	SW1	CC	Pool	1.1	0.1	5	Cobble	5	15x10x10	1	40	-	Pink and milky	Nest 5; no fish observed, around 5% dead eggs.

Notes:

[1] L= Left downstream bank

[2] CRH= Torrent sculpin (*Cottus rhotheus*); CC= (*Cottus* sp.)

"-" denotes no information available

APPENDIX E
Flow Reduction PIT-Tracking Movements

Table E1. Movement records for PIT tagged sculpins and dace at lower Columbia River (LCR) index sites, 2012-2013.

Waterbody	Site Name[1]	Sample Date	Flow Reduction	Method[2]	Start Time	PIT Number	Species Code[3]	Length (mm)	Alive/Dead	Easting	Northing	Move From Last (m)[4]	Move Direction	Time Interval (hrs)	Movement Rate (m/hr)	Water Depth (m)	Average Velocity (m/s)	River Meter (m)	Substrate Type	Embeddedness (%)
LCR	LCR_24.5R	9/17/2012	No	EF1	9/17/2012 10:30	3D9.1C2D239ABE	LNC	54		449984	5450695									
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D239ABE	LNC	54	Alive	450022	5450721	**46.0**	-	3483.83	0.01	0.4	0.05	2.6	Cobble	5
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D239ABE	LNC	54	Alive	450022	5450719	0	None	117.83	0.00	0.63	0.08	2.8	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D239ABE	LNC	54	Alive	450022	5450719	0	None	50.75	0.00	0.15	0.05	0.25	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D23B9F8	CCN	50	Alive	452625	5462900									
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D23B9F8	CCN	50	Unknown	452635	5462906	**11.7**	-	991665.58	0.00	0.12	0.04	0.25	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D23C2D1	CAS	45	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D23C2D1	CAS	45	Alive	452630	5462900	**5**	-	245.00	0.02	0.48	0.02	2	Cobble	10
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D23C2D1	CAS	45	Alive	452626	5462903	6	Out	19.25	0.31	0.85	0.3	4.5	Cobble	10
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D23C2D1	CAS	45	Alive	452608	5462887	20	Downstream	119.33	0.17	0.28	0	2.5	Cobble	20
LCR	LCR_24.5R	9/17/2012	No	EF1	9/17/2012 10:30	3D9.1C2D23F35C	CBA	59	Alive	449984	5450695									
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D23F35C	CBA	59	Alive	449994	5450695	**10**	-	3483.83	0.00	1.1	0.5	3.2	Cobble	10
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D312D15	CRH	85	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	No	TR1	2/8/2013 11:50	3D9.1C2D312D15	CRH	85	Alive	450001	5450701	0	None	26.50	0.00	0.58	0.19	1.8	Cobble	10
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D312D15	CRH	85	Alive	450001	5450701	0	None	144.33	0.00	0.58	0.19	1.8	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D312D15	CRH	85	Alive	450001	5450701	0	None	50.75	0.00	0.05	0	0.1	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D312D35	CRH	60	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D312D35	CRH	60	Alive	452637	5462921	**24.2**	-	245.00	0.10	0.55	0.02	3	Cobble	10
LCR	LCR_10.5L	10/26/2012	No	TR1	10/26/2012 12:45	3D9.1C2D312D35	CRH	60	Alive	452634	5462912	**9.5**	-	669.50	0.01	0.72	0.07	2.2	Cobble	5
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D312D35	CRH	60	Alive	452633	5462915	0	None	22.83	0.00	0.17	0.02	0.8	Cobble	5
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D312D35	CRH	60	Alive	452632	5462915	**1.0**	-	2519.92	0.00	1.1	0.05	5	Cobble	5
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D312D35	CRH	60	Alive	452633	5462911	2	Downstream	118.08	0.02	0.81	0.03	3	Gravel	5
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D312DA8	CRH	69	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D312DA8	CRH	69	Alive	452623	5462888	**12.2**	-	988335.25	0.00	0.55	0.05	2	Cobble	10
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D312DA8	CRH	69	Alive	452617	5462885	8	Downstream	19.25	0.42	0.55	0.01	3	Cobble	10
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D312DA8	CRH	69	Alive	452612	5462882	**5.8**	-	673.08	0.01	0.35	0.02	2	Cobble	5
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 13:20	3D9.1C2D312DA8	CRH	69	Alive	452613	5462880	1	Out	289.75	0.00	0.4	0.02	3	Cobble	10
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 19:35	3D9.1C2D312DA8	CRH	69	Alive	452613	5462880	**0**	-	6.25	0.00	0.4	0.02	3	Cobble	10
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D312DA8	CRH	69	Alive	452620	5462889	**11.4**	-	2223.92	0.01	0.95	0.3	4.5	Cobble	5
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D312DA8	CRH	69	Alive	452617	5462891	2	Out	118.08	0.02	0.8	0.39	5	Cobble	25
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D312DA8	CRH	69	Alive	452617	5462891	0	None	49.83	0.00	0.4	0.13	3	Cobble	24
LCR	LCR_24.5R	9/17/2012		EF2	9/17/2012 14:00	3D9.1C2D312EE0	UDC	55	Alive	449999	5450702									
LCR	LCR_24.5R	10/4/2012	No	TR1	10/4/2012 13:00	3D9.1C2D312EE0	UDC	55	Unknown	450005	5450702	**6**	-	407.00	0.01	0.31	0	0.5	Cobble	20
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D312F14	CBA	94	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	No	TR1	2/8/2013 11:50	3D9.1C2D312F14	CBA	94	Alive	450000	5450703	**3**	-	26.50	0.11	0.2	0.2	2	Cobble	10
LCR	LCR_24.5R	2/8/2013	Yes	TR1	2/8/2013 17:00	3D9.1C2D312F14	CBA	94	Unknown	450001	5450705	0.2	Out	5.17	0.04	0.15	0.05	1.2	Cobble	10
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D312F14	CBA	94	Unknown	450004	5450701	**5**	-	139.17	0.04	0.95	0.23	2.3	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D312F14	CBA	94	Unknown	450004	5450701	0	None	50.75	0.00	0.35	0	1.5	Cobble	5
LCR	LCR_10.5L	2/7/2013	No	EF1	2/7/2013 13:00	3D9.1C2D312F3F	CRH	75	Alive	452637	5462898									
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D312F3F	CRH	75	Unknown	452617	5462870	**34.4**	-	164.58	0.21	0.65	0.01	4	Cobble	40
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D312F3F	CRH	75	Unknown	452617	5462870	0	None	49.83	0.00	0.24	0.02	1	Cobble	40
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D313036	CCN	86	Alive	452625	5462900									
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D313036	CCN	86	Unknown	452621	5462901	**4.1**	-	383.58	0.01	0.71	0.6	4	Cobble	10
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D31317A	CBA	95	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	No	TR1	2/8/2013 11:50	3D9.1C2D31317A	CBA	95	Alive	450002	5450708	**2.8**	-	26.50	0.11	0.15	0.1	3.8	Cobble	10
LCR	LCR_24.5R	2/8/2013	Yes	TR1	2/8/2013 17:00	3D9.1C2D31317A	CBA	95	Alive	450002	5450708	0	None	5.17	0.00	0.15	0.1	1.8	Cobble	10
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D31317A	CBA	95	Alive	450001	5450704	1.5	Out	21.33	0.07	0.2	0.25	1	Cobble	10
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D31317A	CBA	95	Alive	449998	5450699	4	Downstream	117.83	0.03	0.1	0.24	0.4	Cobble	5
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D31317A	CBA	95	Alive	449999	5450699	3	Downstream	50.75	0.06	0.15	0	0.2	Cobble	5
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D31317A	CBA	95	Alive	449999	5450699	0	None	117.33	0.00	0.15	0	0.2	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D3131F2	CCN	52	Alive	452625	5462900									
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D3131F2	CCN	52	Unknown	452615	5462892	**12.8**	-	383.58	0.03	0.8	0.6	4	Cobble	5
LCR	LCR_10.5L	2/7/2013	No	EF1	2/7/2013 13:00	3D9.1C2D3131FB	CRH	75	Alive	452637	5462898									
LCR	LCR_10.5L	2/8/2013	No	TR1	2/8/2013 9:40	3D9.1C2D3131FB	CRH	75	Alive	452631	5462901	**6.7**	-	20.67	0.32					
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D3131FB	CRH	75	Alive	452616	5462871	**33.5**	-	193.75	0.17	0.12	0.01	1	Boulder	10
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D3132D6	CRH	66	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D3132D6	CRH	66	Unknown	452636	5462917	**20.2**	-	245.00	0.08	0.6	0.12	3	Cobble	10
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D3132D6	CRH	66	Alive	452635	5462914	2	Out	19.25	0.10	0.2	0.05	1.2	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D3133F4	CRH	63	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D3133F4	CRH	63	Unknown	452636	5462917	**20.2**	-	245.00	0.08	0.6	0.12	3	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D313439	CCN	64	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D313439	CCN	64	Alive	452634	5462898	**9.2**	-	988335.25	0.00	0.28	0.02	0.8	Cobble	5

Table E1 continued.

Waterbody	Site Name[1]	Sample Date	Flow Reduction	Method[2]	Start Time	PIT Number	Species Code[3]	Length (mm)	Alive/Dead	Easting	Northing	Move From Last (m)[4]	Move Direction	Time Interval (hrs)	Movement Rate (m/hr)	Water Depth (m)	Average Velocity (m/s)	River Meter (m)	Substrate Type	Embeddedness (%)
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D313439	CCN	64	Alive	452630	5462903	1.5	Out	19.25	0.08	0.02	0	0.1	Boulder	0
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D313439	CCN	64	Alive	452623	5462903	**7.0**	-	673.08	0.01	0.62	0.26	3	Gravel	5
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 13:20	3D9.1C2D313439	CCN	64	Alive	452624	5462907	0.5	Downstream	289.75	0.00	0.53	0.03	4	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D31348E	CRH	88	Alive	452625	5462900									
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D31348E	CRH	88	Alive	452604	5462871	**35.8**	-	988354.50	0.00	1.03	0.03	12	Boulder	5
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D31348E	CRH	88	Alive	452607	5462878	**7.6**	-	673.08	0.01	0.56	0.02	6	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D31350B	CRH	64	Alive	452625	5462900									
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D31350B	CRH	64	Unknown	452634	5462913	**15.8**	-	988354.50	0.00	0.28	0	0.8	Cobble	10
LCR	LCR_24.5R	9/17/2012		EF2	9/17/2012 14:00	3D9.1C2D313548	CBA	59	Alive	449999	5450702									
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D313548	CBA	59	Unknown	449990	5450693	**12.7**	-	3648.92	0.00	0.65	0.03	1.8	Cobble	5
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D3135AB	CBA	63	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	No	TR1	2/8/2013 11:50	3D9.1C2D3135AB	CBA	63	Alive	450002	5450705	**2.2**	-	26.50	0.08	0.6	0.5	1.2	Cobble	10
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D3135AB	CBA	63	Alive	450003	5450703	5	Out	26.50	0.19	0.75	0.4	3	Cobble	5
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D313615	CBA	72	Alive	450000	5450706									
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D313615	CBA	72	Alive	450001	5450707	**1.4**	-	53.00	0.03	0.05	0	0.1	Cobble	10
LCR	LCR_24.5R	9/17/2012		EF2	9/17/2012 14:00	3D9.1C2D313629	CRH	69	Alive	449999	5450702									
LCR	LCR_24.5R	11/8/2012	No	TR1	11/8/2012 17:30	3D9.1C2D313629	CRH	69	Alive	450003	5450697	**6.4**	-	1251.50	0.01	0.8	0.17	2.5	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D313629	CRH	69	Alive	449985	5450693	**18.4**	-	2397.42	0.01	0.25	0	0.2	Cobble	5
LCR	LCR_10.5L	2/7/2013	No	EF1	2/7/2013 13:00	3D9.1C2D313787	CRH	86	Alive	452637	5462898									
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D313787	CRH	86	Alive	452621	5462884	**21.3**	-	46.50	0.46	0.34	0	1.5	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D313899	CCN	83	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D313899	CCN	83	Alive	452639	5462923	**26.9**	-	988335.25	0.00	0.18	0.03	1.5	Cobble	5
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D313899	CCN	83	Alive	452637	5462903	6	Upstream	19.25	0.31	0.2	0	0.5	Cobble	0
LCR	LCR_10.5L	10/26/2012	No	TR1	10/26/2012 12:45	3D9.1C2D313899	CCN	83	Alive	452642	5462928	**25.5**	-	650.25	0.04	0.15	0.14	0.5	Cobble	10
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D313899	CCN	83	Alive	452638	5462931	1	Out	22.83	0.04	0.18	0.17	1	Cobble	5
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D313899	CCN	83	Alive	452622	5462888	**45.9**	-	2519.92	0.02	0.42	0	2.5	Cobble	10
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D313899	CCN	83	Alive	452620	5462888	0.25	Out	118.08	0.00	0.49	0.01	2	Cobble	10
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D313899	CCN	83	Alive	452620	5462889	1.5	Out	49.83	0.03	0.2	0.01	1.5	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D3139A5	CCN	54	Alive	452625	5462900									
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D3139A5	CCN	54	Unknown	452627	5462902	**2.8**	-	264.25	0.01	0.53	0.2	3.5	Cobble	5
LCR	LCR_24.5R	9/17/2012		EF2	9/17/2012 14:00	3D9.1C2D3139E1	CRH	68	Alive	449999	5450702									
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D3139E1	CRH	68	Alive	450017	5450717	**23.4**	-	3480.33	0.01	0.4	0.5	2.5	Cobble	15
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D3139E1	CRH	68	Alive	450016	5450713	0	None	117.83	0.00	0.68	0.19	2.5	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D3139E1	CRH	68	Alive	450016	5450713	0.25	Out	50.75	0.00	0.15	0.1	0.3	Cobble	10
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D3139E1	CRH	68	Alive	450016	5450710	1	Downstream	117.33	0.01	0.15	0	0.3	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D313B3E	CCN	55	Alive	452625	5462900									
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D313B3E	CCN	55	Alive	452609	5462883	**23.3452351**	-	989027.58	0.00	0.68	0.04	5	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D313C1F	CCN	65	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D313C1F	CCN	65	Alive	452632	5462907	**9.9**	-	245.00	0.04	0.5	0.06	2	Cobble	5
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D313C1F	CCN	65	Alive	452632	5462908	2.5	Out	19.25	0.13	0.21	0	0.5	Gravel	5
LCR	LCR_10.5L	2/7/2013	No	EF1	2/7/2013 13:00	3D9.1C2D313C6E	CRH	81	Alive	452637	5462898									
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D313C6E	CRH	81	Alive	452630	5462904	**9.2**	-	46.50	0.20	0.57	0	2.5	Cobble	5
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D313C6E	CRH	81	Alive	452615	5462885	**24.2**	-	167.92	0.14	0.59	0.01	2.5	Cobble	50
LCR	LCR_10.5L	2/21/2013	No	TR1	2/21/2013 10:10	3D9.1C2D313C6E	CRH	81	Alive	452607	5462876	**12.0**	-	118.75	0.10	0.56	0.03	6	Cobble	30
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D313CC6	CCN	58	Alive	452625	5462900									
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D313CC6	CCN	58	Alive	452619	5462902	**6.3**	-	383.58	0.02	0.63	0.6	4	Cobble	5
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D313CC6	CCN	58	Alive	452620	5462902	**1.0**	-	553.75	0.00	0.62	0.62	4	Gravel	5
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 13:20	3D9.1C2D313CC6	CCN	58	Alive	452622	5462902	0.1	In	289.75	0.00	0.63	0.37	5	Cobble	10
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D313CC6	CCN	58	Alive	452623	5462903	**1.4**	-	2398.08	0.00	0.67	0.1	3	Cobble	5
LCR	LCR_10.5L	2/21/2013	No	TR1	2/21/2013 10:10	3D9.1C2D313CC6	CCN	58	Alive	452628	5462908	6	Upstream	118.75	0.05	0.45	0.01	4	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D313D12	CCN	68	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D313D12	CCN	68	Alive	452623	5462893	**7.3**	-	988335.25	0.00	0.8	0.27	3.5	Cobble	10
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D313D12	CCN	68	Alive	452622	5462894	0.75	Out	19.25	0.04	0.3	0.1	1.2	Cobble	5
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D313D12	CCN	68	Alive	452615	5462892	**7.3**	-	119.33	0.06	0.78	0.05	3	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF2		3D9.1C2D313D5F	CRH	94	Alive	452625	5462900									
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 19:35	3D9.1C2D313D5F	CRH	94	Unknown	452618	5462895	**8.6**	-	989323.58	0.00	0.78	0.36	6	Cobble	10
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D313D91	CBA	80	Alive	450000	5450706									
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D313D91	CBA	80	Alive	450002	5450703	**3.6**	-	53.00	0.07	0.5	0.4	2	Cobble	5
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D313D91	CBA	80	Alive	450001	5450699	2	Downstream	117.83	0.02	0.62	0.37	2.5	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D314BA3	CCN	53	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D314BA3	CCN	53	Unknown	452629	5462903	**5.0**	-	245.00	0.02	0.91	0.31	4	Cobble	5
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D314BA3	CCN	53	Unknown	452621	5462901	**8.2**	-	138.58	0.06	0.71	0.6	4	Cobble	10

Table E1 continued.

Waterbody	Site Name[1]	Sample Date	Flow Reduction	Method[2]	Start Time	PIT Number	Species Code[3]	Length (mm)	Alive/Dead	Easting	Northing	Move From Last (m)[4]	Move Direction	Time Interval (hrs)	Movement Rate (m/hr)	Water Depth (m)	Average Velocity (m/s)	River Meter (m)	Substrate Type	Embeddedness (%)
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D314BA3	CCN	53	Unknown	452623	5462905	**4.5**	-	553.75	0.01	0.7	0.57	4	Cobble	5
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D315976	CBA	92	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	Yes	TR1	2/8/2013 17:00	3D9.1C2D315976	CBA	92	Alive	450001	5450704	**2.2**	-	31.67	0.07	0.15	0.05	0.2	Cobble	10
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D315976	CBA	92	Alive	450002	5450705	2.5	Out	21.33	0.12	0.2	0.05	1.1	Cobble	5
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D315976	CBA	92	Alive	450027	5450716	**27.3**	-	285.92	0.10	0.15	0	1.3	Boulder	0
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D315A4C	CRH	60	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D315A4C	CRH	60	Unknown	452632	5462903	**7.6**	-	245.00	0.03	0.47	0.03	2	Cobble	10
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D315A54	CRH	60	Alive	452625	5462900									
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D315A54	CRH	60	Alive	452641	5462929	**33.1**	-	245.00	0.14	0.16	0.02	0.2	Cobble	5
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 13:20	3D9.1C2D315A54	CRH	60	Alive	452633	5462927	**8.2**	-	982.08	0.01	0.63	0.16	3	Cobble	5
LCR	LCR_10.5L	11/8/2012	No	TR1	11/8/2012 19:35	3D9.1C2D315A54	CRH	60	Alive	452623	5462894	**34.5**	-	6.25	5.52	0.5	0.04	2	Cobble	10
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D315A54	CRH	60	Alive	452620	5462879	**15.3**	-	2223.92	0.01	0.45	0	2.5	Cobble	5
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D315A54	CRH	60	Alive	452618	5462883	2	Upstream	118.08	0.02	0.47	0.03	3	Cobble	5
LCR	LCR_10.5L	2/7/2013	No	EF1	2/7/2013 13:00	3D9.1C2D315B3D	CRH	73	Alive	452637	5462898									
LCR	LCR_10.5L	2/8/2013	Yes	TR1	2/8/2013 15:20	3D9.1C2D315B3D	CRH	73	Alive	452628	5462897	**9.1**	-	26.33	0.34	1.3	0.3	3.5	Cobble	10
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D315B3D	CRH	73	Alive	452628	5462897	**0**	None	20.17	0.00	0.32	0.1	1	Cobble	5
LCR	LCR_10.5L	2/14/2013	No	TR1	2/14/2013 9:35	3D9.1C2D315B3D	CRH	73	Alive	452626	5462897	**2.0**	-	118.08	0.02	0.42	0.05	2	Cobble	25
LCR	LCR_10.5L	2/16/2013	Yes	TR1	2/16/2013 11:25	3D9.1C2D315B3D	CRH	73	Alive	452626	5462898	0.5	Out	49.83	0.01	0.15	0.01	0.5	Cobble	5
LCR	LCR_24.5R	2/7/2013	No	EF1	2/7/2013 9:20	3D9.1C2D315B85	CRH	71	Alive	450000	5450706									
LCR	LCR_24.5R	2/8/2013	Yes	TR1	2/8/2013 17:00	3D9.1C2D315B85	CRH	71	Alive	450003	5450707	**3.2**	-	31.67	0.10	0.2	0.05	0.2	Cobble	15
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D315B85	CRH	71	Alive	450003	5450705	2.8	Out	21.33	0.13	0.3	0.05	1.2	Cobble	10
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D315B85	CRH	71	Alive	450003	5450705	0	None	117.83	0.00	0.23	0.07	1.1	Cobble	5
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D315B85	CRH	71	Alive	450004	5450703	3	Downstream	50.75	0.06	0.2	0	0.6	Cobble	5
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D315B85	CRH	71	Alive	450004	5450700	1.5	Upstream	117.33	0.01	0.22	0	1.1	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D315BB3	CCN	62	Alive	452625	5462900									
LCR	LCR_10.5L	10/4/2012	No	TR1	10/4/2012 9:50	3D9.1C2D315BB3	CCN	62	Alive	452623	5462910	**10.2**	-	383.58	0.03	0.83	0.6	4	Cobble	5
LCR	LCR_10.5L	10/27/2012	Yes	TR1	10/27/2012 11:35	3D9.1C2D315BB3	CCN	62	Alive	452623	5462910	**0**	None	553.75	0.00	0.87	0.53	6	Cobble	5
LCR	LCR_10.5L	9/18/2012	No	EF1	9/18/2012 10:15	3D9.1C2D315D93	CCN	62	Alive	452625	5462900									
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D315D93	CCN	63	Unknown	452625	5462901	**1**	-	264.25	0.00	0.67	0.2	4	Cobble	10
LCR	LCR_10.5L	3/28/2012	No	EF1	3/28/2012 15:00	3D9.1C2D62CCD7	CCN	64	Alive	452624	5462884									
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D62CCD7	CCN	64	Unknown	452622	5462895	**11.2**	-	4435.50	0.00	0.43	0.3	4	Cobble	10
LCR	LCR_24.5R	4/26/2011	No	EF1		3D9.1C2D63698E	CRH	77	Alive	450033	5450719									
LCR	LCR_24.5R	9/5/2012	No	TR1	9/5/2012 9:35	3D9.1C2D63698E	CRH		Alive	450012	5450721	**38.2**	-	987777.58	0.00	0.45	0.19	1.5	Cobble	0
LCR	LCR_10.5L	3/28/2012	No	EF1	3/28/2012 15:00	3D9.1C2D63A57B	CCN	76	Alive	452624	5462884									
LCR	LCR_10.5L	3/29/2012	No	TR2	3/29/2012 16:12	3D9.1C2D63A57B	CCN	76	Alive	452625	5462895	**11.0**	-	25.20	0.44	0.59	0.28	3.2	Cobble	5
LCR	LCR_10.5L	3/30/2012	Yes	TR1	3/30/2012 9:15	3D9.1C2D63A57B	CCN	76	Alive	452626	5462895	0.6	Upstream	17.05	0.04	0.54	0.31	2.2	Cobble	0
LCR	LCR_10.5L	3/30/2012	Yes	TR2	3/30/2012 11:45	3D9.1C2D63A57B	CCN	76	Alive	452624	5462892	0.5	Out	2.50	0.20	0.64	0.26	3	Cobble	5
LCR	LCR_10.5L	3/31/2012	Yes	TR1	3/31/2012 9:00	3D9.1C2D63A57B	CCN	76	Alive	452624	5462892	0	None	21.25	0.00	0.42	0.17	1.8	Cobble	5
LCR	LCR_10.5L	3/31/2012	Yes	TR2	3/31/2012 10:40	3D9.1C2D63A57B	CCN	76	Alive	452624	5462892	0	None	1.67	0.00	0.26	0.08	0.9	Cobble	5
LCR	LCR_10.5L	4/1/2012	Yes	TR1	4/1/2012 8:32	3D9.1C2D63A57B	CCN	76	Alive	452623	5462895	**3.2**	-	21.87	0.14	0.46	0.23	2.3	Cobble	5
LCR	LCR_10.5L	9/28/2012	No	TR1	9/28/2012 15:15	3D9.1C2D63A57B	CCN	76	Alive	452623	5462886	**9.0**	-	4326.72	0.00	0.45	0.02	1.5	Cobble	5
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D63A57B	CCN	76	Alive	452620	5462887	2	Out	19.25	0.10	0.18	0.03	0.5	Cobble	10
LCR	LCR_24.5R	4/26/2011	No	EF2		3D9.1C2D63AAAF	CRH	64	Alive	449997	5450698									
LCR	LCR_24.5R	5/12/2011	No	TR1	5/12/2011 10:00	3D9.1C2D63AAAF	CRH	64	Alive	886923.8	5464071		-			0.14	0.03	0.2	Cobble (64-	10
LCR	LCR_24.5R	9/5/2012	No	TR1	9/5/2012 9:35	3D9.1C2D63AAAF	CRH		Alive	449964	5450691	**33.7**	-	2900.42	0.01	0.92	0.54	2	Cobble	10
LCR	LCR_24.5R	3/28/2012	No	EF1	3/28/2012 9:30	3D9.1C2D63AABE	CCN	79	Alive	450011	5450713									
LCR	LCR_24.5R	3/29/2012	No	TR1	3/29/2012 9:51	3D9.1C2D63AABE	CCN	79	Alive	450013	5450711	**2.8**	-	24.35	0.12	0.59	0.2	2.8	Cobble	5
LCR	LCR_24.5R	3/29/2012	No	TR2	3/29/2012 12:12	3D9.1C2D63AABE	CCN	79	Alive	450013	5450711	0	None	2.35	0.00	0.59	0.2	2.8	Cobble	5
LCR	LCR_24.5R	3/30/2012	Yes	TR1	3/30/2012 14:15	3D9.1C2D63AABE	CCN	79	Alive	450013	5450711	0	None	26.05	0.00	0.39	0.14	1.3	Cobble	0
LCR	LCR_24.5R	3/31/2012	Yes	TR1	3/31/2012 13:35	3D9.1C2D63AABE	CCN	79	Alive	450012	5450711	2	Out	23.33	0.09	0.39	0.19	1.3	Cobble	0
LCR	LCR_24.5R	3/31/2012	Yes	TR2	3/31/2012 14:35	3D9.1C2D63AABE	CCN	79	Alive	450012	5450711	0	None	1.00	0.00	0.5	0.19	1.4	Cobble	0
LCR	LCR_24.5R	4/1/2012	Yes	TR1	4/1/2012 12:02	3D9.1C2D63AABE	CCN	79	Alive	450012	5450706	0.8	Downstream	21.45	0.04	0.25	0.04	0.5	Cobble	0
LCR	LCR_24.5R	4/13/2012	No	TR1	4/13/2012 12:43	3D9.1C2D63AABE	CCN	79	Alive	450010	5450711	**5.4**	-	288.68	0.02	0.45	0.33	2	Cobble	5
LCR	LCR_24.5R	4/13/2012	No	TR2	4/13/2012 14:23	3D9.1C2D63AABE	CCN	79	Alive	450010	5450711	0	None	1.67	0.00	0.45	0.33	2	Cobble	5
LCR	LCR_24.5R	10/4/2012	No	TR1	10/4/2012 13:00	3D9.1C2D63AABE	CCN	79	Alive	449960	5450680	**58.8**	-	4174.62	0.01	0.16	0	0.5	Cobble	5
LCR	LCR_24.5R	11/8/2012	No	TR1	11/8/2012 9:45	3D9.1C2D63AABE	CCN	79	Alive	449958	5450677	**3.6**	-	836.75	0.00	0.05	0.01	0.25	Gravel	5
LCR	LCR_10.5L	3/28/2012	No	EF1	3/28/2012 15:00	3D9.1C2D69390B	CRH	81	Alive	452624	5462884									
LCR	LCR_10.5L	3/29/2012	No	TR1	3/29/2012 14:04	3D9.1C2D69390B	CRH	81	Alive	452622	5462886	**2.8**	-	23.07	0.12	0.66	0.04	2.6	Cobble	5
LCR	LCR_10.5L	3/29/2012	No	TR2	3/29/2012 16:12	3D9.1C2D69390B	CRH	81	Alive	452622	5462886	0	None	2.13	0.00	0.66	0.04	2.6	Cobble	5
LCR	LCR_10.5L	3/30/2012	Yes	TR1	3/30/2012 9:15	3D9.1C2D69390B	CRH	81	Alive	452622	5462887	0	None	17.05	0.00	0.58	0.04	3	Cobble	0
LCR	LCR_10.5L	3/30/2012	Yes	TR2	3/30/2012 11:45	3D9.1C2D69390B	CRH	81	Alive	452622	5462887	0	None	2.50	0.00	0.36	0.35	2.2	Cobble	0
LCR	LCR_10.5L	3/31/2012	Yes	TR1	3/31/2012 9:00	3D9.1C2D69390B	CRH	81	Alive	452622	5462887	1.5	Upstream	21.25	0.07	0.45	0.01	1.6	Cobble	5

Table E1 continued.

Waterbody	Site Name[1]	Sample Date	Flow Reduction	Method[2]	Start Time	PIT Number	Species Code[3]	Length (mm)	Alive/Dead	Easting	Northing	Move From Last (m)[4]	Move Direction	Time Interval (hrs)	Movement Rate (m/hr)	Water Depth (m)	Average Velocity (m/s)	River Meter (m)	Substrate Type	Embeddedness (%)
LCR	LCR_10.5L	3/31/2012	Yes	TR2	3/31/2012 10:40	3D9.1C2D69390B	CRH	81	Alive	452622	5462887	0	None	1.67	0.00	0.25	0.01	1.4	Cobble	5
LCR	LCR_10.5L	4/1/2012	Yes	TR1	4/1/2012 8:32	3D9.1C2D69390B	CRH	81	Alive	452620	5462889	**2.8**	-	21.87	0.13	0.21	0.02	1.3	Cobble	5
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D69390B	CRH	81	Unknown	452617	5462873	**16.3**	-	4345.97	0.00	0.18	0.01	1.8	Cobble	10
LCR	LCR_10.5L	3/28/2012	No	EF1	3/28/2012 15:00	3D9.1C2D6939AB	CCN	88	Alive	452624	5462884									
LCR	LCR_10.5L	3/29/2012	No	TR1	3/29/2012 14:04	3D9.1C2D6939AB	CCN	88	Alive	452624	5462888	**4.0**	-	23.07	0.17	0.5	0.03	2.8	Cobble	0
LCR	LCR_10.5L	3/31/2012	Yes	TR1	3/31/2012 9:00	3D9.1C2D6939AB	CCN	88	Alive	452632	5462905	**18.8**	-	42.93	0.44	0.29	0.02	1.2	Cobble	5
LCR	LCR_10.5L	3/31/2012	Yes	TR2	3/31/2012 10:40	3D9.1C2D6939AB	CCN	88	Alive	452632	5462905	0.1	Upstream	1.67	0.06	0.13	0.06	0.4	Cobble	5
LCR	LCR_10.5L	9/29/2012	Yes	TR1	9/29/2012 10:30	3D9.1C2D6939AB	CCN	88	Alive	452616	5462885	**25.6**	-	4367.83	0.01	0.61	0.04	3.5	Cobble	10
LCR	LCR_10.5L	2/9/2013	Yes	TR1	2/9/2013 11:30	3D9.1C2D6939AB	CCN	88	Unknown	452624	5462891	**10.0**	-	3193.00	0.00	0.34	0.15	1	Boulder	5
LCR	LCR_24.5R	9/17/2012	No	EF1	9/17/2012 10:30	3D9.1C2D693A54	CAS	70		449984	5450695									
LCR	LCR_24.5R	10/4/2012	No	TR1	10/4/2012 13:00	3D9.1C2D693A54	CAS	70	Alive	450034	5450726	**58.8**	-	410.50	0.14	0.38	0.2	1.5	Cobble	0
LCR	LCR_24.5R	11/8/2012	No	TR1	11/8/2012 17:30	3D9.1C2D693A54	CAS	70	Alive	450033	5450726	**1.0**	-	844.50	0.00	0.2	0.15	0.5	Cobble	5
LCR	LCR_24.5R	2/9/2013	Yes	TR1	2/9/2013 14:20	3D9.1C2D693A54	CAS	70	Alive	450034	5450725	**1.4**	-	2228.83	0.00	0.35	0.05	2.2	Cobble	10
LCR	LCR_24.5R	2/14/2013	No	TR1	2/14/2013 12:10	3D9.1C2D693A54	CAS	70	Alive	450034	5450724	1	Out	117.83	0.01	0.68	0.01	3.2	Cobble	10
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D693A54	CAS	70	Alive	450034	5450724	0	None	50.75	0.00	0.2	0.05	0.3	Cobble	10
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D693A54	CAS	70	Alive	450034	5450724	0	None	117.33	0.00	0.2	0.05	0.3	Cobble	10
LCR	LCR_24.5R	9/17/2012	No	EF1	9/17/2012 10:30	3D9.1C2D693B54	UDC	52		449984	5450695									
LCR	LCR_24.5R	2/16/2013	Yes	TR1	2/16/2013 14:55	3D9.1C2D693B54	UDC	52	Unknown	449983	5450692	**3.2**	-	3652.42	0.00	0.46	0	1.5	Cobble	10
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D693B54	UDC	52	Unknown	449983	5450692	0	None	117.33	0.00	0.46	0	1.5	Cobble	10
LCR	LCR_24.5R	9/17/2012	No	EF1	9/17/2012 10:30	3D9.1C2D69409C	CBA	79		449984	5450695									
LCR	LCR_24.5R	2/21/2013	No	TR1	2/21/2013 12:15	3D9.1C2D69409C	CBA	79	Unknown	449983	5450685	**10.0**	-	3769.75	0.00	0.78	0.01	1	Boulder	5

Notes:

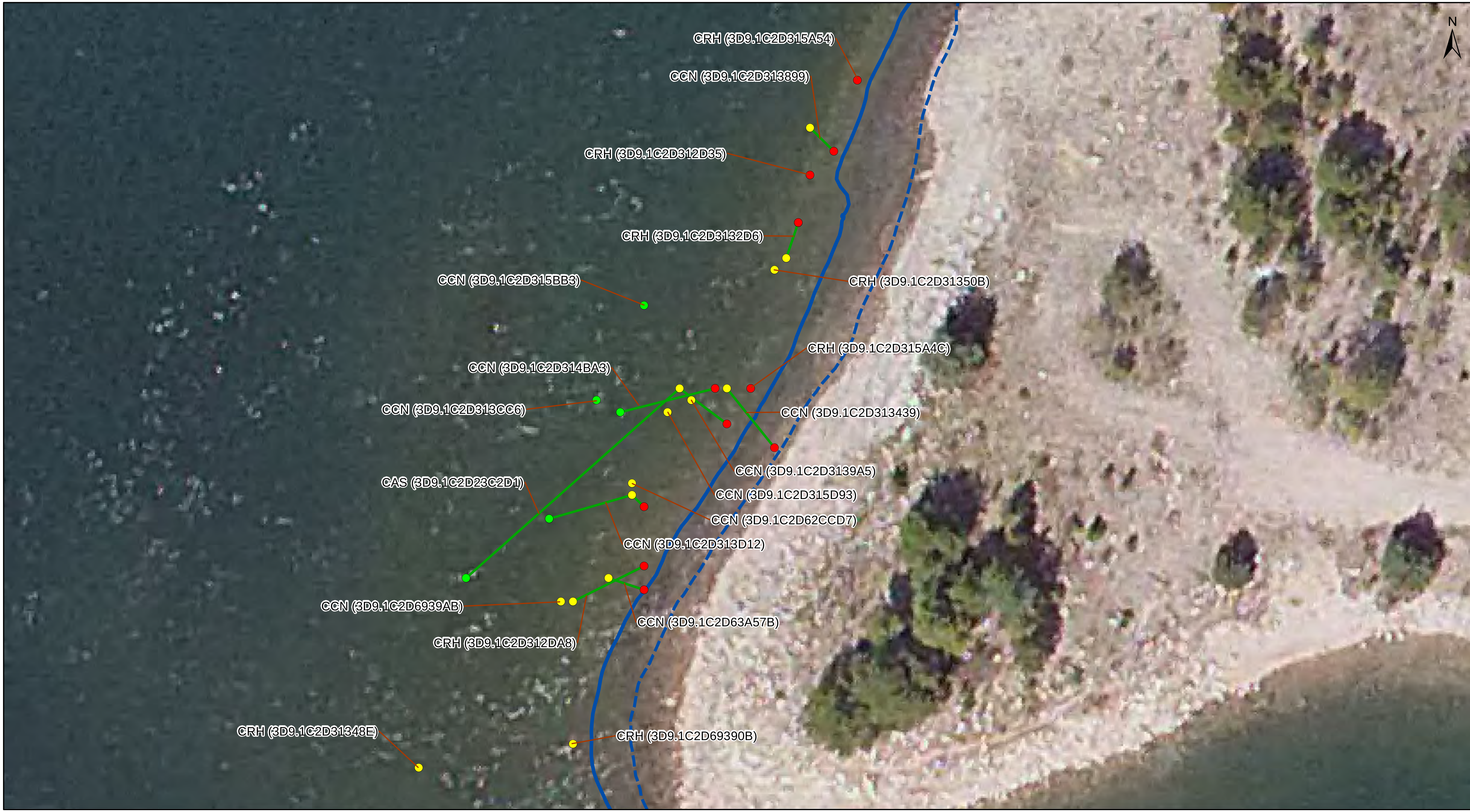
[1] LB or L= left downstream bank; RB or R= right downstream bank; US= upstream; DS= downstream

[2] EF= Backpack Electrofishing; TR= Pit-tag Tracking

[3] CAS= prickly sculpin; CBA= Columbia sculpin; CCN= shorthead sculpin; CRH= torrent sculpin; LNC= longnose dace; UDC= Umatilla dace

[4] Bold text = UTM measurement; plain text = direct field measurement

APPENDIX F
Flow Reduction Movement Maps



Legend

- 28/09/2012 PIT Tag Location
- 29/09/2012 PIT Tag Location
- 04/10/2012 PIT Tag Location
- Movement of Relocated PIT Tag

Wetted Edge

- 28-SEP-12
- 29-SEP-12

CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

DRAFT

0 5 10

Metres

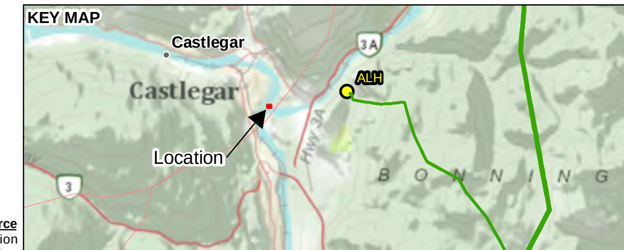
Scale:1:300

Source

BC Government GeoBC Data Distribution

Microsoft Bing Map

KEY MAP



CLIENT: BC hydro

PROJECT: **LCR Sculpin and Dace**

TITLE: Locations of PIT Tagged Sculpins at LCR_10.5L Before, Immediately Following and One Week After a HLK Flow Reduction on September 29, 2012

DATE: May, 2013	ANALYST: MY	Figure F1
JOB No: VE52219	QA/QC: CL	PDF FILE: 001_survey_120928_121004.pdf
GIS FILE: 001_survey_120928_121004.mxd		
PROJECTION: UTM 11	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\001_survey_120928_121004.mxd

Legend

- 26/10/2012 PIT Tag Location
- 27/10/2012 PIT Tag Location
- 08/11/2012 PIT Tag Location
- Movement of Relocated PIT Tag

CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

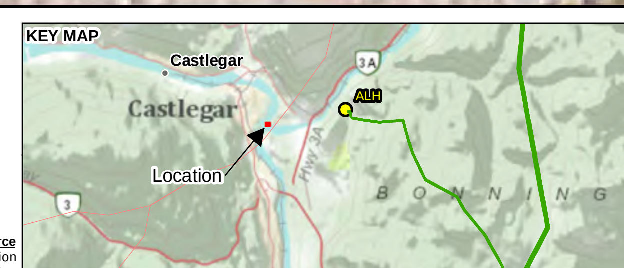
Wetted Edge
- 26-OCT-12
- 27-OCT-12

DRAFT

0 5 10
Metres
Scale:1:300

Source
BC Government GeoBC Data Distribution
Microsoft Bing Map

KEY MAP



CLIENT: BC hydro

PROJECT: **LCR Sculpin and Dace**

TITLE: Locations of PIT Tagged Sculpins at LCR_10.5L Before, Immediately Following and One Week After a HLK Flow Reduction on October 27, 2012

DATE: May, 2013	ANALYST: PK	Figure F2
JOB No: VE52219	QA/QC: MY	PDF FILE: 002_survey_121026_121108_v1.pdf
GIS FILE: 002_survey_121026_121108_v1.mxd		
PROJECTION: UTM 11	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\002_survey_121026_121108_v1.mxd

Legend

- 08/02/2013 (AM) PIT Tag Location
- 08/02/2013 (PM) PIT Tag Location
- 09/02/2013 PIT Tag Location
- 14/02/2013 PIT Tag Location

Wetted Edge

- 08-FEB-13 (AM)
- 08-FEB-13 (PM)
- 09-FEB-13
- Movement of Relocated PIT Tag

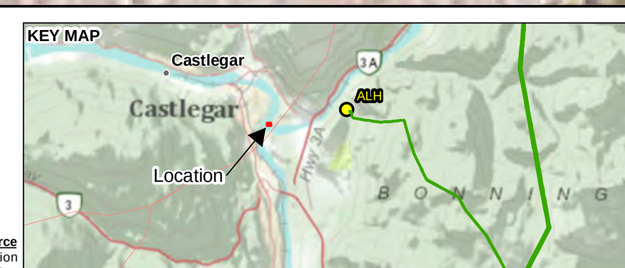
CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

DRAFT

0 5 10
Metres
Scale:1:300

Source
BC Government GeoBC Data Distribution
Microsoft Bing Map

KEY MAP



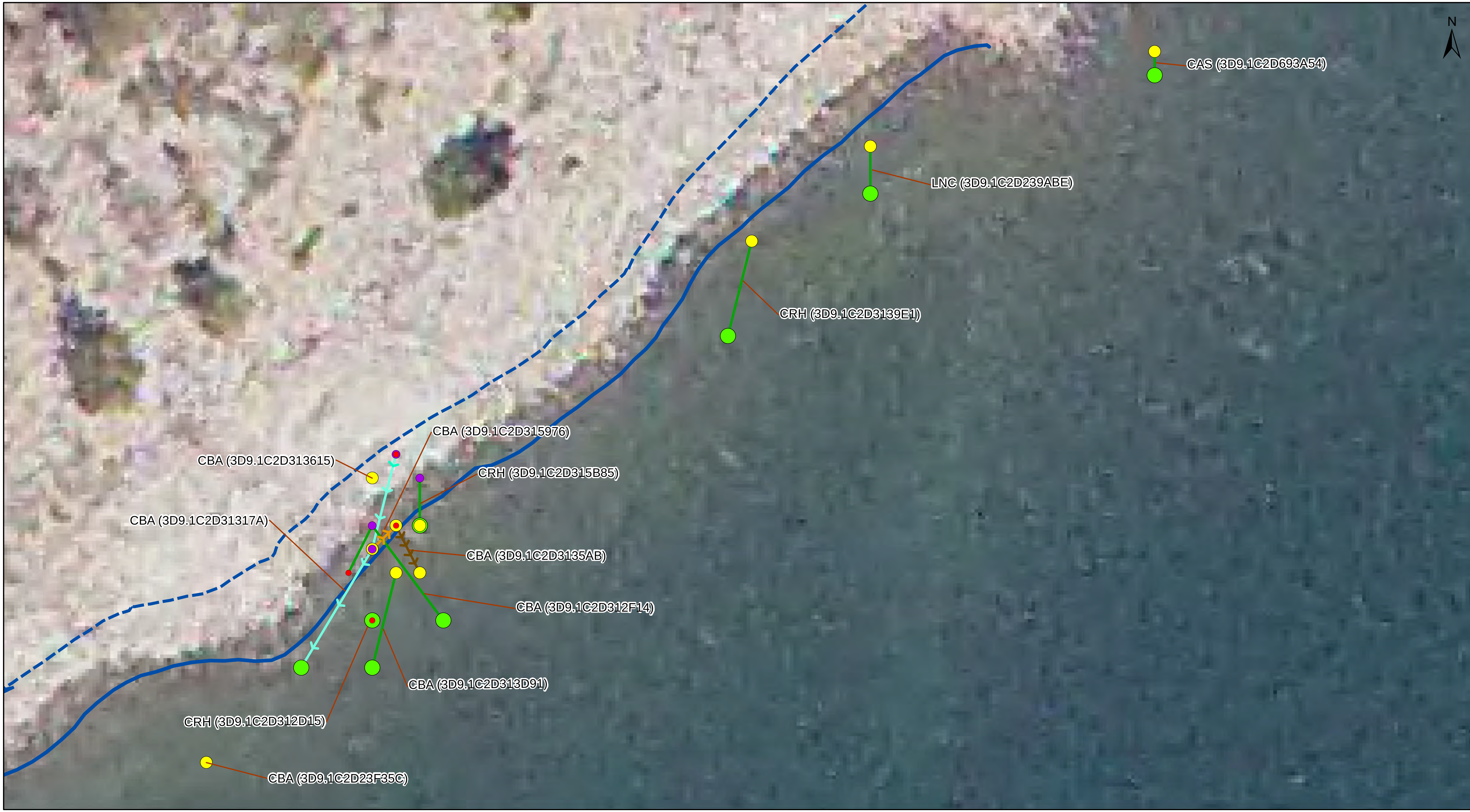
CLIENT: BC hydro

PROJECT: **LCR Sculpin and Dace**

TITLE: Locations of PIT Tagged Sculpins at LCR_10.5 Before, Immediately Following and One Week After a HLK Flow Reduction on February 8-9, 2013

DATE: May, 2013	ANALYST: PK	Figure F3
JOB No: VE52219	QA/QC: MY	PDF FILE: 003_survey_130208_130214.pdf
GIS FILE: 003_survey_130208_130214.mxd		
PROJECTION: UTM 11	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\003_survey_130208_130214.mxd



Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\003_survey_130208_130214_map2_v1.mxd

Legend

- 08/02/2013 (AM) PIT Tag Location
- 08/02/2013 (PM) PIT Tag Location
- 09/02/2013 PIT Tag Location
- 14/02/2013 PIT Tag Location

Movement of Relocated PIT Tag

- All Other Movement of Relocated PIT Tag's
- 3D9.1C2D31317A
- 3D9.1C2D3135AB
- 3D9.1C2D315976

Wetted Edge

- 08-FEB-13
- 09-FEB-13

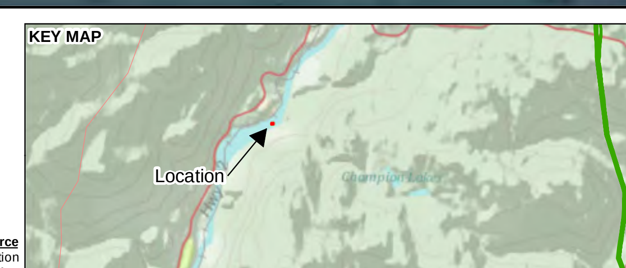
CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

DRAFT

0 5 10
Metres
Scale:1:150

Source
BC Government GeoBC Data Distribution
Microsoft Bing Map

KEY MAP



CLIENT: BC hydro	PROJECT: **LCR Sculpin and Dace**
TITLE: Locations of PIT Tagged Sculpins at LCR_24.5R Before, Immediately Following and One Week After a HLK Flow Reduction on February 8-9, 2013	DATE: May, 2013 — ANALYST: PK — Figure F4
	JOB No: VE52219 — QA/QC: MY — PDF FILE: 003_survey_130208_130214_map2_v1.pdf
	GIS FILE: 003_survey_130208_130214_map2_v1.mxd
	PROJECTION: UTM 11 — DATUM: NAD83 — amec

Legend

- 14/02/2013 PIT Tag Location
- 16/02/2013 PIT Tag Location
- 21/02/2013 PIT Tag Location
- Movement of Relocated PIT Tag

CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

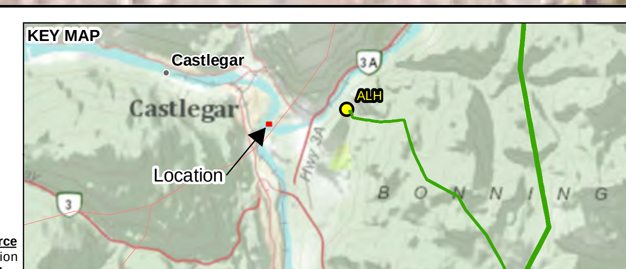
Wetted Edge

- 14-FEB-13
- 16-FEB-13

DRAFT

0 5 10
Metres
Scale:1:300

Source
BC Government GeoBC Data Distribution
Microsoft Bing Map



CLIENT: BC hydro

PROJECT: **LCR Sculpin and Dace**

TITLE: Locations of PIT Tagged Sculpins at LCR_10.5L Before, Immediately Following and One Week After a HLK Flow Reduction on February 16, 2013

DATE: May, 2013	ANALYST: PK	Figure F5
JOB No: VE52219	QA/QC: MY	PDF FILE: 004_survey_130214_130221.pdf
GIS FILE: 004_survey_130214_130221.mxd		
PROJECTION: UTM 11	DATUM: NAD83	amec

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\004_survey_130214_130221.mxd

Legend

- 14/02/2013 PIT Tag Location
- 16/02/2013 PIT Tag Location
- 21/02/2013 PIT Tag Location
- Movement of Relocated PIT Tag

CAS (3D9.1C2D23C2D1) - Species and PIT Tag Number

Wetted Edge

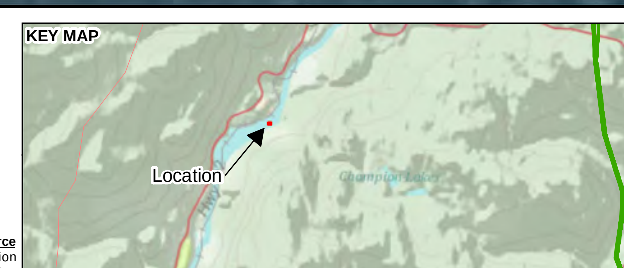
- 14-FEB-13
- 16-FEB-13

DRAFT

0 5 10
Metres
Scale:1:200

Source
BC Government GeoBC Data Distribution
Microsoft Bing Map

KEY MAP



CLIENT: BC hydro

PROJECT: **LCR Sculpin and Dace**

TITLE: Locations of PIT Tagged Sculpins at LCR_24.5R Before, Immediately Following and One Week After a HLK Flow Reduction on February 16, 2013

DATE: May, 2013	ANALYST: PK	Figure F6
JOB No: VE52219	QA/QC: MY	PDF FILE: 004_survey_130214_130221_map2.pdf
GIS FILE: 004_survey_130214_130221_map2.mxd		amec
PROJECTION: UTM 11	DATUM: NAD83	

Y:\GIS\Projects\VE\VE51872_sculpin_dace\Mapping\MXD\Drafts\004_survey_130214_130221_map2.mxd