

**Bulkley River Watershed
Overwintering Study
2009-2010**



prepared by

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July 2010

Executive Summary

An overwintering study was conducted from November 2009 to March 2010 in the Bulkley River watershed in north-central British Columbia. The study area includes the Upper Bulkley River located near Houston, B.C. and Waterfall Creek (a tributary to Mission Creek), located at the Village of New Hazelton, B.C. This study focused on monitoring species composition and fish condition at sites that were index sites during the Bulkley/Morice Watershed Overwintering Studies conducted from 1998 – 2001. This over-wintering monitoring was conducted to provide background data to assist Habitat Management staff and Resource Restoration staff in liaising with various agencies and proponents when work is to be conducted in areas of the Upper Bulkley and Mission Creek watershed study areas. The data also assists in monitoring condition of hatchery raised coho released to Waterfall Creek.

Species composition, fork length and weight data were collected when possible. Catch per unit effort (CPUE) data and condition of fish was collected over the winter at each site. Fall (2009) habitat assessments were also completed at each site.

This report focuses primarily on the reporting of data collected during this study (2009/2010), although some comparisons have been made to the previous year's studies (2005/2006, 2006/2007, 2007/08 and 2008/2009).

Waterfall Creek and Upper Bulkley River Sites

Habitat assessments found all sites to have sufficient water depth, DO and potential for migration throughout the winter.

Four species were captured at the Waterfall Creek sites, predominantly Coho salmon and Dolly Varden char (*Salvelinus malma*) and included rainbow trout and cutthroat trout. A total of 1,272 coho and 122 Dolly Varden were captured over the winter. High numbers of coho were captured at all four sites, likely due to adult and fry stocking enhancement in the system. On the whole, there were much fewer Dolly Varden captured at the Waterfall Creek sites during this study as well as in 2008/2009, 2007/08, 2006/07, compared to the 2005/06 study. It should be noted that 3 cutthroat trout (*Oncorhynchus clarki*) and 12 Rainbow trout (*Oncorhynchus mykiss*) were captured during this study.

Site 2 contained the highest number of fish of all four sites. Overall capture at Site 3 was higher than in previous years and this was most likely due to the addition of rip rap type rock at that site (fall 2008).

A large proportion of coho captured at site 1 were less than or equal to 80 mm. The mean Fulton's Condition Factor for coho decreased over the winter at all sites. There were more DV captured in the greater than 80 mm length category than the less than or equal to 80 mm category at all the sites.

Coho CPUE decreased overall from beginning to end of winter at all sites. The CPUE for coho was highest at Site 2 and lowest at Site 4 over the winter. Overall, the CPUE for coho far exceeded the CPUE for DV, which was not always the case in 2005/06. The CPUE for DV at Site 1, 2 and 3 decreased from beginning to end of winter and the CPUE at Site 4 remained the same.

A portion of the coho captured at all of the sites on Waterfall Creek were checked for the presence of a right maxillary clip. The right maxillary clip is used to mark all coho fry being released from the Chicago Creek Hatchery. The hatchery fry are released to various locations in Waterfall Creek at a mean size of 1 to 2 grams. Of the 115 coho that were checked for the presence of a clip, the percentage of coho with right maxillary clips ranged from 4.9% (Waterfall #2, Nov. 25/09) to 50% (Waterfall #3, Nov 25/09). The majority of the coho with right maxillary clips (89.6%) were in the FL \leq 80 mm category and these fry are assumed to be from the spring 2009 fry release.

At the Upper Bulkey sites three species of juveniles were captured, Coho salmon (*Oncorhynchus kisutch*), Rainbow Trout/Steelhead (*Oncorhynchus mykiss*) and Northern Pike Minnow (*Ptychocheilus oregonensis*).

The majority of juveniles captured were Rainbow trout/steelhead (RBT) juveniles. Total capture during the 2009/10 study included 160 RBT, 88 Coho and 1 Northern pikeminnow juvenile.

In general, CPUE for both RBT and Coho decreased from beginning to end of winter. Coho CPUE was highest (6.7) at McQuarrie Creek on Dec 1, 2009 and lowest at Barren Creek (0.3) on March 23, 2010. CPUE was highest for RBT at McQuarrie Creek (19) on Dec 1, 2009 and lowest on March 23, 2010 at Richfield Creek (1).

The majority of coho captured (60.3%) were in the FL \leq 80 mm category. For RBT, the majority of juveniles captured (71.1%) were in the FL $>$ 80 mm category. Most of the RBT juveniles captured were captured at the Byman Creek site (50%).

CPUE for Coho and RBT during the 2009/2010 study was the highest recorded of all the overwintering studies for the McQuarrie, Byman and Richfield Creek sites. CPUE for Barren Creek was lower than in previous study years and this was most likely due to reduced access to the site during dredging at this culvert pool.

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Acknowledgements

The overwintering study of 2009/2010 was conducted by the Department of Fisheries and Oceans Canada (DFO), Smithers, B.C. Brenda Donas designed the project, based on previous years of overwintering sampling conducted by Brenda Donas (DFO) in conjunction with SKR Consultants Ltd. Brenda Donas, Gavin Grubb, Natalie Newman, Cindy Verbeek and Margaret Letkeman conducted field sampling. Data was entered by Natalie Newman and Brenda Donas, and the data analysis and reporting was conducted by Natalie Newman and Brenda Donas.

1.0 INTRODUCTION

The 2009/2010 overwintering program was used to monitor species composition and fish condition within the study area (i.e Waterfall Creek and the Upper Bulkley watershed) located in the Bulkley River watershed. Culvert pools, as well as other pools were areas of focus. The Waterfall Creek monitoring sites were the same index sites monitored during the 1998 – 2001 overwintering study (Donas and Saimoto. 2001b). Three of the Upper Bulkley sites (Barren Creek, McQuarrie Creek and Byman Creek) were the same index sites monitored during the 1998-2001 and subsequent studies and the Richfield Creek site was a new site just upstream of the site sampled during the 2007/2008 study.

The Bulkley River watershed is utilized by several species of pacific salmon (Coho, Chinook, sockeye, pink salmon) and steelhead, which have been in decline (Houston Chapter of the Steelhead Society of B.C. 1990, BCCF 1997, 1998, Holtby and Finnegan 1998). Declines in salmon stocks are generally attributed to over-exploitation of the stocks, decreased ocean or freshwater survival or a combination of these (Hillborn and Walters 1992, Walters 1995, Slaney *et al.* 1996, Slaney and Zaldokas 1997, Bradford and Irvine 2000). Decreased survival of juveniles in freshwater is often attributed to habitat degradation (National Research Council 1992, Johnston and Slaney 1996, Slaney and Zaldokas 1997, BCCF 1998). Winter survival has been considered to be one potential bottleneck in salmonid production in several systems (Bustard and Narver 1975, Swales *et al.* 1986, Dolloff 1987, Koning and Keeley 1997) since winter is generally a more stressful time for fish with resultant starvation, energy loss, declines in fish health and survival (Bustard and Narver 1975, Dolloff 1987, Cagnelli and Gross 1997) (Donas and Saimoto 2001a).

The long-term objectives of the Bulkley overwintering studies are to:

- determine changes in species abundance during the winter,
- document changes in weight, length and condition of species at sites examined,
- document changes in habitat such as reduction in available habitat over the course of the winter,
- document any changes to the quality of overwintering habitat due to low water levels (or other impacts) as compared to previous year's measurements at the same sites.

This report documents the results of the overwintering study from November 2009 to March 2010. Sampling was conducted in November, January and March as those months would be representative of pre-winter, mid- winter and end of winter conditions. Some of the previous overwintering study measurements were conducted during each month of winter in the 1998-2001 and 2005-2006 studies.

2.0 STUDY AREA

The Bulkley River is a major tributary to the Skeena River, located in north-central British Columbia. The Bulkley River drains into the Skeena River near the Village of Hazelton, B.C. The study area includes the Upper Bulkley Watershed, near Houston B.C. (Figure 1) and Waterfall Creek, a tributary to Mission Creek, at the Village of New Hazelton, B.C. Waterfall Creek is located in the lower Bulkley River Watershed (Figure 2).

Figure 1. Locations of sites sampled in the Upper Bulkley Watershed

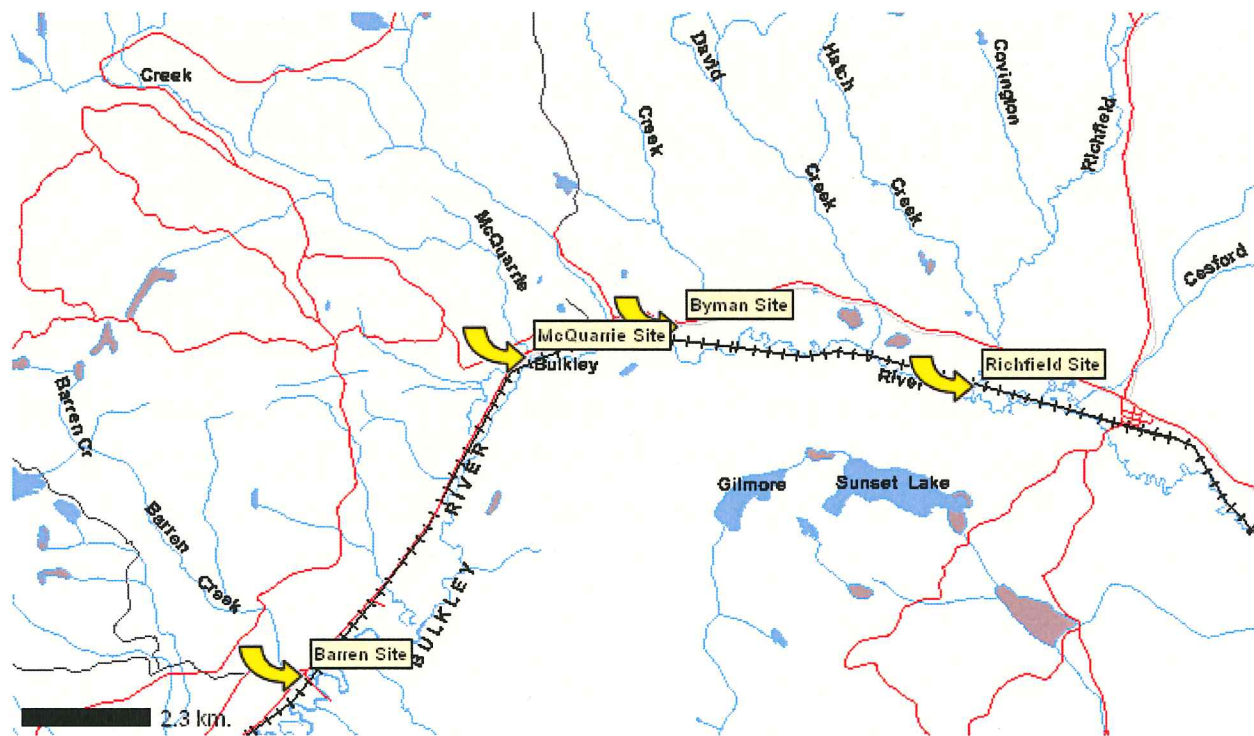
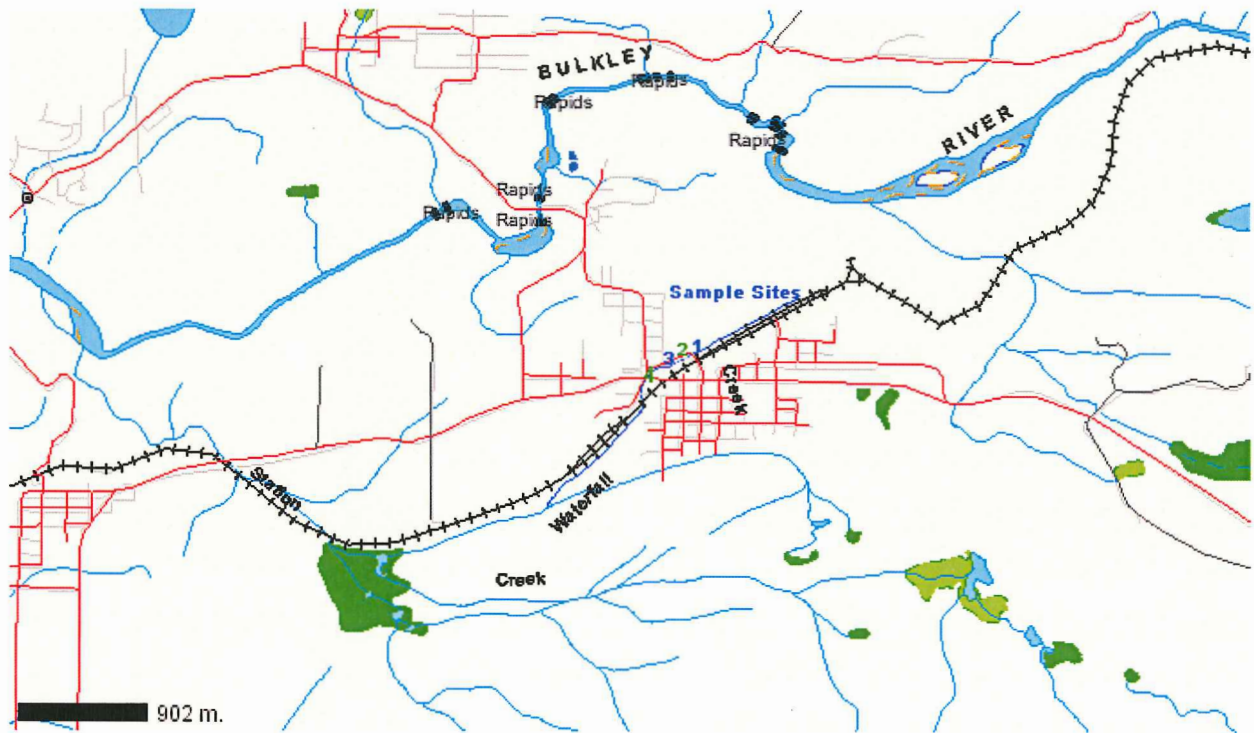


Figure 2. Locations of sites 1-4 sampled in the Waterfall Creek.



3.0 MATERIALS AND METHODS

3.1 *Habitat Assessment*

Sites were selected based on accessibility of sites to salmonids and ease of access during winter sampling. Some of the sites were located at culvert pools at road crossings. Sample site locations are illustrated in Figures 1 and 2.

The Upper Bulkley River sites included Barren Creek, McQuarrie Creek, Byman Creek and Richfield Creek. All of the included streams are tributaries to the Upper Bulkley River and are located between Houston and Topley, B.C. Three of the sites (Barren, McQuarrie and Byman sites) are located at Highway 16 culvert crossings. The Richfield Creek site is a new site not previously sampled.

The Waterfalls Creek sites in New Hazelton are located in the Lower Bulkley River watershed, and were sampled for continuity with the previous years of sampling (Donas and Saimoto 1999, 2000, 2001; Donas and Newman 2006, 2007, 2008).

3.1.1 Winter Assessments

Changes in physical and chemical parameters (Table 1) were recorded in November, January and March for each sample site using a data form designed for overwintering sampling (Appendix 1). Monthly physical and chemical data were collected by removing ice from the limnological/trapping station by hand with an axe or by using a chainsaw (with vegetable oil for chain oil).

These data include air temperature, pH, water temperature, ice thickness, snow depth, dissolved oxygen, and water depth.

Table 1. Physical and chemical parameters recorded on a monthly basis for each site during the overwintering study.

Parameter	Unit/Categories	Method
Air temperature	Celsius	truck thermometer
Ice Cover	percent	visual estimate
Potential for fish migration	None, Low, Moderate, High	visual estimate
water depth	centimeters	meter stick
ice thickness	centimeters	meter stick
clarity of ice	None, Low, Moderate, High	visual estimate
snow depth	centimeters	meter stick
water temperature	Celsius	OxyGuard D. O. Meter
turbidity	None, Low, Moderate, High	visual estimate
Dissolved Oxygen	ppm	Oxyguard
pH	pH units	Hanna H 19812

3.1.2 Fall Assessments

The physical characteristics were evaluated at each site prior to the onset of winter. These site assessments were conducted in November 2009, using an updated data form designed for the project (Appendix 2). The data form was updated from the spring assessment form used in the 2006/07 overwintering study, in order to be more consistent with the Fish Habitat Assessment Procedure (http://www.for.gov.bc.ca/hfd/library/ffip/Johnson_NT1996.pdf). Habitat measurements were documented for all sites (Table 2).

Table 2. Physical parameters recorded in the field for each site sampled in October and November 2009, immediately before ice formation.

	Parameter	Unit/Categories	Methods
pool, glide or riffle	Length of habitat unit	meter	hipchain
	Wetted width	meter	hipchain
	Bankfull width	meter	hipchain
	Max. wetted depth (at deepest point)	centimeter	Meter stick
	Depth at trap cluster location	centimeter	Meter stick
	Depth at riffle crest (at pool outlet)	centimeter	Meter stick
	Residual pool depth	centimeter	N/A
	Total % of wetted area covered	percent	Visual estimate
	Cover % breakdown (adds to 100%)		
	Cobble proportion of site	percent	Visual estimate
	Boulder proportion of site	percent	Visual estimate
	SWD (<10cm diameter)	percent	Visual estimate
	LWD (>10cm diameter)	percent	Visual estimate
	Undercut Banks	percent	Visual estimate
	Total length of undercut area	meter	Meter stick
Average Distance Undercut from edge	centimeter	Meter stick	

	Parameter	Unit/Categories	Methods
	Instream Vegetation	percent	Visual estimate
	Overhanging Vegetation	percent	Visual estimate
	Deep Pools	percent	Visual estimate
	Bed Material (adds to 100%)		
	% fines (< 2mm)	percent	Visual estimate
	% gravel (2-64 mm)	percent	Visual estimate
	% cobble (64-256 mm)	percent	Visual estimate
	% boulder (>256mm)	percent	Visual estimate
	% bedrock	percent	Visual estimate
	Description of other habitat features, impacts or restoration opportunities.	N/A	N/A

3.2 Fish Sampling

Low water temperatures and thick ice cover precluded the use of electrofishers, since electrofishing at water temperatures below 4°C can be harmful to salmonids. Fish sampling was conducted by setting minnow traps baited with roe in nylon bags at each of the sample sites during each sampling period (beginning, middle and end of winter). The minnow traps were left for 24 hours. Fish were recovered from the traps with fish being counted and identified by species and mark type per trap so that Catch Per Unit Effort and species composition could be calculated. Fish were randomly selected from each trap and placed into a separate bucket. Those fish were individually sampled for length and weight. Fish to be sampled were anesthetized with Alka Seltzer and baking soda, identified to species, measured (fork length \pm 1.0 mm), weighed (\pm 0.1 g using an Acculab V1200 electronic balance) and released back into the habitat. Due to difficulties encountered with estimates of population size in the winter of 1998/1999 (Donas and Saimoto 1999), no mark-recapture estimates were conducted in the winter of 2009/2010. Attempts were made to standardize the trapping intensity by considering the surface area of the site and it was assumed that a cluster of three traps would attract juvenile salmonids within a 50 m² surface area.

Trapping intensity at each site changed through the winter, in some cases, due to decreased pool depth in the latter portion of winter. Total catch and particularly catch per unit effort (i.e. catch per trap) was used as an indicator of fish abundance, as suggested in previous studies (Swales *et al.* 1986).

3.3 Fish Fork Length, Size and Condition

Fulton's condition factor was calculated for sampling dates where both length and weight of the fish were recorded. Fulton's condition factor (equation 4) is useful where growth is isometric, and/or if the fish to be compared are of approximately the same length (Ricker 1975, Bagenal 1978). Fulton's condition factor provides a measure of fatness of the fish, which is expected to reflect a fish's health.

Equation 4:
$$K = 10^5 (w / l^3)$$

where: K = Fulton's condition factor
w = weight (g)
l = length (mm)

4.0 RESULTS

4.1 *Habitat Assessment*

Sites chosen in 2009 were at pools associated with road culvert crossings and other pools or glides that were expected to be suitable for overwintering habitat. Most of the sites were also monitored during the 2008/09 study. Four sites on tributaries in the Upper Bulkley watershed, and four sites in the Waterfall Creek mainstem (a tributary to Mission Creek) were sampled. The distribution of sites among general habitat types is summarized in Table 3. Winter and fall habitat assessment forms are located in Appendices 1 and 2, respectively.

4.1.1 Fall Assessments

Fall assessments were conducted at all eight sites in November 2009. Five of the eight sites could be characterized as pool habitat and the remaining three sites as glides. The surface area, width and depth of all sites are summarized in Table 4.

4.1.1.1 Surface Area, Width and Depth

A total of eight sites were sampled in November 2009. Sites ranged in surface area from 33.4 m² to 223.44 m². The Byman Creek site had the largest surface area (223.44 m²). It should be noted that sites 1 and 2 of Waterfall Creek were situated in the same 110 meter long glide, where site 1 was situated at the upper end of the glide and site 2 was situated at the lower end of the glide. The total length of the glide at Waterfall Creek site 1 and site 2 was assumed to be 16.7 meters based on an attraction distance of 8.3m upstream of a cluster of three traps and 8.3m downstream of a cluster of traps.

Wetted width of the Upper Bulkley sites ranged from 4.8 to 14.7 meters and the wetted widths in Waterfall Creek ranged from 4.3 to 6.5 meters. Maximum depths at the Upper Bulkley sites ranged from 87 cms to 130 cms and the maximum depths at the Waterfall Creek sites ranged from 77 cms to 115 centimeters.

4.1.1.2 Habitat, Substrate and Cover

The majority of the habitat sampled consisted of pools (n=5) and the remainder consisted of glides (n=3). Sites sampled had estimated gradients ranging between 0-1 percent. The dominant bed material at the Upper Bulkley sites was gravel (2 – 64 mm) and cobble (64 – 256mm). The

majority of Upper Bulkley sites (Barren, McQuarrie and Byman Creeks) had little to no woody debris (large or small). There was small woody debris at the Richfield Creek site. At the Waterfall Creek sites bed material consisted of mostly fines. The highest proportion of boulders was found at Waterfall Creek site 3, primarily due to rock placed in the channel in summer of 2008.

Cover that would be useable by fish in the winter was provided primarily by deep pools, cobbles, and boulders at all sites. Small woody debris was also present at Waterfall Creek Sites 1-4 (2-5%). It should be noted that at the time of winter sampling the amount of SWD at Waterfall Creek Site 2 had increased due to beaver activity. Cover provided by LWD was present in a small amount (~2%) at Waterfall Creek Site 4. Cover was provided in varied amounts by instream vegetation and overhanging vegetation at most of the sites; however, this cover would not be present during the winter.

Table 3. Site description and sampling times during the Bulkley River overwintering study, Nov 2009 to Mar 2010.

	Site # or Name	Location	Habitat	Surface Area (m ²)
Waterfalls Creek (Lower Bulkley)	Site 1*	Located approx. 1 km upstream of Highway 16 culvert, just downstream of a beaver dam. This is the uppermost site sampled, and is located adjacent to railway tracks.	Glide, fines	76.5
	Site 2*	Located approx. 800 m upstream of Highway 16 culvert, just upstream of a beaver dam. This site is also located adjacent to railway tracks.	Glide, fines	205.4
	Site 3*	Located approx. 500 m upstream of Highway 16 culvert, just upstream of a riffle. Site located adjacent to road.	Pool, fines/cobble/boulder	65.8
	Site 4*	Located just downstream of culvert crossing of road to landing. This site is located approximately 200 m downstream of Highway 16 culvert.	Culvert pool, cobble.	33.4
UBR	Barren Cr.	Located at upstream side of Hwy 16 culvert.	Pool, gravel/fines	62.9
	McQuarrie Cr.	Located at downstream side of Hwy 16 culvert	Pool, cobbles/gravel	59.8
	Byman Cr.	Located at downstream side of Hwy 16 culvert	Pool, gravel/cobble/boulder	223.4
	Richfield Cr.	Located 20m u/s of CNR bridge	Pool, gravel/cobble	53.6

(¹ also see Figure 1 and 2 for site locations

* indicates sites also sampled in the winter of 1999 – 2001, 2005/06, 2006/07, 2007/08

+ indicates site also sampled in the winter of 2005/06 and 2006/07

^ indicates site also sampled in the winter of 2006/07)

Table 4. Surface Area, Wetted Width and Maximum Depth of all sites sampled in Oct. 2009.

	Barren Creek	McQuarrie Creek	Byman Creek	Richfield Creek	Waterfalls Site 1	Waterfalls Site 2	Waterfalls Site 3	Waterfalls Site 4
Wetted Width (m)	4.8	6.8	14.7	9.4	5.1	12.3	4.3	7.5
Max. Depth (cm)	103	87	130	130	83	115	88	77
Surface Area (m ²)	62.9	59.8	223.4	53.6	85.2	205.4	66	38.25

4.1.2 Winter Assessments

Some variability in air and water temperature, dissolved oxygen, pH, water depth, ice cover and thickness, and snow depth were observed among the sites sampled during the winter. Turbidity remained clear throughout the winter at all sites. Quantitative data recorded during the winter sampling at the sites are summarized in Table 5. Refer to Appendix 1 for detailed information.

Air temperature throughout the study ranged from a low of -9°C to a high of 5°C . It was possible to individually sample juveniles on almost all sample dates since air temperature was not below -10°C on fish sampling dates. There was one sample date at Barren Creek where the atmospheric temperature dipped below -10°C and fish could not be sampled. Water temperature ranged from 0.5°C to 2.9°C , with the highest water temperatures recorded at WFC Site 3.

The recorded pH across all sites was within safe limits for salmonids and ranged from 6.9 to 8.0. Dissolved oxygen (DO) levels were also within safe limits for salmonids and were greater than 8 ppm for all sites throughout the sample period. Minimum water depth (37 cm) was recorded at WFC Site 4 on March 22, 2010. Maximum water depth (92 cm) was recorded at Barren Creek on March 23, 2010.

Stream flow ranged from low to moderate at Upper Bulkley sites and from low to high at the Waterfall Creek sites. The potential for fish migrating in and out of the pools at the Upper Bulkley sites was mostly moderate to high and at Waterfall Creek was moderate to high at all sites.

Ice cover throughout the winter at the Upper Bulkley sites ranged from 50%-100%. Ice thickness at the Upper Bulkley sites ranged from 0 cms (Barren Creek site) to 65 cms (Richfield Creek site). Ice cover at the Waterfall Creek sites ranged from 0% (WFC Site 4) to 100% and ice thickness ranged from 0 cms to 47 cms. Snow depth at all the sites ranged from 0 – 20 cm.

Table 5. Summary of winter assessment results at all sites sampled from November 2009 to March 2010.

Variable	N	Minimum	Maximum
Air Temperature	20	-9°C	5°C
Water Temperature	20	0.5°C	2.9°C
Dissolved Oxygen	20	8.6 ppm	14.6 ppm
pH	12	6.9	8.0
Water Depth (cm)	20	37 cm	92 cm
Ice Thickness (cm)	20	0 cm	65 cm
Ice Cover (%)	20	0%	100%
Snow Depth (cm)	20	0 cm	20 cm

N=Number of times the variable was recorded over the course of the winter study.

4.1.3 Changes in Habitat During the Winter

The change in habitat at sites in the Upper Bulkley and Waterfall Creek is presented in the following sections for comparison purposes. Water depth, dissolved oxygen, water temperature and pH measurements are graphed for each site (Figures 3 and 4). Ice cover and snow depth varied throughout the winter (detailed data is in Appendix 1). The pH remained relatively consistent throughout the winter. Air temperature varied throughout the winter since some sites were sampled during warm or cold spells. Only minor decreases in water temperatures occurred at all sites throughout the winter (Refer to data sheets in Appendix 1 for more detailed information).

4.1.3.1 Upper Bulkley Tributary Sites

Water depths at the Upper Bulkley sites are presented in Figure 3. Water depths at all sites ranged from 42 cms to 92 cms throughout the winter. The dissolved oxygen (DO) was consistently greater than 8 ppm at all sites. Ice thickness ranged from 5 cms to a maximum of 65 cms (Richfield Creek, March 23, 2010). Ice cover was between 50% and 100% at all sites throughout the winter. Snow depth ranged from 0 to 20 cms at all sites.

Bulkley River Overwintering Study 2009-2010

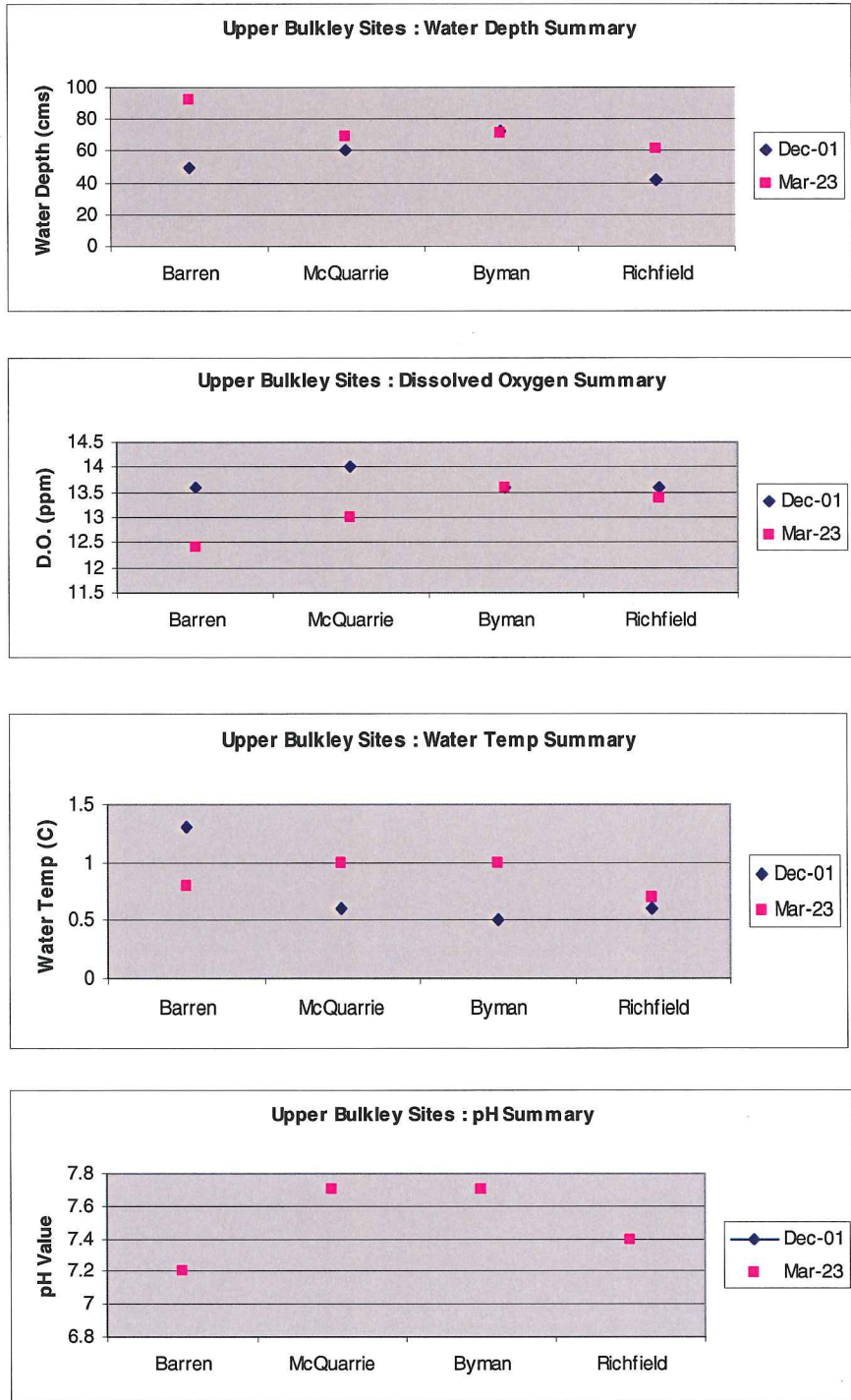
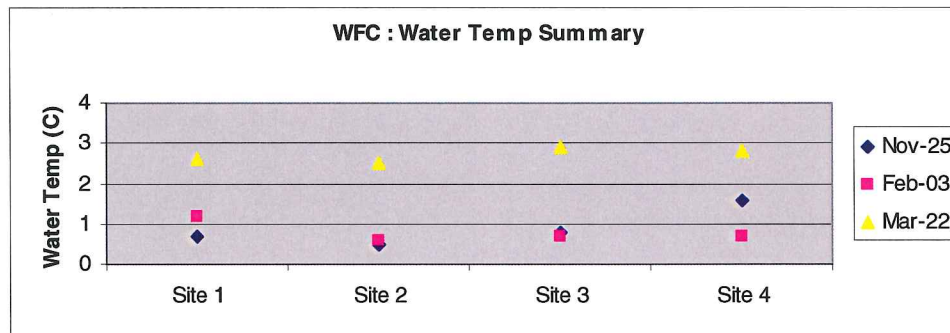
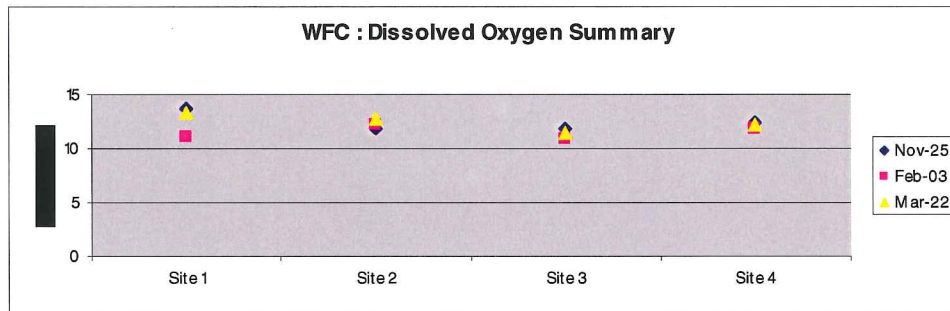
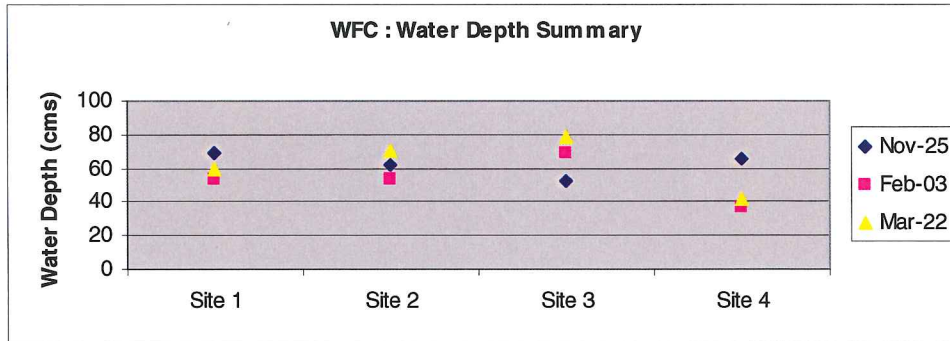


Figure 3 : Upper Bulkley Sites : Water Depth (cms), Dissolved Oxygen (ppm), Water Temperature (C) and pH : 2009/10

4.1.3.2 Waterfall Creek Sites

Water depths varied throughout the winter at all Waterfall Creek sites. There was beaver activity in Waterfall Creek around Sites 1, 2 and 3 throughout the winter. Site 4 had the greatest decrease in water depth over the winter compared to the other three sites. The dissolved oxygen (DO) and pH levels of all four sites were well within safe limits for salmonids. Ice cover was 100% at all sites by the middle of winter (Feb 3, 2010) and ice thickness was greatest during middle of winter at all sites.



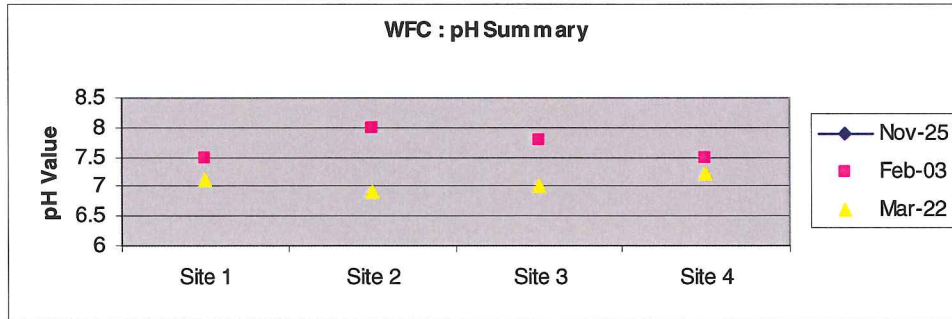


Figure 4 : Waterfall Creek : Water Depth (cms), Dissolved Oxygen (ppm), Water Temperature (°C) and pH : 2009/10

4.2 Fish Sampling

Coho, rainbow trout (RBT/steelhead), cutthroat trout and Dolly Varden char were captured during the overwintering study. The following sections present fish sampling results for the Upper Bulkley and Waterfall Creek sites sampled between December 2009 and March 2010.

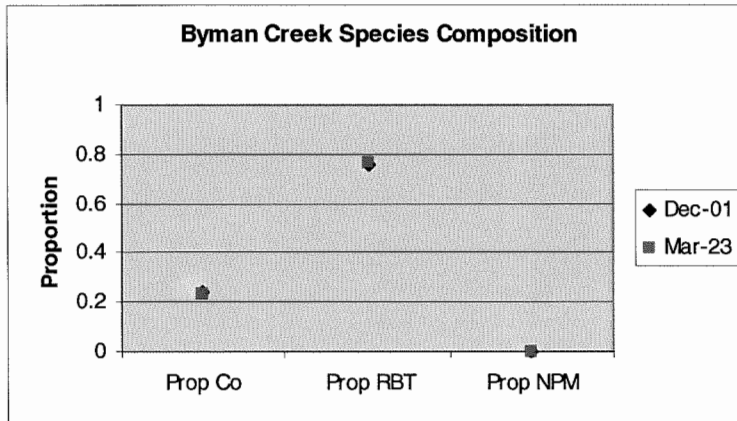
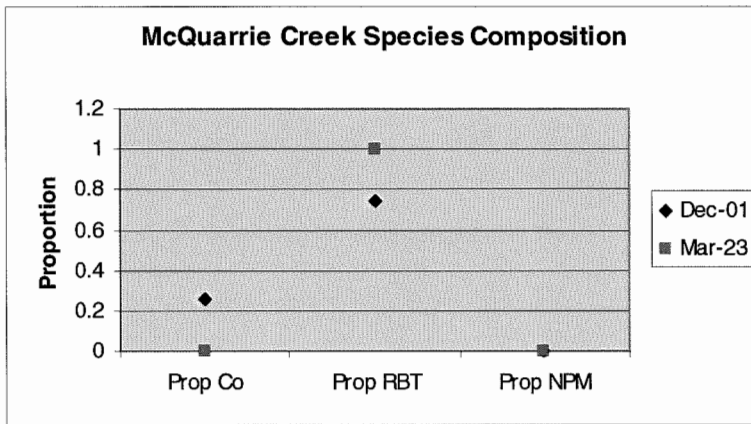
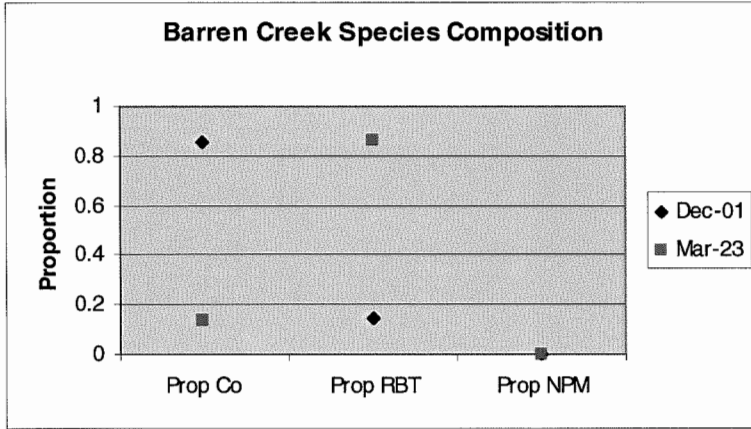
4.2.1 Upper Bulkley Sites

Coho, RBT/sthd and Northern pike minnows were captured during the overwintering study conducted at the Upper Bulkley sites between December 2009 and March 2010. The species composition, as well as fish fork length frequencies and condition will be discussed. Appendix 1 contains all the fish capture data for each site throughout the winter sampling program.

4.2.1.1 Species Composition

The species composition varied between the four sites and dates sampled at the Upper Bulkley sites (refer to Figures 7 to 9). All four of the Upper Bulkley sites were sampled two times throughout the winter.

A total of 88 coho and 160 rbt/sthd juveniles were captured throughout the overwintering study. There was 1 Northern pike minnow captured at Richfield Creek and no other species were captured. The species composition is shown in Figure 5.



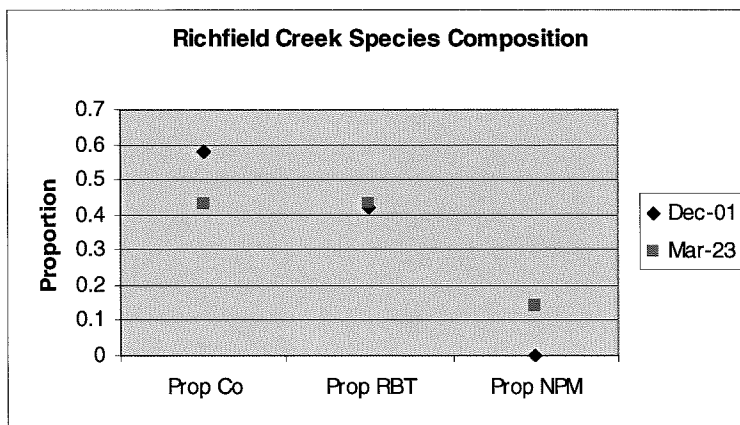


Figure 5. Species Composition at Upper Bulkley Sites : 2009/10

4.2.1.2 Fork Length and Condition Comparisons

Fork length and weight data were collected for salmonids throughout the overwintering study. A total of 68 Coho and 120 RBT/sthd were measured at the Upper Bulkley sites over the winter. Length, weight and condition data are summarized in the following sections. Coho has been presented in two categories estimated from fork length distributions attained from fish captured at sites at the Upper Bulkley tributary sites from 2005-2009. Based on length frequency distributions of Coho, two fork length categories have been created for 80 mm or less Coho, and Coho greater than 80 mm.

Fork length and weight data were collected for the Coho at most of the sites. On December 1st at Barren Creek, the air temperature was -10 degrees so no individual sampling was done at the Barren Creek site. Length, weight and condition factor data for sites sampled are provided in Appendix 1. The fork length comparisons for Coho salmon have been presented by month in two fork length categories (i.e., ≤ 80 mm and > 80 mm).

Figure 10 depicts Coho salmon fork length frequency by month for the Upper Bulkley sites. Overall, there were 41 Coho captured that were ≤ 80 mm long and 27 coho captured that were > 80 mm long. Catch by FL category is shown in Figure 6.

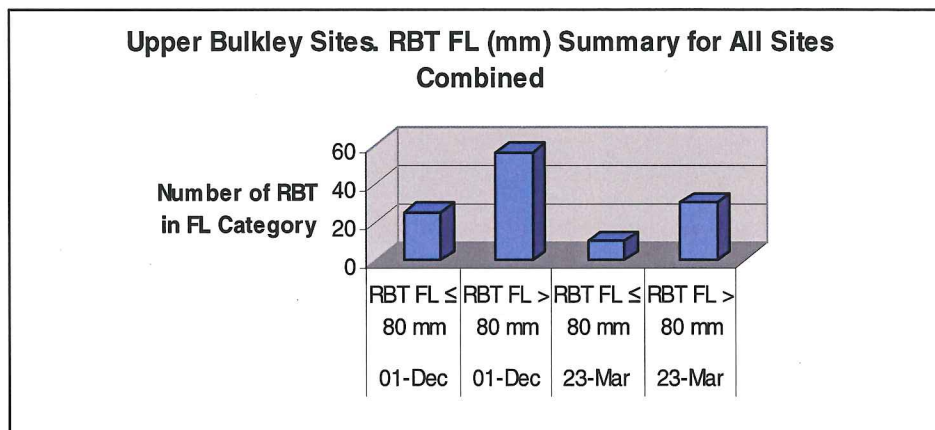
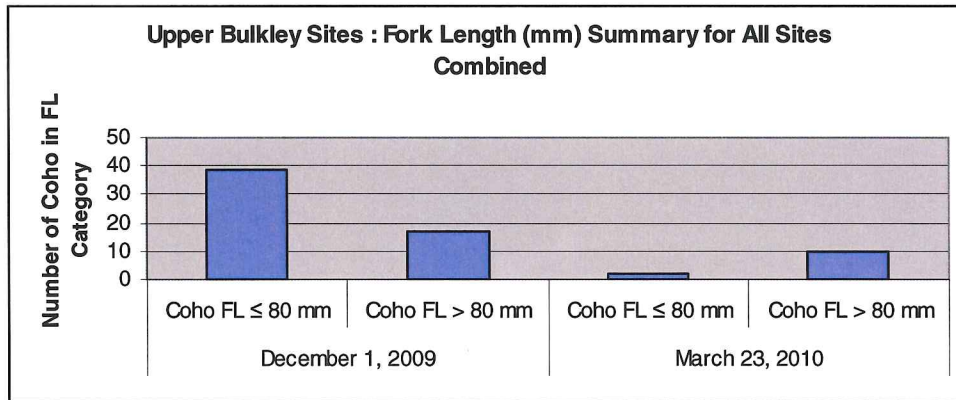


Figure 6. Upper Bulkley Sites : Coho and RBT Fork Length (FL) Frequency by FL Category 2009/10

The mean Fulton's condition factor (FCC) by month and fork length (FL) category has been presented for coho and RBT for all the Upper Bulkley sites (Figure 7). The mean FCC for coho in the ≤ 80 mm FL category ranged from .94 to 1.24 at all sites throughout the winter. The mean FCC for coho in the > 80 mm FL category ranged from .91 to 1.20. The highest mean FCC's for Coho were recorded at the Richfield Creek site for both sample dates (Figure 7).

Bulkley River Overwintering Study 2009-2010

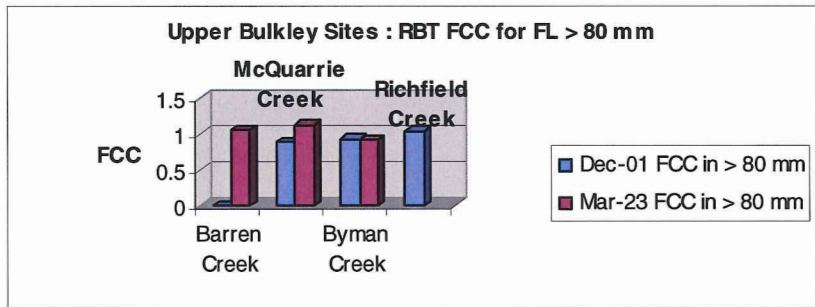
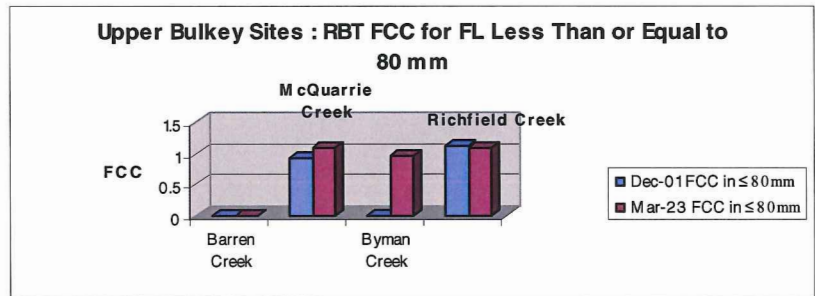
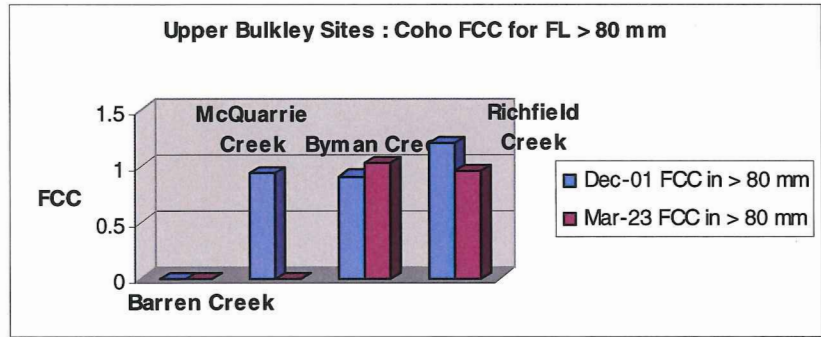
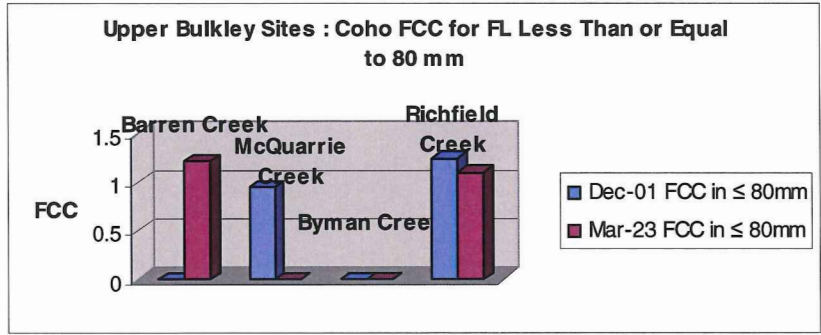


Figure 7. Upper Bulkley Sites : Coho and RBT Mean FCC by FL Category : 2009/10

4.2.2 Waterfall Creek Sites

Coho and Dolly Varden were captured at Waterfall Creek between November 2009 and March 2010. The species composition, as well as fish fork length frequency and condition will be discussed for all four sites sampled at Waterfalls Creek.

4.2.2.1 Species Composition

The species composition varied between the four sites and dates sampled at Waterfalls Creek (refer to Figures 12-15). Overall, site 2 contained the highest number of fish of all the Waterfall Creek sites. There were fewer Dolly Varden than Coho captured at the Waterfall Creek sites, similar to findings of the 2006/07, 2007/08 and 2008/09 studies.

Species composition is shown in Table 6 and for capture information refer to Appendix 1.

Table 6. Waterfall Creek 2009/2010 : Summary of Species Composition by Sample Date and Site

Sample Date	Nov 25, 2009			
WFC Site	Prop'n Coho	Prop'n DV	Prop'n RBT	Prop'n CT
1	.95	.05	0	0
2	.916	.08	.004	0
3	.866	.124	0	.01
4	.771	.186	.04	0

Sample Date	Feb 3, 2010			
WFC Site	Prop'n Coho	Prop'n DV	Prop'n RBT	Prop'n CT
1	0.914	0.074	0	0.012
2	0.981	0.019	0	0
3	0.992	0.008	0	0
4	0.772	0.14	0.088	0

Sample Date	Mar 23, 2010			
WFC Site	Prop'n Coho	Prop'n DV	Prop'n RBT	Prop'n CT
1	0.803	0.197	0	0
2	0.823	0.177	0	0
3	0.903	0.081	0.016	0
4	0.333	0.542	0.125	0

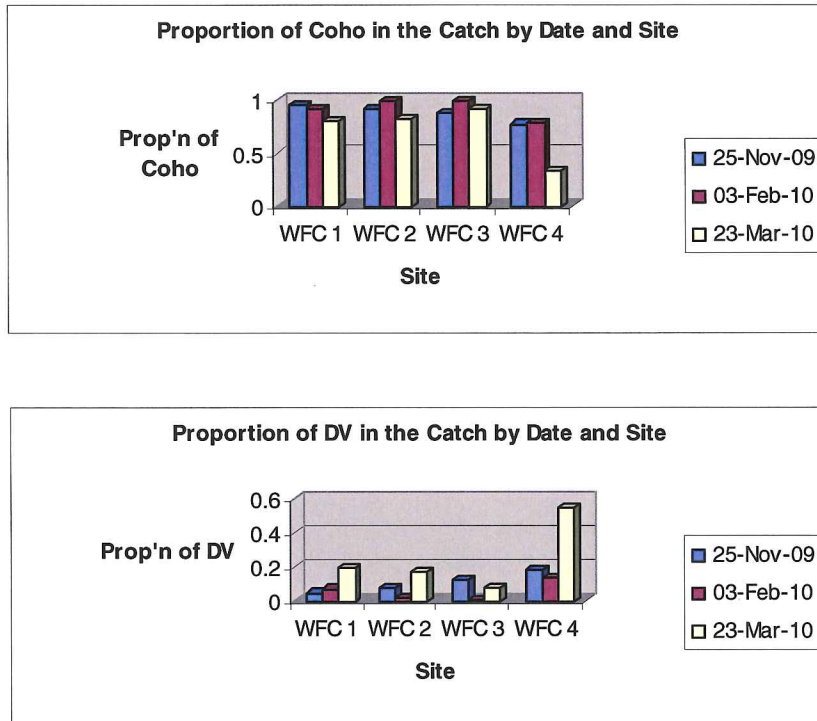


Figure 8. Waterfall Creek Sites 1 to 4 : Species Composition for Coho and Dolly Varden

The proportion of coho in the catch at all sites across all sample dates is greater than 75% with the proportions of coho in the catch ranging from 77% to 95%. The proportion of Dolly Varden in the catch ranges from 0.8% to 54.2% with Site 4 having consistently higher proportions of Dolly Varden in the catch as compared to the other three sites. The proportions of Rainbow trout in the catch were also highest at Site 4.

4.2.2.2 Fork Length and Condition Comparisons

Fork length and weight data were collected for salmonids throughout the overwintering study. A total of 1,272 Coho, 122 Dolly Varden, 3 Cutthroat trout and 12 Rainbow trout were captured at the Waterfall Creek sites during the overwintering study. Length, weight and condition data for Coho and Dolly Varden are summarized in the following sections.

4.2.2.3 Coho

Fork length and weight data was collected for about half of Coho captured at the Waterfall Creek sites. Length, weight and condition factor data for sites sampled are provided in Appendix 1. The fork length comparisons and Fulton’s condition factor (FCC) data for Coho salmon has been presented by month in two fork length categories (i.e., less than or equal to 80 mm and greater than 80 mm) for each site.

Figure 9 depicts Coho salmon fork length frequency by month for sites 1-4 of Waterfall Creek. The proportion of Coho captured at sites 1-4 that were greater than FL of 80 mm increased over the winter as compared to the proportions of Coho with FL \leq 80 mm which decreased over the winter.

Across all sites, approximately 56% of the total coho catch was comprised of fish with FL \leq 80 mm.

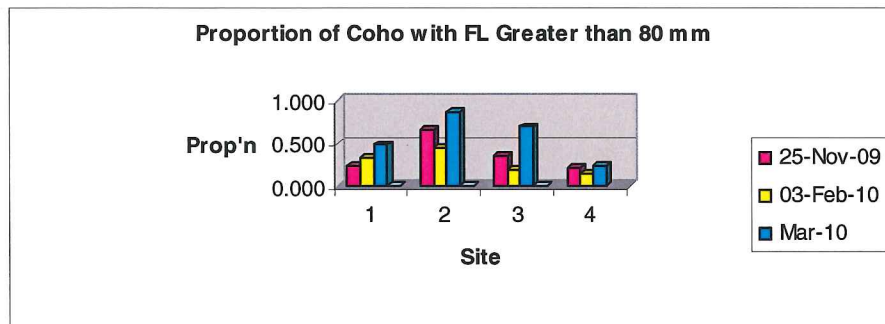
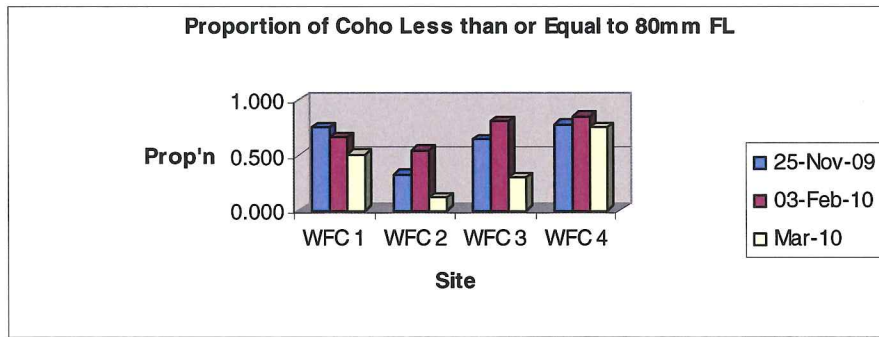


Figure 9. Proportions of Coho at WFC Sites with FL less than or equal to 80 mm and with FL greater than 80 mm

Figure 10 presents mean Fulton's condition factor (FCC) for Coho salmon by month and fork length (FL) category for sites 1-4. FCC's in both FL categories (\leq 80 mm and $>$ 80 mm) ranged from 0.95 to 1.01 across all sites over the entire winter. In general fish appeared to be in good condition throughout the winter months.

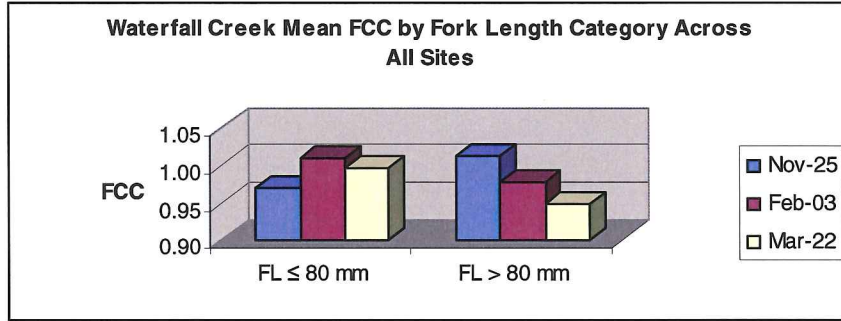


Figure 10. Waterfall Creek Mean FCC by Fork Length Category Across All Sites

4.2.2.4 Dolly Varden

Fork length and weight data was collected for the majority of the Dolly Varden (DV) captured during the study of the Waterfall Creek sites. Length, weight and condition factor data for sites sampled are provided in Appendix 1. The fork length comparisons and Fulton’s condition factor (FCC) data for Dolly Varden has been presented by month in two fork length categories (i.e., less than or equal to 80 mm and greater than 80 mm) for each site.

Figure 11 and Table 7 depict Dolly Varden (DV) fork length frequency by month for sites 1-4 of Waterfall Creek. There were only 2 DV in the FL ≤ 80 mm category and there were 61 DV in the FL > 80 mm category.

Table 7. Waterfall Creek : DV Fork Length (FL) by Category

Site	DV FL ≤ 80 mm 25-Nov-09	DV FL > 80 mm 25-Nov-09	DV FL ≤ 80 mm 03-Feb-10	DV FL > 80 mm 03-Feb-10	DV FL ≤ 80 mm Mar-10	DV FL > Mar-10
WFC 1	0.333	0.667	0.000	1.000	0.143	0.857
WFC 2	0.000	1.000	0.000	1.000	0.000	1.000
WFC 3	0.000	1.000	0.000	0.000	0.000	1.000
WFC 4	0.000	1.000	0.000	1.000	0.000	1.000

Bulkley River Overwintering Study 2009-2010

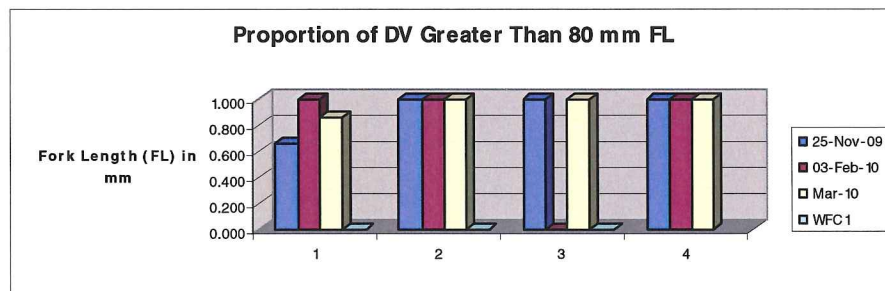
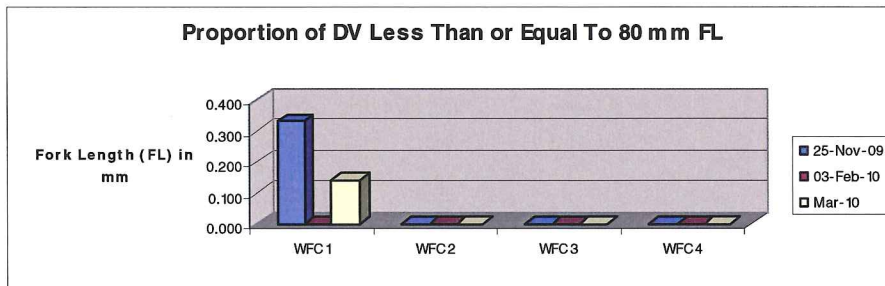


Figure 11. Waterfall Creek DV Fork Length

Mean Fulton's condition factor (FCC) for DV is shown by sample date and fork length (FL) category in Table 8 and Figure 12.

Table 8. DV Mean FCC by FL Category

	Mean FCC FL ≤ 80 mm	Mean FCC FL > 80 mm
Nov-25	1.03	0.95
Feb-03	na	0.90
Mar-22	1.35	0.86

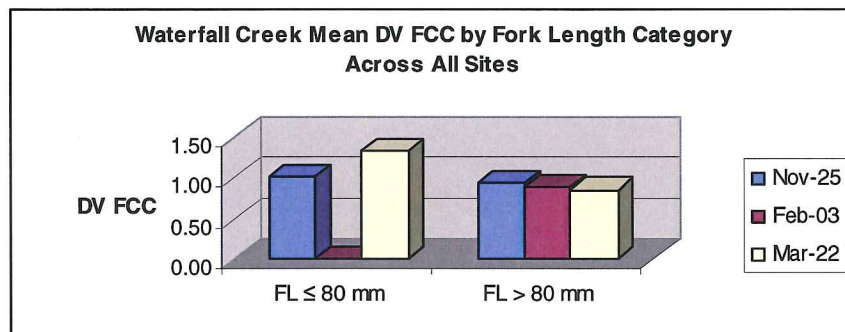


Figure 12. Waterfall Creek DV Mean FCC by FL Category

4.3 Density Indices (CPUE)

Fish capture data was used to calculate catch per unit effort (CPUE). Total catch and CPUE during the overwintering study (Nov.-March) is summarized for each of the sites in Table 9.

Total catch and CPUE was highest at Waterfall Cr. (Site 2) and lowest at the Barren Creek site. Total catch over the winter ranged from 485 fish at Waterfall Cr. (Site 2) to 14 fish at the Barren Creek site. Coho salmon comprised the majority of the catch (greater than 50%) at all Waterfall Creek sites but comprised less than 50% of the catch at the Upper Bulkley sites. The highest percentage of Dolly Varden were captured at Waterfall Cr. (Site 4).

Table 9. Summary of trap catches of juvenile salmonids at all sites sampled during the 2009/10 overwintering study.

<u>Site</u>	<u>No. Tra ps</u>	<u>Coho Set C</u>	<u>%</u>	<u>RBT</u>		<u>CT</u>		<u>%</u>	<u>CPUE</u>	<u>DV C</u>	<u>%</u>	<u>CPUE</u>	<u>All Species C CPUE</u>	
				<u>C</u>	<u>%</u>	<u>C</u>	<u>%</u>						<u>C</u>	<u>CPUE</u>
Barren Cr	5	7	50%	1.4	7	50 %	0	0.0%	0	0	0%	0	14	2.8
McQuar.	6	20	25%	3.3	61	75 %	0	0.0%	0	0	0%	0	81	13.5
Byman	6	19	24%	3.2	61	76 %	0	0.0%	0	0	0%	0	80	13.3
Richfield	6	42	57%	7	31	42 %	0	0.0%	0	0	0%	0	74	12.3
WFC 1	9	327	91%	36.3	0	0.0 %	1	0.3%	0.11	30	8%	3.33	358	39.8
WFC 2	9	447	92%	49.7	0	0.0 %	1	0.2%	0.11	37	8%	4.11	485	53.9
WFC 3	9	392	94%	43.6	1	0.2 %	1	0.2%	0.11	21	7%	2.33	415	46.1
WFC 4	9	106	70%	11.8	11	7% %	0	0.0%	0	34	23%	3.77	151	16.8

C=total catch, %=proportion of the total catch, CPUE=mean catch of each species using monthly CPUE data.

The following figures present CPUE data by sampling date, as well as between sites and by species. The CPUE for Coho salmon for all the sites sampled for fish are presented in Figure 13. The CPUE for Rainbow Trout/sthd is presented for the Upper Bulkley sites in Figure 14. CPUE for Dolly Varden is presented for the Waterfall Creek sites in Figure 15.

4.3.1 CPUE for Coho

The CPUE for Coho salmon at the beginning of winter differed among the three sites in the Upper Bulkley watershed with the highest CPUE for Coho at the beginning of winter at the McQuarrie Creek site. The lowest CPUE for coho was McQuarrie Creek at end of winter when no coho were captured. There were less Coho captured at all three sites on the Upper Bulkley as compared to the Waterfall Creek sites where coho CPUE was much higher. The coho CPUE at Waterfall Creek ranged from 2.7 at WFC Site 4 to 79.3 at WFC Site 3.

A Summary of Catch Per Unit Effort by date is shown in Table 10.

Table 10. Upper Bulkley Sites CPUE Summary : 2009/2010

Site	Nov/ Dec 2009				Feb 2010				Mar 2010			
	Co	D V	C T	RB	Co	D V	C T	RB	Co	D V	C T	RB
WFC #1	66.7	3.7	0	0	24.7	2	.3	0	17.7	4.3	0	0
WFC #2	76	6.7	.3	0	51.3	1	0	0	21.7	4.7	0	0
WFC #3	32.7	4.7	.3	0	79.3	.7	0	0	18.7	1.7	0	.3
WFC #4	18	4.3	0	1	14.7	2.7	0	1.7	2.7	4.3	0	1
Barren	3	0	0	.5					0.3	0	0	2
McQuarrie	6.7	0	0	19					0	0	0	1.3
Byman	3.7	0	0	11.3					2.7	0	0	9
Richfield	13	0	0	9.3					1.0	0	0	1

The CPUE for Coho salmon decreased overall from beginning to end of winter at all Waterfall Creek and Upper Bulkley sites as shown in Figure 13. The CPUE for RBT at the Upper Bulkley sites also decreased from beginning to end of winter.

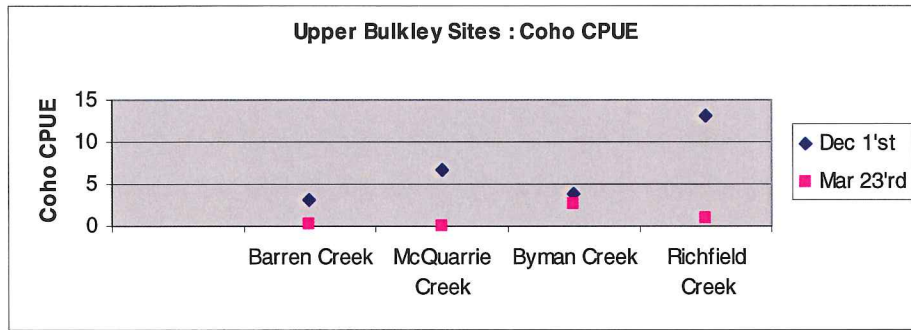
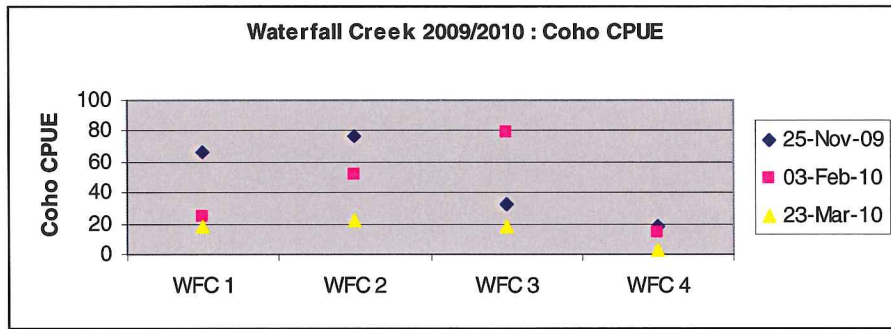


Figure 13. Coho CPUE at the Waterfall Creek and Upper Bulkley Sites (2009/2010).

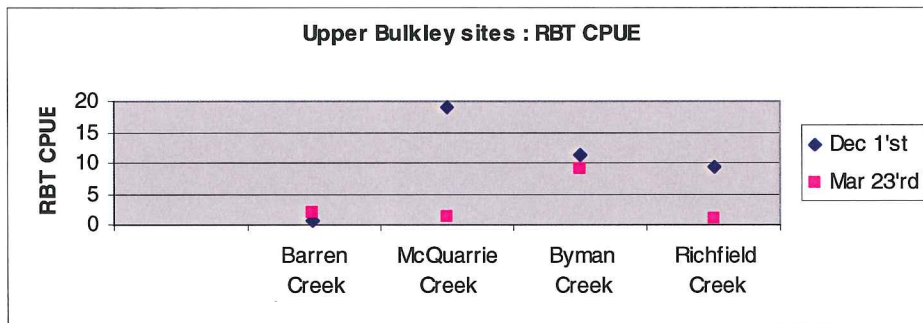


Figure 14. RBT CPUE at the Upper Bulkley Sites : 2009/10

4.3.2 CUPE for Dolly Varden (DV)

Dolly varden were captured at the Waterfall Creek sites only. The CPUE for DV at WFC sites 2 and 3 decreased from the beginning to middle/end of winter samples dates. The CPUE for DV at Site 1 increased at the end of winter and the CPUE for site 4 was the same at beginning and end of winter (CPUE = 4.33).

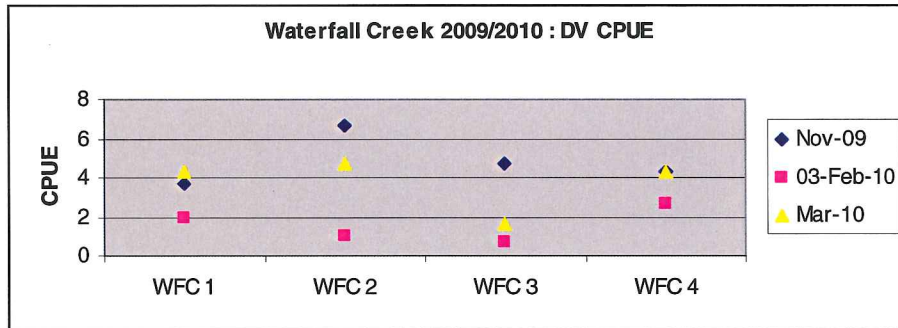


Figure 15. CPUE for Dolly Varden at the Waterfall Creek sites 1-4 (2009/10).

4.3.3 CPUE for RBT(Rainbow Trout/steelhead) and Cutthroat Trout (CT)

Rainbow Trout/steelhead juveniles were captured at both the Waterfall Creek sites and the Upper Bulkley sites. Prevalence of RBT was greater at the Upper Bulkley sites and CPUE for RBT ranged from 0.5 (Barren Cr.) to 19 (McQuarrie Creek). The presence of RBT juveniles in Waterfall Creek is surprising as there is an impassable culvert on Mission Creek, approximately 1 km from the confluence with the Bulkley River. Waterfall Creek is several kilometers upstream of that culvert.

CPUE for RBT in both Waterfall Creek and at the Upper Bulkley sites is shown in Figure 16.

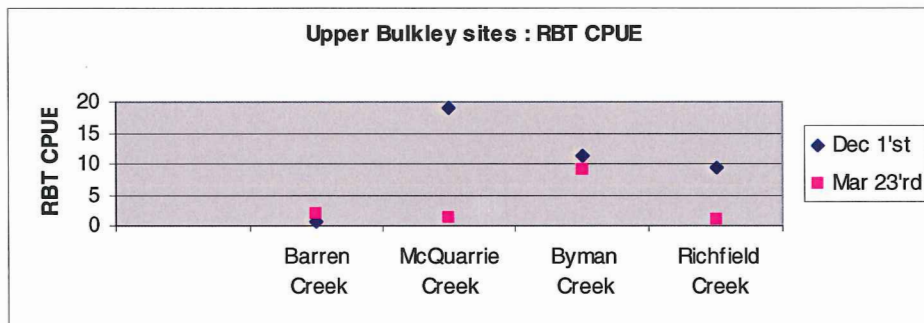
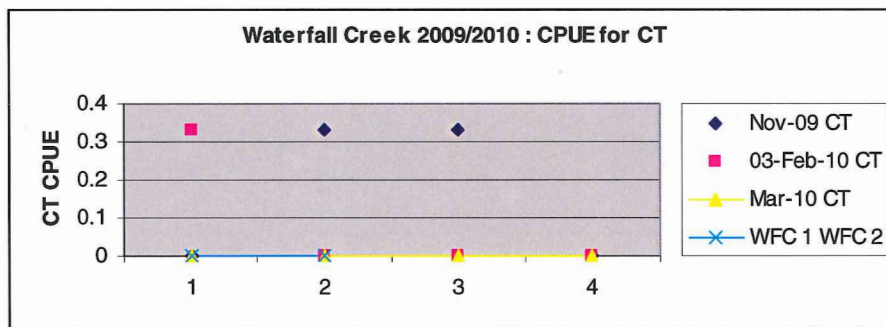
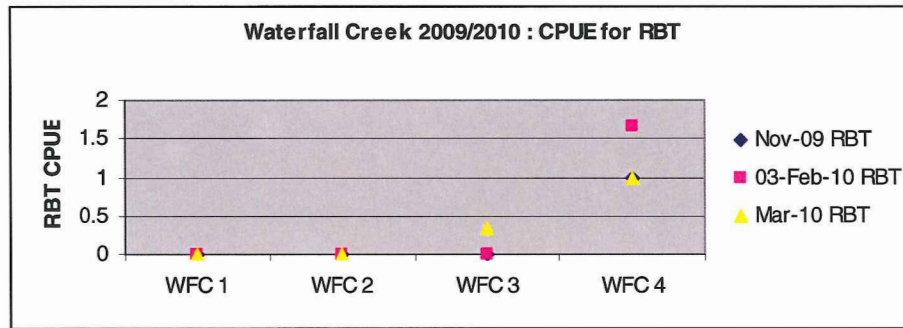


Figure 16. CPUE for RBT and CT for Waterfall Creek and Upper Bulkley Sites (2009/2010)

4.4 Right Maxillary Clip (Rmax) Percentage – Waterfall Creek Coho

The Coho captured at the Waterfall Creek sites were checked for the presence of a hatchery mark (i.e. right maxillary clip) over the winter. The percentage of Coho with right maxillary clips, used to mark the Mission Creek Hatchery fry prior to release to the wild, ranged from 8.8% (Waterfall #1, Nov 24/08) to 50% (Waterfall #3, Feb 3, 2010). Most of the Rmax clipped coho (103) were in the FL \leq 80 mm category and only 12 coho were in the FL > 80 mm category. Figure 17 depicts the percentage of Coho with right maxillary clips at the Waterfall Creek sites where marking was checked.

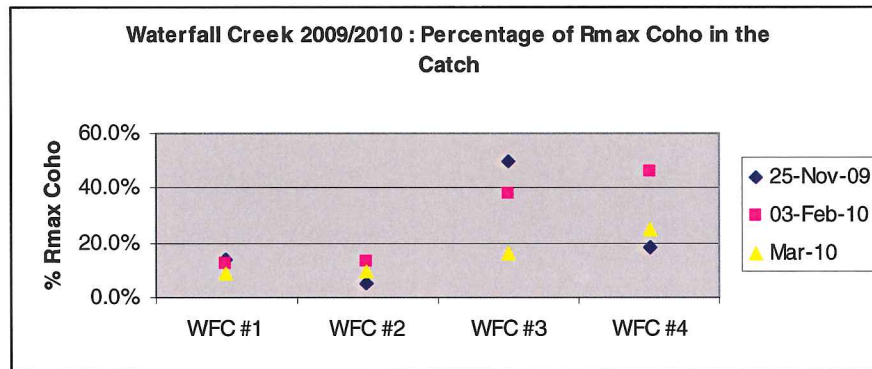


Figure 17. Percentage of Rmax Coho in the Catch at the Waterfall Creek Sites (2009/2010)

5.0 DISCUSSION & COMPARISON TO WINTER STUDIES CONDUCTED FROM 2005 TO 2010.

As noted in previous overwintering studies (Donas and Saimoto 2001a, 2001b; Donas and Newman 2006; Donas and Newman 2007), watershed characteristics, as well as habitat types sampled are expected to influence species composition, fish size and condition, and fish densities such as CPUE. Therefore, it can be expected for results to vary as they have between sites of this study. Winter has been documented to be a critical time in the life history of salmonids (Bustard and Narver 1975), since this season can affect fish health and survival (Bustard and Narver 1975, Dolloff 1987). Many habitat types, such as beaver ponds, lakes, mainstems and tributaries have been identified as important overwintering habitat for salmonids (Bustard and Narver 1975, Swales et al. 1986). Within these habitat types, the importance of cobble substrate, deep pools and organic cover have been documented (Bustard and Narver 1975, Swales et al. 1986, Dolloff 1987). Differences in species composition, densities and fish size are expected to occur as a result of habitat composition at the different sample sites. As used in previous overwintering studies (Donas and Saimoto 1999-2001; Donas and Newman 2006; Newman and Donas 2007 and 2008), the two main indicators of habitat suitability in this

study were species density indices (CPUE) and fish size (fork length, weight and condition).

5.1 Winter Habitat Assessments

Overall, there seemed to be a greater number of fish captured at sites with water depths greater than approximately 50 centimeters or in areas influenced by groundwater.

There was no sampling conducted at the McKinnon Creek sites, Hydro Pole 12 site or at the Proctor Groundwater Channel during the 2009/2010 winter. However, comparison of water depth from the winter habitat assessments at the Hydropole 12 and Groundwater site up to the 2008/09 winter is provided below. Overall, water depth at the Hydropole 12 site appeared to be highest in 2008/09, compared to 2005/06 and 2006/07 (Figure 18). It should be noted that water levels were too low at Hydropole 12 to sample in winter 2007/08. Water depths at the Groundwater site were highest in 2008/09 due to the overwintering enhancement project conducted at the Groundwater channel in July 2008 where the channel was excavated deeper and connectivity to McKinnon Creek flow was increased (Figure 19).

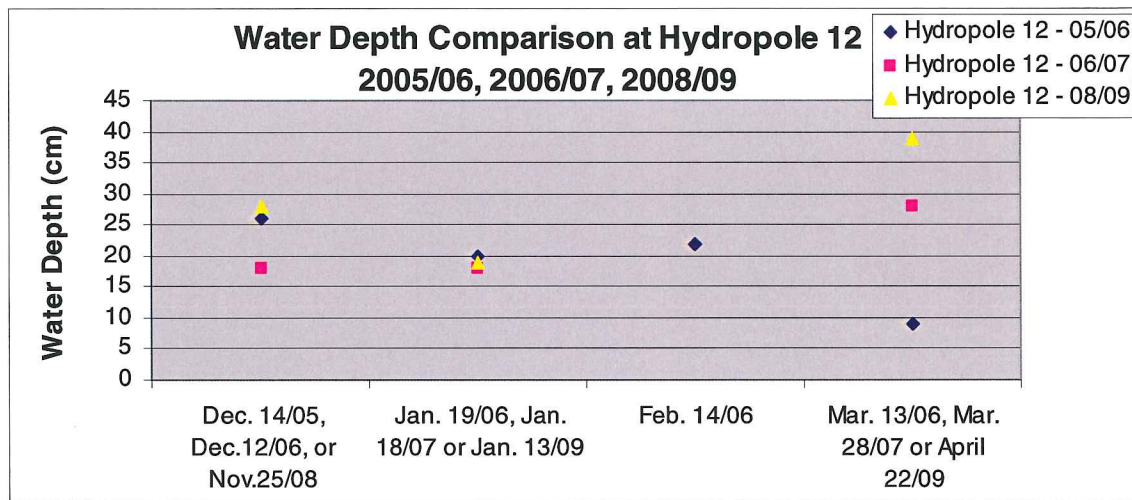


Figure 18. Water Depth Comparison at the unnamed creek at Hydropole 12 (2005/06, 2006/07 and 2008/09).

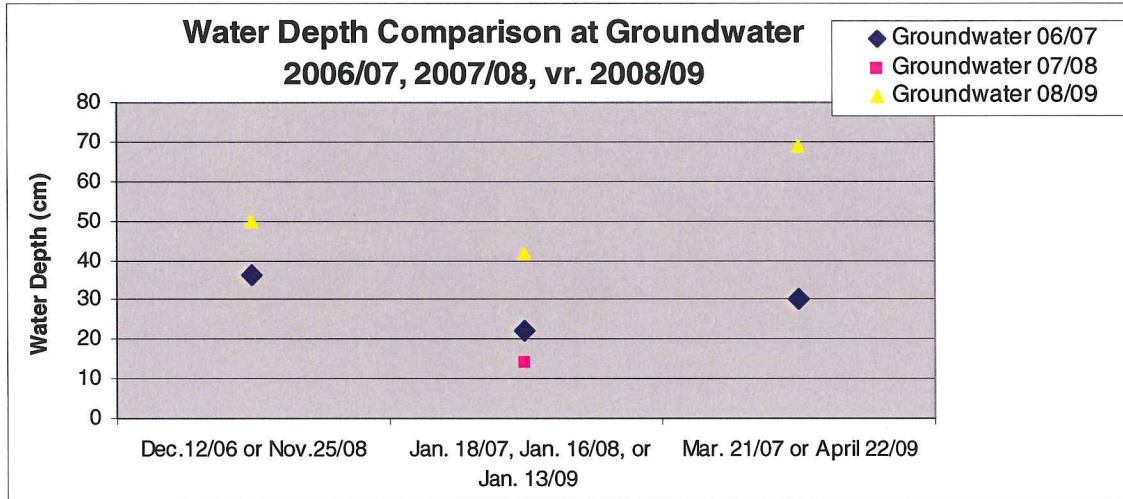
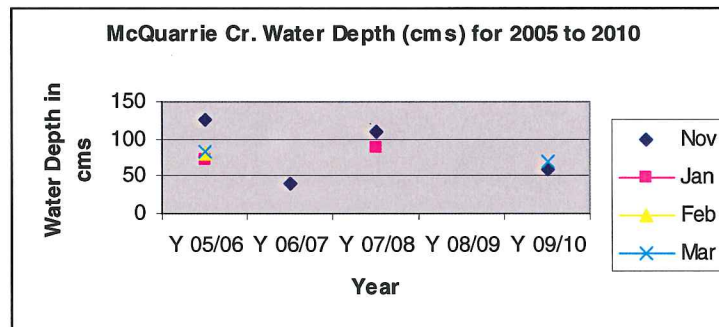
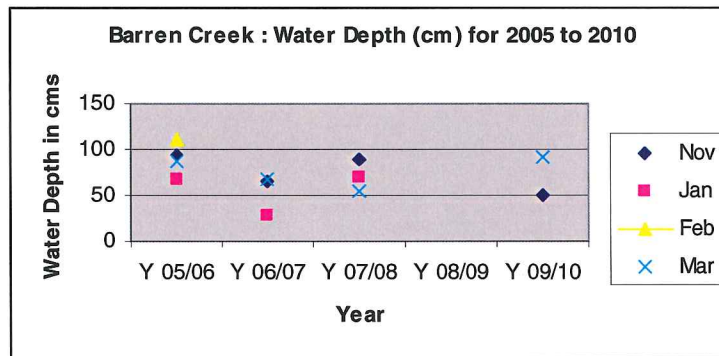


Figure 19. Water Depth Comparison at the Groundwater site (2006/07, 2007/08, 2008/09).

At the Upper Bulkley sites, winter habitat assessments found most sites to have sufficient water depth and dissolved oxygen (Appendix 1) throughout the winters when sampling was conducted. At most of the sites water level decreased from beginning to end of winter and ice thickness increased from beginning to end of winter (Figure 20).



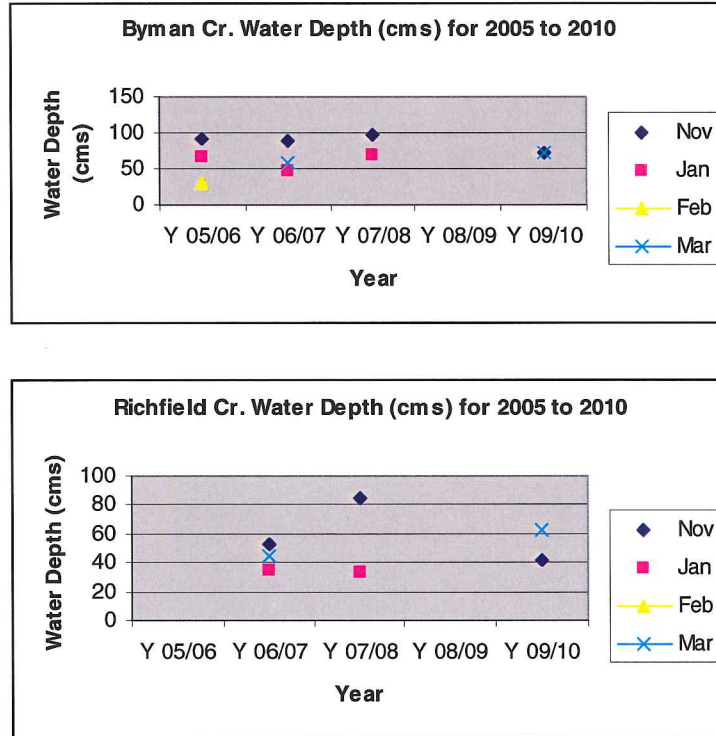


Figure 20. Water Depths at Upper Bulkley Sites for 2005 to 2010

Winter habitat assessments at Waterfall Creek found most sites to have sufficient water depth and dissolved oxygen throughout the winter during all four study periods (Figures 21 to 24). Water depth at Site 1 appeared to be highest during the 2007/08 study period, as compared to the other study periods (Figure 21). Site 2 had sufficient water depths and dissolved oxygen throughout the winter from 2005-08, but not in 2009. The water depth likely decreased at site 2 in the 2008/2009 study, due to less beaver activity in the area or the beaver dam being pulled prior to winter (Figure 22 and Photo 1). The water level returned to average levels in the winter of 2009/2010 due to beaver activity. (Photo 1 shows location of new beaver dam at WFC Site 2).

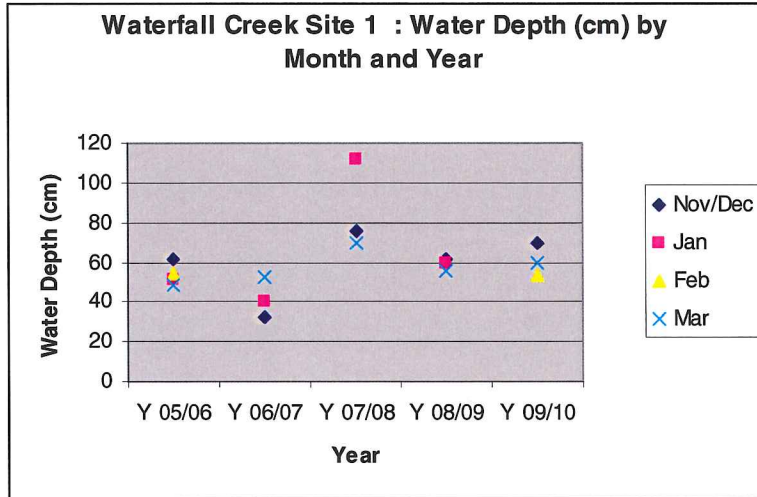


Figure 21. Water Depth Comparison at Waterfall Site 1 (2005/06 to 2009/2010)

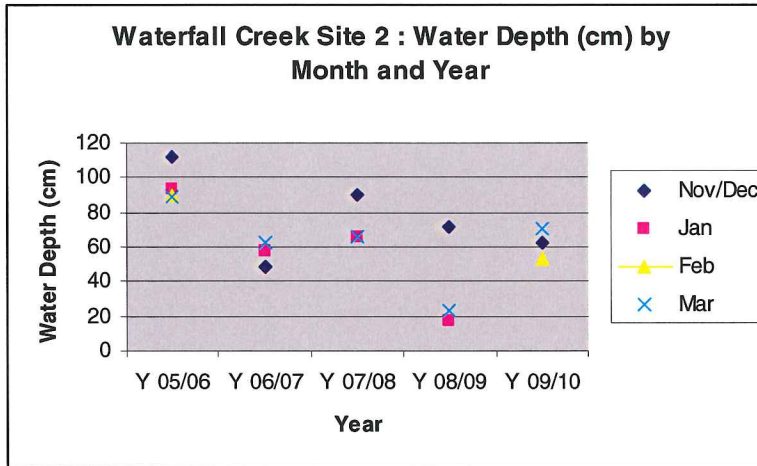


Figure 22. Water Depth Comparison at Waterfall Site 2 (2005/06to 2009/2010)

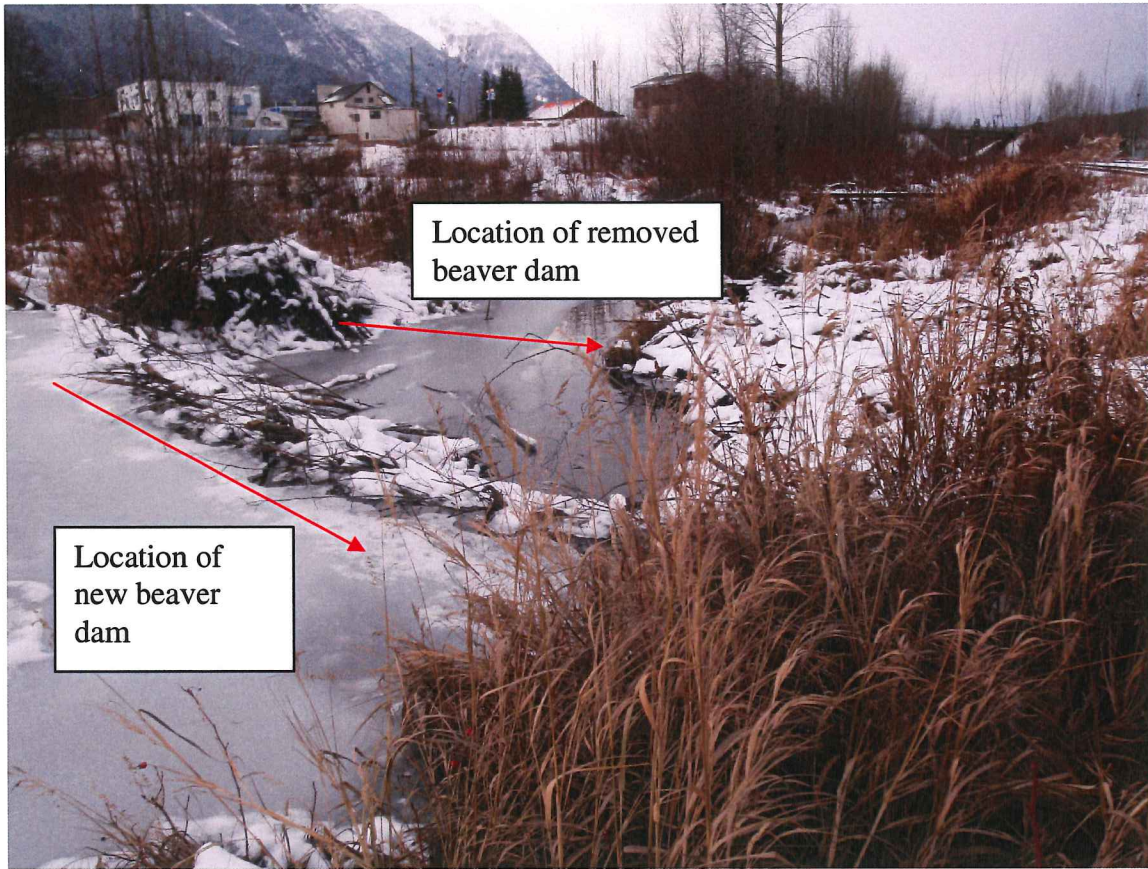


Photo 1. WFC Site 2 : Locations of beaver dams affecting Site 2 water levels.

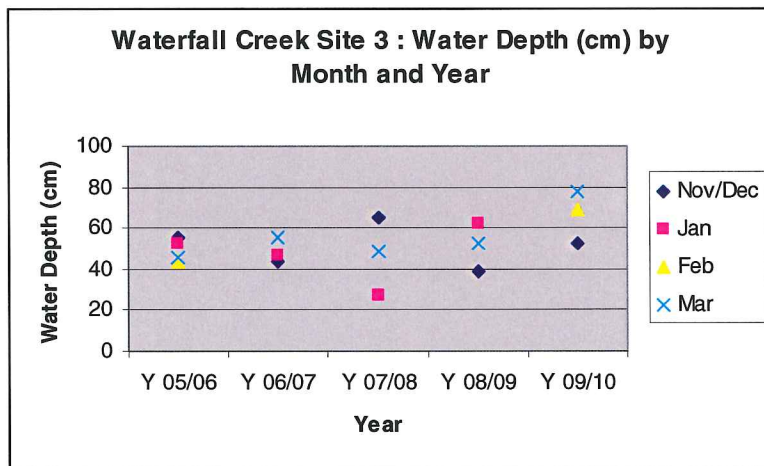


Figure 23. Water Depth Comparison at Waterfall Site 3 (2005/06 to 2009/2010)

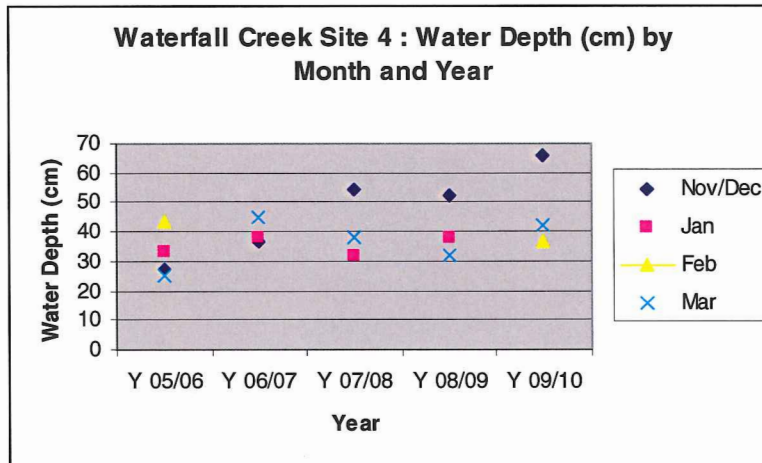


Figure 24. Water Depth Comparison at Waterfall Site 4 (2005/06 to 2009/2010)

Water depth at WFC Site 4 has been consistent during the winters of 2005/06 to 2009/10 with mean water depth around 41 cms.

5.2 Species Composition and Diversity

Upper Bulkley Sites

The Upper Bulkley Sites have not been sampled every year between 1997 and 2009/10. No sampling was conducted during the 2008/2009 winter and there were other years where certain sites were not sampled due to changes in the habitat (in-filling of pools). The Richfield Creek sample site was moved about 25 meters upstream of the original site for the 2009/2010 winter.

None of the Upper Bulkley sites have had exclusively coho although the Richfield Creek site had a species composition of 100% RBT in the 1997/1998 sample year. Catch per unit effort from 1997/1998 to the 2009/2010 winter, has been highest for coho during the 2009/2010 winter at three of the Upper Bulkley sites (Appendix 1). The Barren Creek site was disturbed due to dredging upstream of a highways culvert and fish access was poor after the project was completed. This resulted in low catch per unit effort for coho in the 2009/2010 year.

Species composition has been compared at the four Upper Bulkley sites in Figure 25.

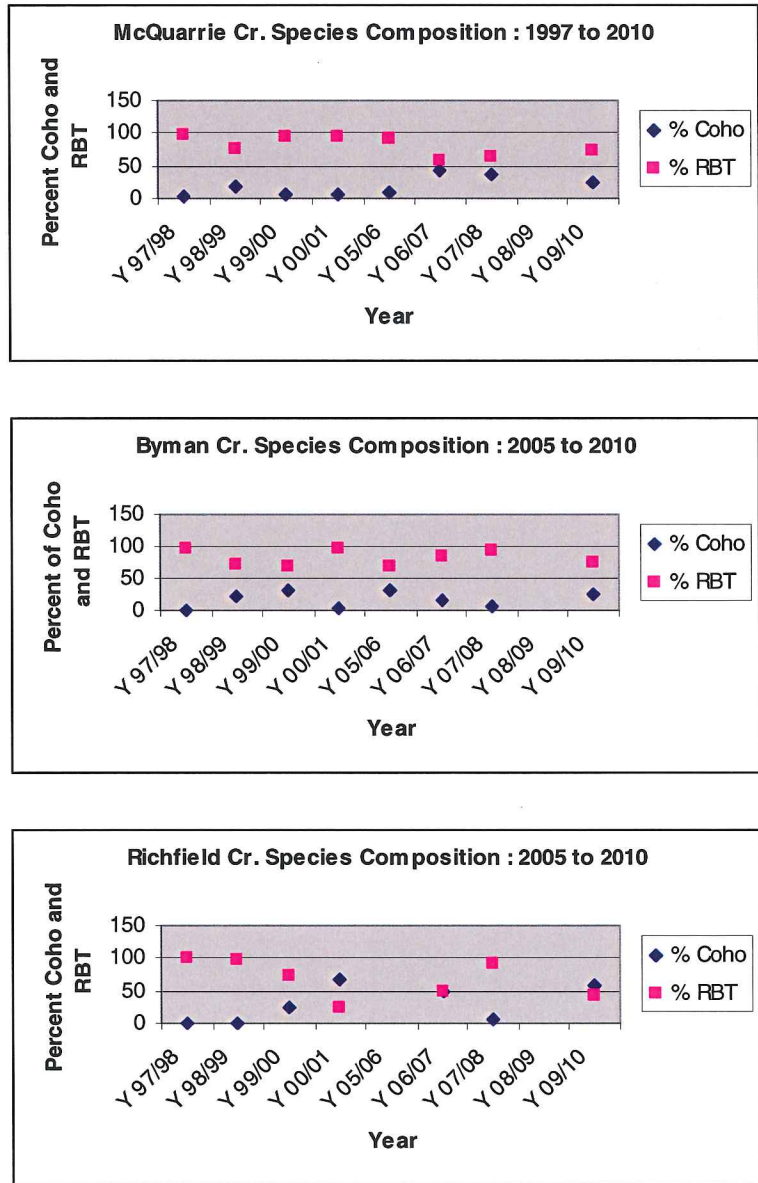


Figure 25 : Upper Bulkley Sites Species Composition for 1997/98 to 2009/10

Coho escapement to the Upper Bulkley River may influence coho CPUE over the years. Years of higher escapement may lead to a higher CPUE assuming that sample sites are representative. Escapement monitoring occurred at the Upper Bulkley River Coho Assessment Fence from 1997 to 2005. During that time period the Strategic Stock Enhancement Program funded both coho fry and smolt releases into the Upper Bulkley River. Peak escapement occurred in 2005 and those fish would have returned in 2008 and 2009. The coho juveniles that were produced from coho spawning in the fall of 2008 would have been captured in the winter of 2009/2010. Usually a strong coho escapement one year results in a strong coho escapement three years later. (The majority of Upper Bulkley coho return as three year old fish – DFO age class analysis). This would result in

a strong escapement in the fall of 2008 which may explain the higher coho CPUE for the 2009/10 winter study. (Figure 26).

CPUE for RBT is shown in Figure 27.

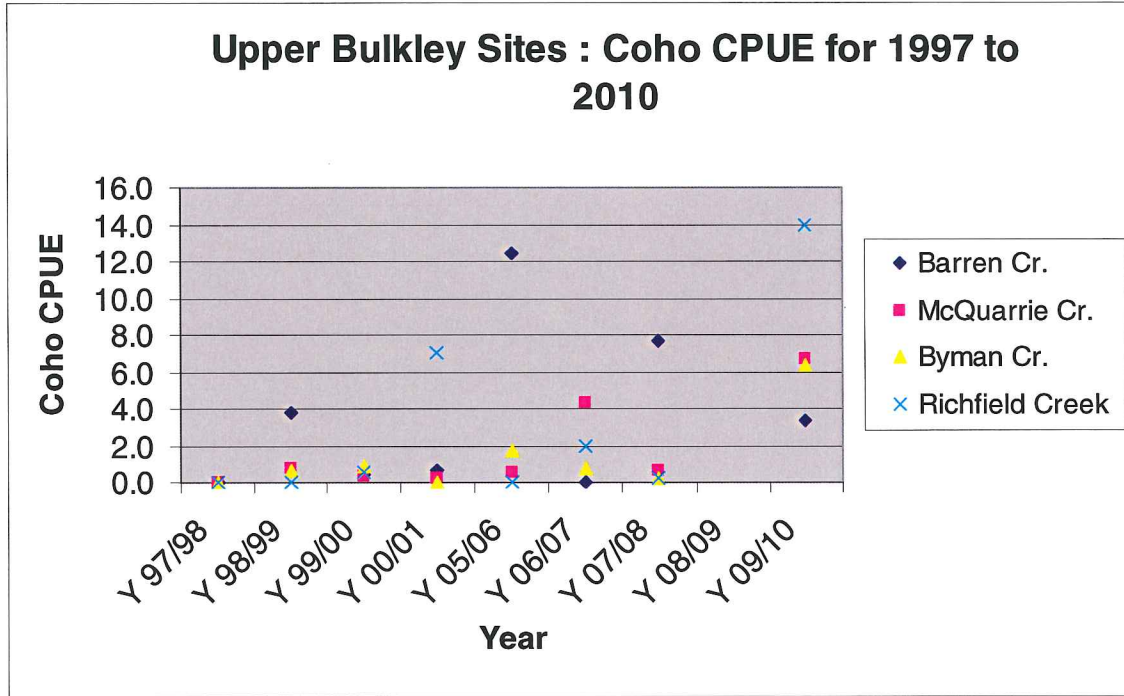


Figure 26. Coho CPUE for the Upper Bulkley Sites : 1997 to 2010

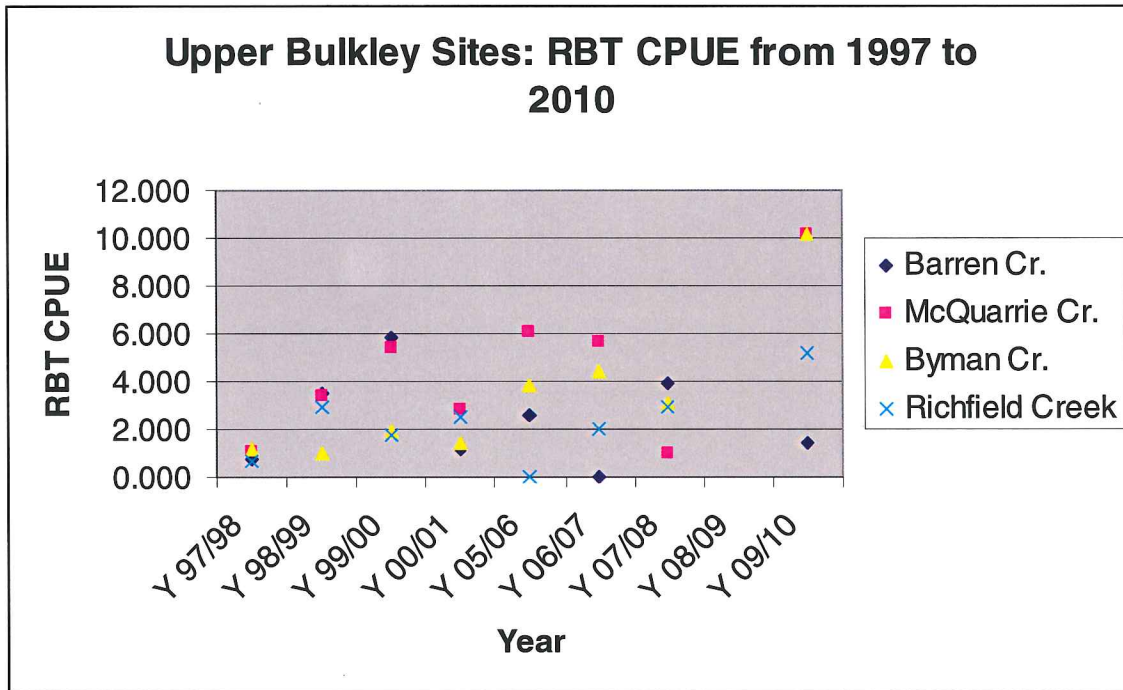


Figure 27. RBT CPUE for the Upper Bulkley Sites : 1997 to 2010

The CPUE for RBT juveniles has also peaked in the 2009/2010 winter study. Since steelhead escapements are not monitored in the Upper Bulkley system, it is difficult to determine if the increase in CPUE for RBT is due to increased spawning escapement.

In general, increases in CPUE could be due to a decrease in the amount of pool habitat available for juvenile salmonids. This would lead to higher juvenile densities in the available pool habitat.

Middle Bulkley Sites

The Middle Bulkley sites were not sampled during the 2009/2010 winter, however a comparison of species composition up to 2008/2009 is provided for Hydropole 12, the groundwater channel and for the McKinnon Creek sites that were sampled.

The species composition at the groundwater site consisted of Coho (n=120), rainbow trout/sthd (n=2), cutthroat trout (n=1), Dolly Varden (n=1) and Mountain Whitefish (n=1) over the winter of 2008/09. The species composition was different in 2006/07 where only Coho were captured (Figure 28). The increase in species diversity in 2008/09 is likely due to the enhancement project conducted at the groundwater channel in summer 2008 where access for fish to and from the main channel was increased. The groundwater channel was not sampled in 2005/06, and water levels were too low to sample in 2007/08.

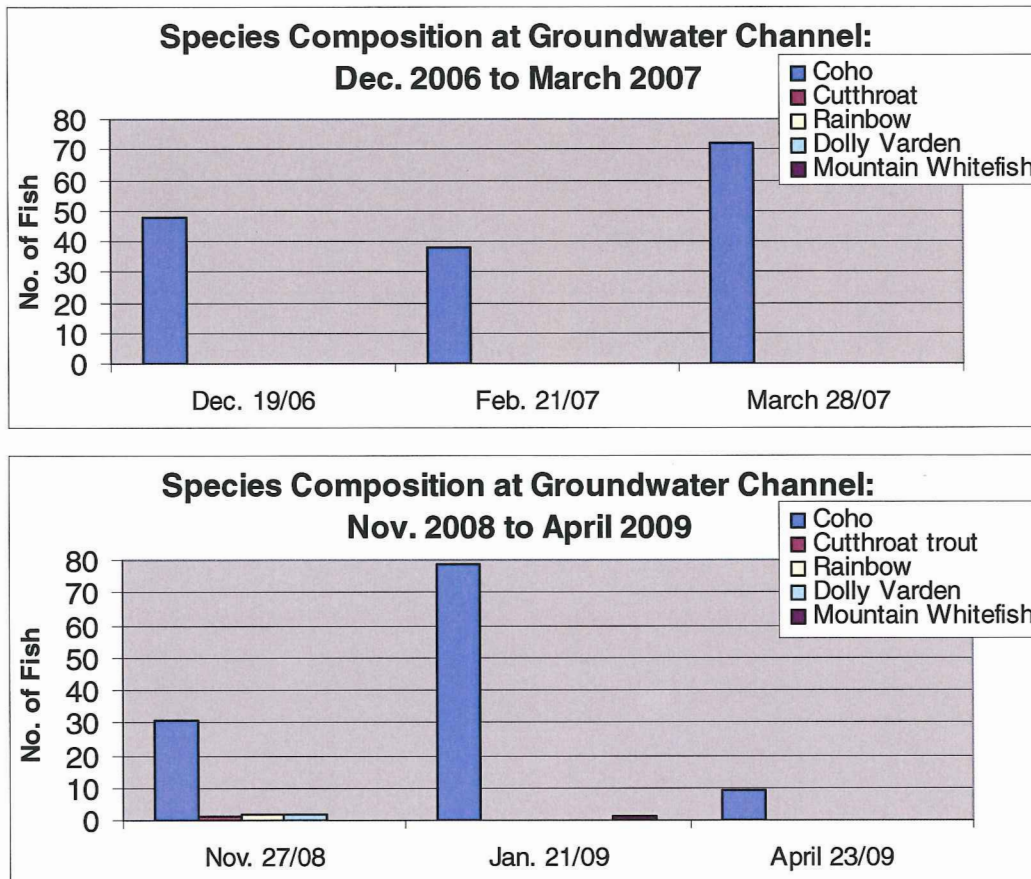


Figure 28. Species Composition at the Groundwater Channel (2006/07 and 2008/09).

The species composition at Hydropole 12 in 2008/09 consisted of Coho and cutthroat trout. Overwintering habitat at Hydropole 12 was not sampled in 2007/08 due to low water levels. There was sampling conducted at Hydropole 12 in 2006/07, but only at the end of winter in March 2007 where 1 Coho and 4 CT were captured. Hydropole 12 provided good overwintering habitat in 2005/06 where Coho, rainbow trout/steelhead and cutthroat trout were captured. Both cutthroat trout and Coho were captured during the three sampling periods; however, rainbow trout/steelhead was captured on Dec. 14/05 only. The number of Coho and cutthroat trout captured was highest on Nov. 27/08, potentially due to water depth being slightly higher than was recorded on other sampling times in early winter (Figure 29).

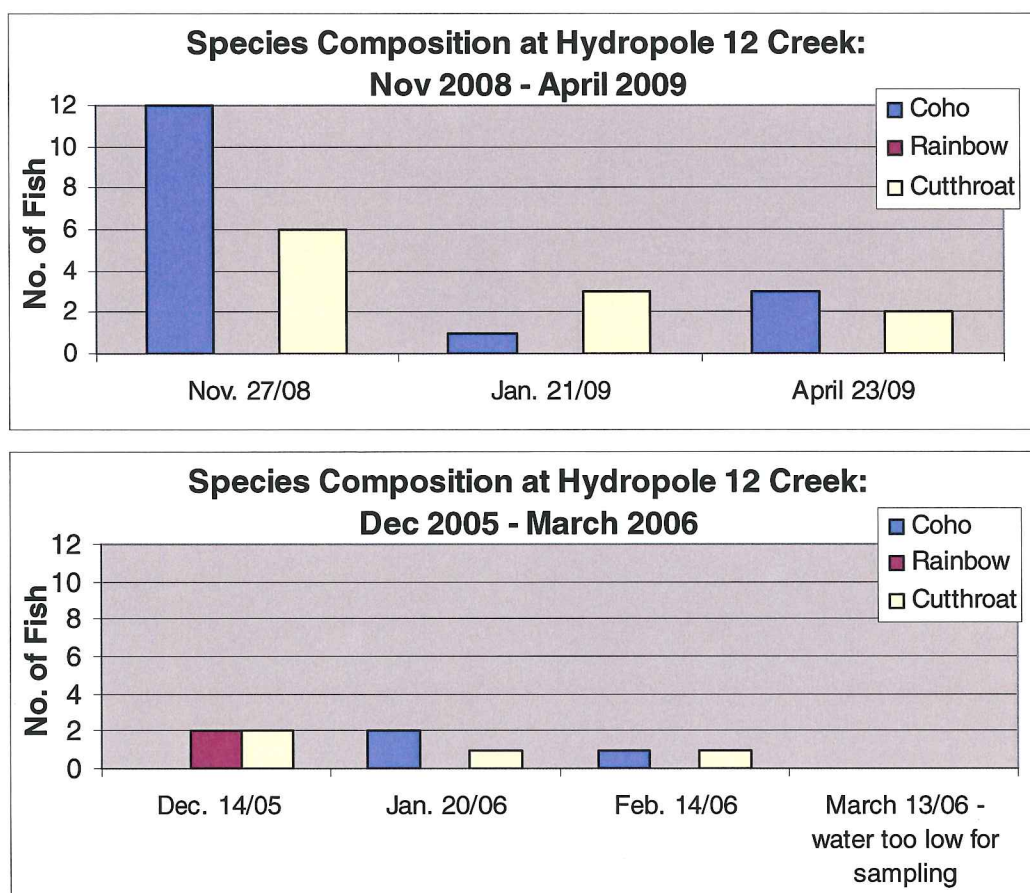
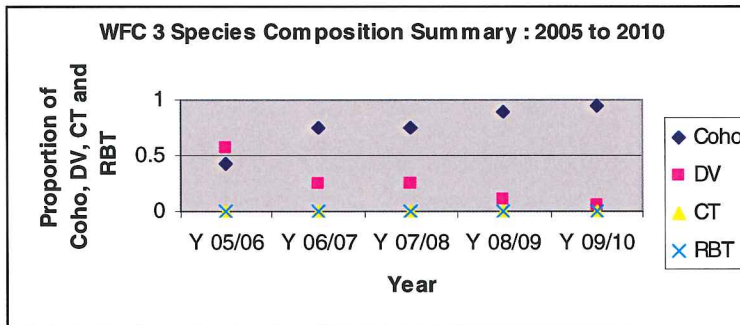
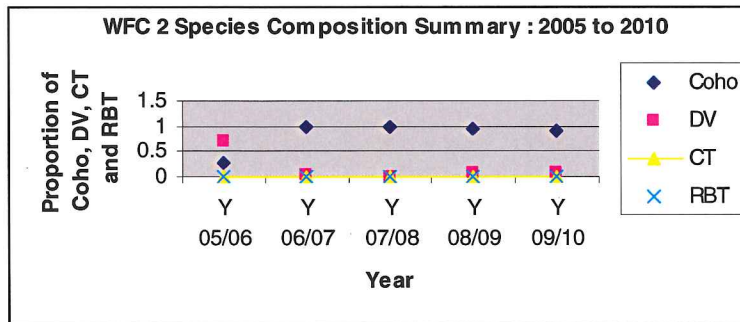
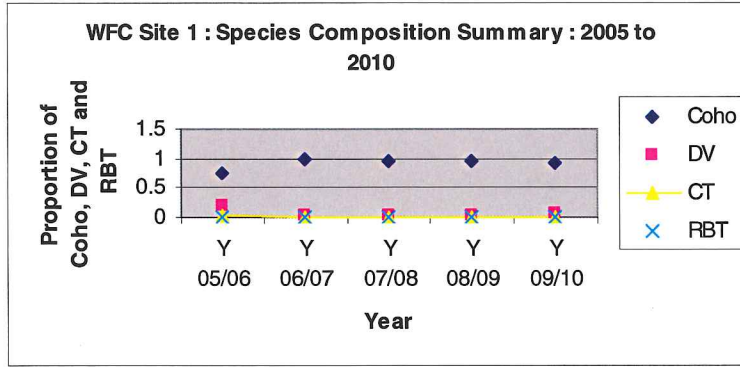


Figure 29. Species Composition at unnamed Creek at Hydropole 12 (2005/06 and 2008/09).

Waterfall Creek

Two species (i.e., Coho and Dolly Varden char) were captured at the Waterfall Creek sites in 2007/08 and 2008/09, where as three species (i.e., Coho, Dolly Varden char and a small proportion of cutthroat trout) were documented during the 2006/07 and 2005/06 studies and four species were captured during the 2009/2010 study. High numbers of Coho were captured in Waterfall Creek during all four studies, likely due to adult and fry stocking enhancement in the system. On the whole, the proportion of Dolly Varden compared to Coho at all the sites was much less in 2006/07, 2007/08, 2008/09 and 2009/10, than in 2005/06. The reason for fewer Dolly Varden is not known, but could be due to older resident DV migrating out of Waterfall Creek, possibly downstream into Mission Creek or the Bulkley River. Further assessments of DV habitat, as well as DV presence/absence, should be conducted in the Mission Cr. System (upstream of the impassable culvert). Comparison Graphs for the Waterfall Creek Coho and Dolly Varden captured from 2005-2010 have been provided in Section 5.3- Fork Length and Condition Comparisons and in Section 5.4-Density.

Species composition and diversity data collected from 2005-10 indicates that sites 1-4 of Waterfall Creek provide good to excellent overwintering habitat for juvenile Coho salmon. WFC Site 3 was complexed using rip rap rock that measured about 30 cms in width. Since that site was complexed with rock, the species composition for coho increased. Site 4 had the greatest diversity with four species (coho, DV, CT and RBT) being captured during the 2009/2010 season.



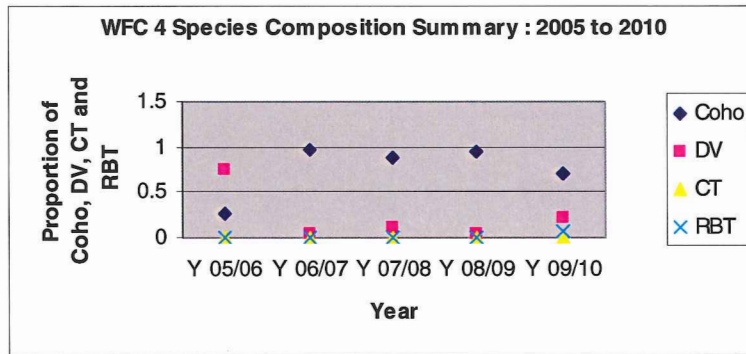


Figure 30. Waterfall Creek Sites 1 – 4, Species Composition Summary for 2005 to 2010

5.3 Fork Length and Condition Comparisons

The frequency of larger fork length fish is expected to be more prevalent near the end of winter than the smaller less competitive fish since smaller fish are assumed to have less energy reserves (Dolloff 1987). Fulton's condition factor (FCC) is expected to change over the winter, and differ between sites, since the amount of energy loss during the winter is expected to vary between sites (Donas and Saimoto 2001b).

5.3.1 Coho – Middle Bulkeley Tributaries

There was no fish sampling conducted at McKinnon sites 1 and 2 in 2006/07, 2007/08 or 2008/09 due to a loss of pool habitat. There was no sampling done at Hydro Pole 12 or at the Proctor Groundwater Channel during the 2009/2010 winter due to workload and staffing issues.

Sampling was conducted at the Groundwater Channel in 2008/09 and a comparison of fork length (mm) by category and mean FCC has been made to sampling conducted in 2006/07. There was a higher number of Coho in the FL > 80 mm category in 2008/09 than in 2006/07 (Figure 33). The reason for the change in Coho FL may have been due to the habitat enhancement project of summer 2008 where the connection of the groundwater channel to McKinnon Creek was increased, allowing larger fish to migrate into the channel. The mean FCC was higher at the end of winter than the beginning of winter in 2008/09; where as, the mean FCC was lower at the end of winter than beginning of winter in 2006/07 (Figure 34). The reason for the difference in Coho condition at the end of winter during the two sampling periods is not known and it can not be determined if the enhancement project conducted in summer 2008 was a factor in higher condition of Coho fry at the end of winter 2009.

Sampling was conducted at the Hydropole 12 site in 2008/09 and 2005/06. There was no sampling conducted in 2007/08 or in 2006/07, except at the end of winter 2007, due to low water. There is no fork length by category or mean Fulton's condition factor (mean FCC) comparison due to low numbers of fish captured at Hydropole 12.

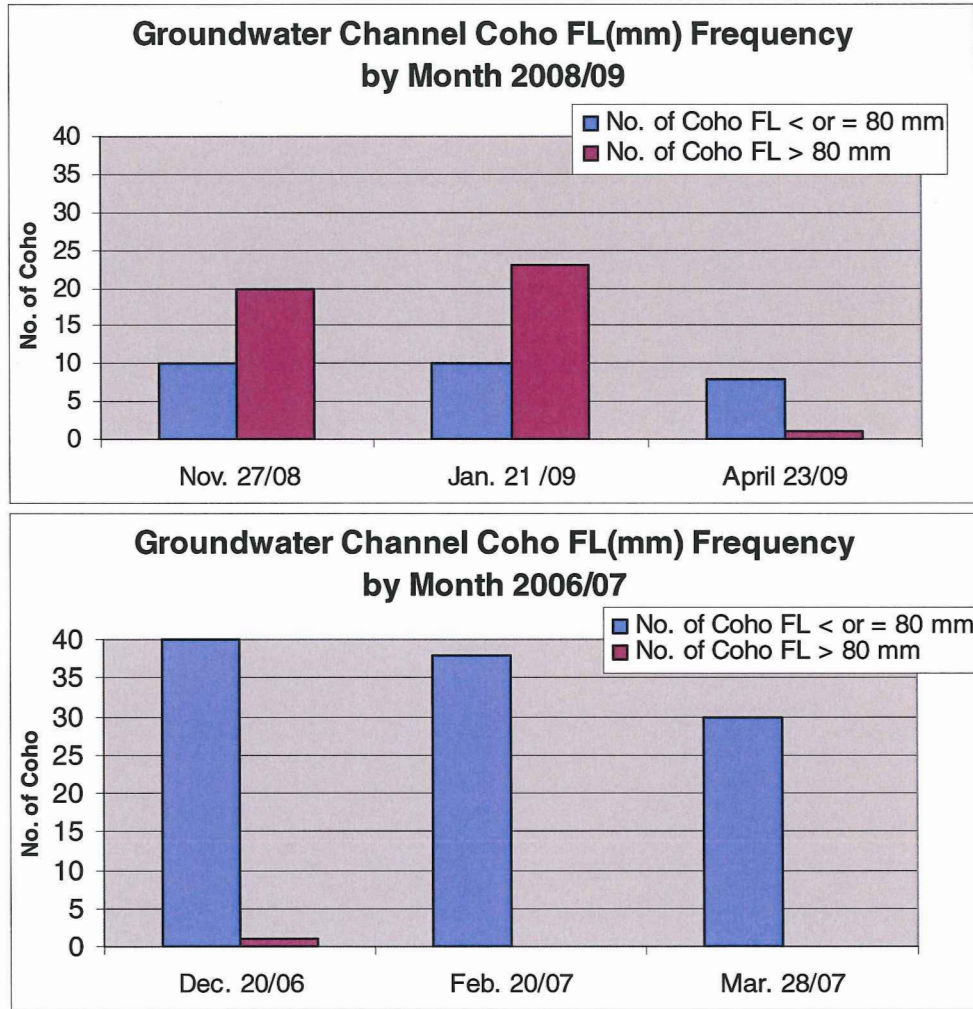


Figure 31. Fork Length frequency by month at Groundwater channel (2006 /07 and 2008/09).

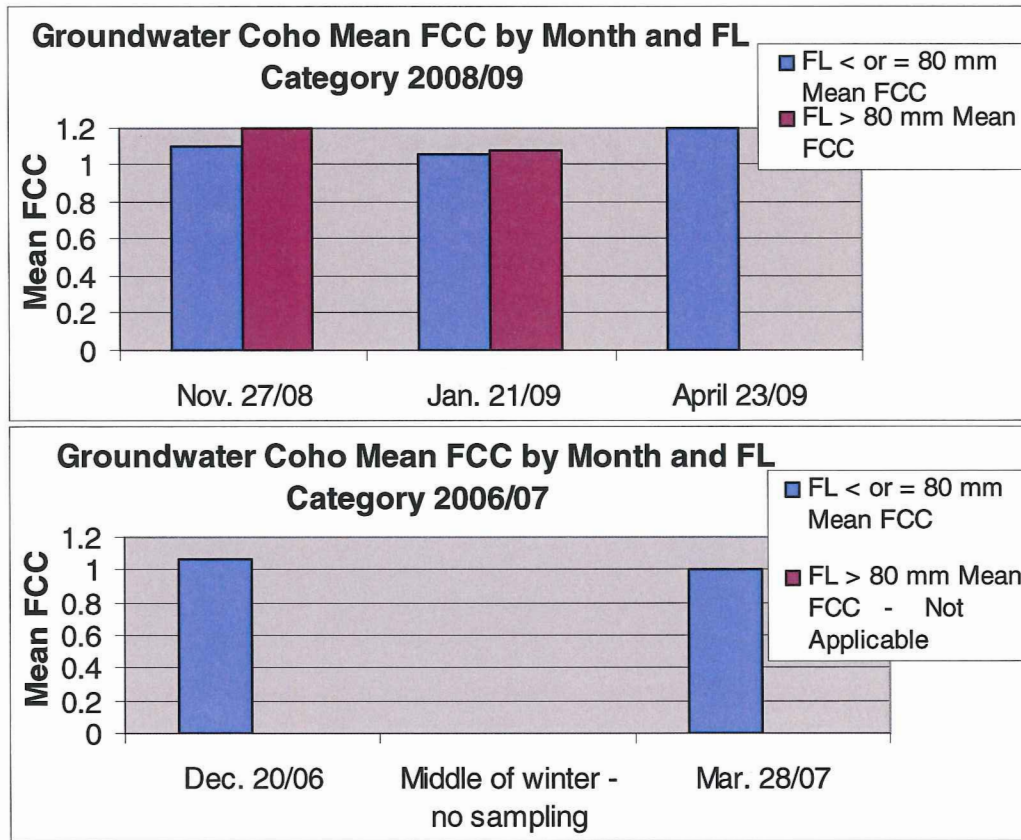


Figure 32. Mean FCC by month at Groundwater channel (2006/07 vs. 2008/09).

5.3.2 Coho – Waterfall Creek

A large proportion of Coho captured at site 1 from 2005-10 of Waterfall Creek were less than or equal to 80 mm. The greater than 80 mm category for Coho has remained fairly constant throughout the winters with a mean proportion of FL >80 mm of 22%. (Figure 33). These results indicate that site 1 provides fairly stable habitat, with the decline in numbers possibly due to net migration out of the glide in March, although some studies have noted a lack of movement of salmonids during winter (Dolloff 1987, Swales et al. 1986, Giannico and Healey 1998). Due to warmer water temperatures in March younger Coho may have migrated to other habitat in the system however, mortality of Coho is also a possibility.

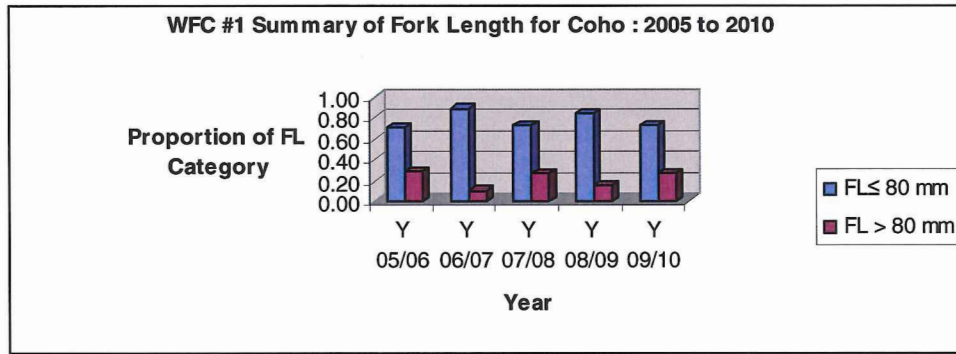


Figure 33. WFC 1 Summary of Fork Length for Coho : 2005 to 2010

Most of the Coho captured at site 2 were in the less than or equal to 80 mm Fork Length category with the exception of the 2005/2006 winter where 97% of the coho were in the FL > 80 mm category. In the years 2006/2007, 2007/2008 and 2008/2009 there were a higher proportion of coho in the FL ≤ 80 mm category. However in the 2009/2010 winter there was a higher proportion (65%) of the coho in the FL > 80 mm category.

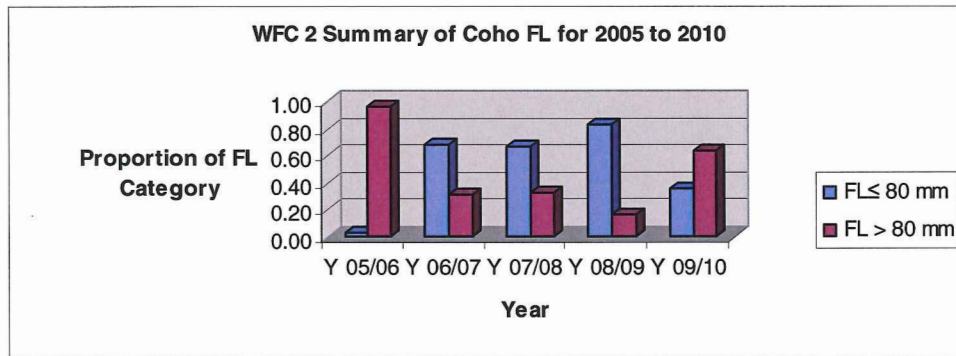


Figure 34. WFC 2 Summary of Fork Length for Coho : 2005 to 2010

At site 3, the majority of the coho captured from 2005 to 2010 are in the less than or equal to 80 mm FL category. The proportion of coho in the greater than 80 mm FL category has been fairly consistent since the 2006/2007 overwinter study. The proportions of coho in each FL category are shown in Figure 35.

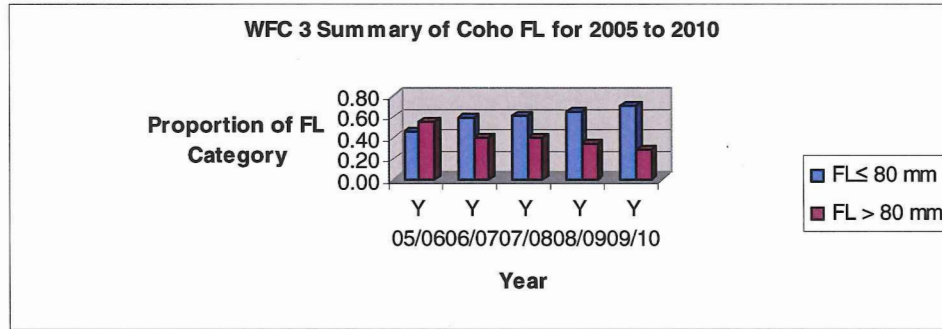


Figure 35. WFC 3 Summary of Fork Length for Coho : 2005 to 2010

All Coho captured at site 4 in 2005/06 were of the less than or equal to 80 mm category. The majority of Coho captured from 2006 to 2010 fell into the less than or equal to 80 mm FL category.

Proportions of coho in each FL category are shown in Figure 36.

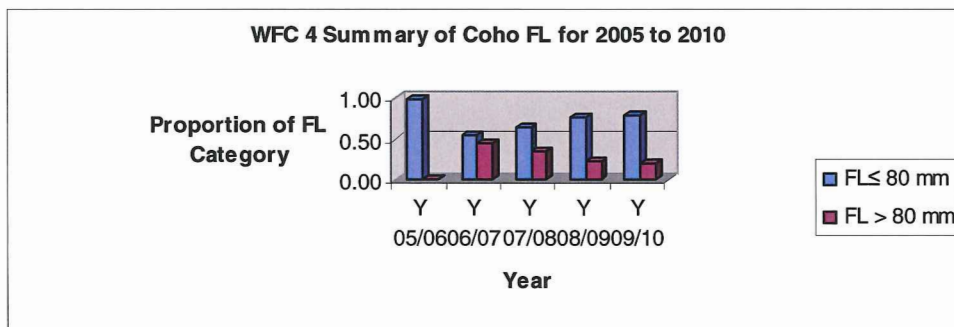


Figure 36. WFC 4 Summary of Fork Length for Coho : 2005 to 2010

Overall, WFC Site 1 had the greatest proportion of coho in the less than or equal to 80 mm FL category, in all sample years.

In all years (2005 to 2010), the mean FCC for Coho in both Fork Length categories at site 1 and 2 decreased slightly over the winter.

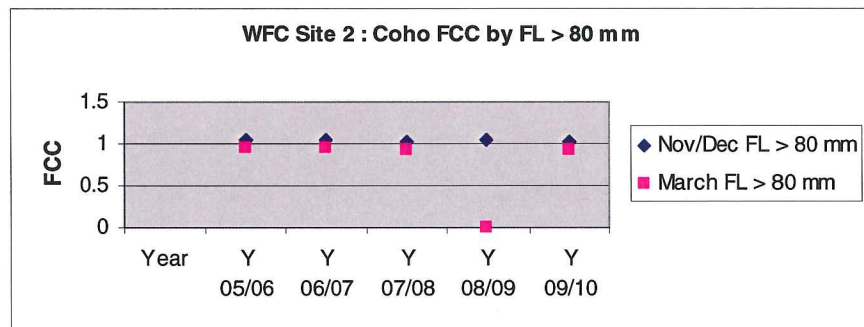
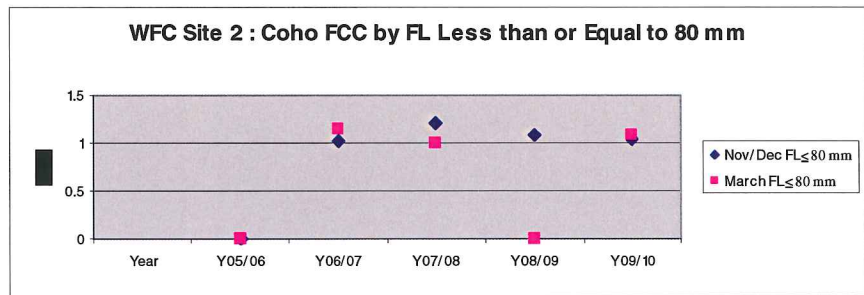
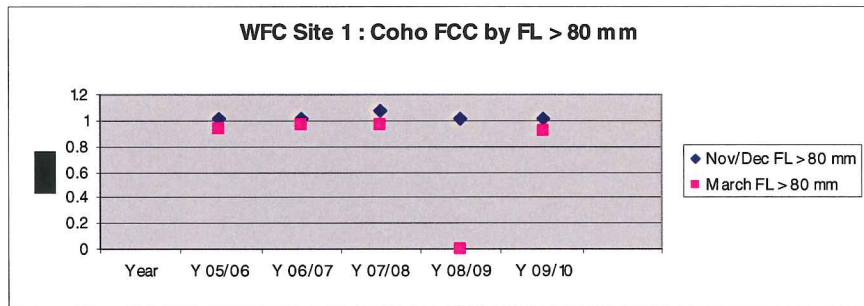
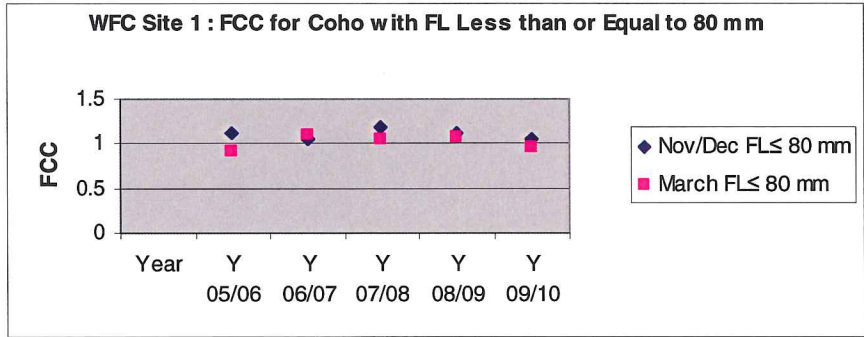


Figure 37. WFC Sites 1 and 2 : Coho FCC by FL Categories : 2005 - 2010

The mean FCC for Coho at site 3 in the FL ≤ 80 mm category was fairly consistent over the course of the winter for all years. (2005 to 2010). The mean FCC at site 3 for coho in the FL > 80 mm category usually decreased from beginning to end of winter.

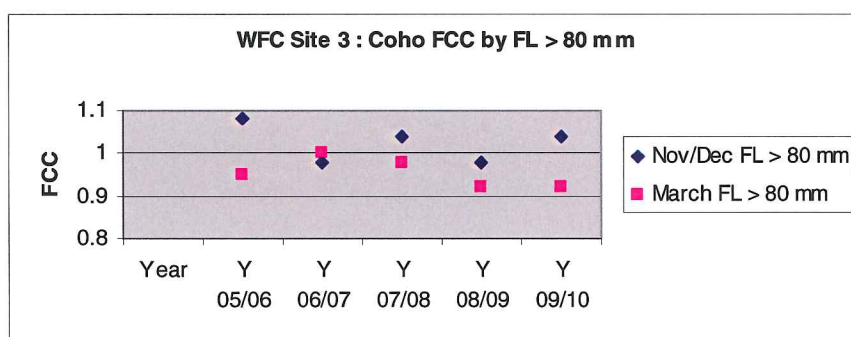
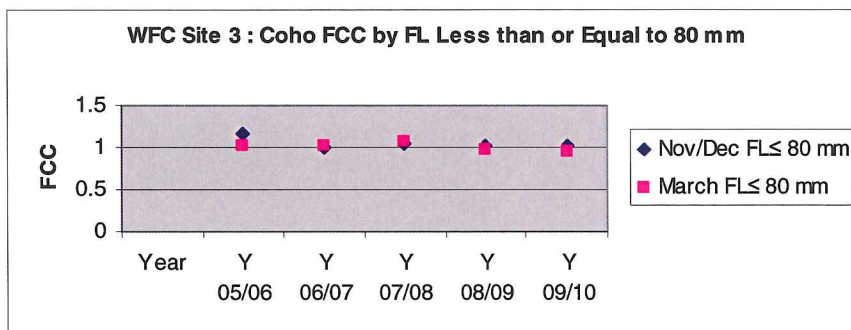


Figure 38 WFC Site 3 : Coho FCC by FL Category : 2005 - 2010

The mean FCC for Coho at site 4 in both categories remained fairly constant from beginning to end of winter during all years. (2005 to 2010)

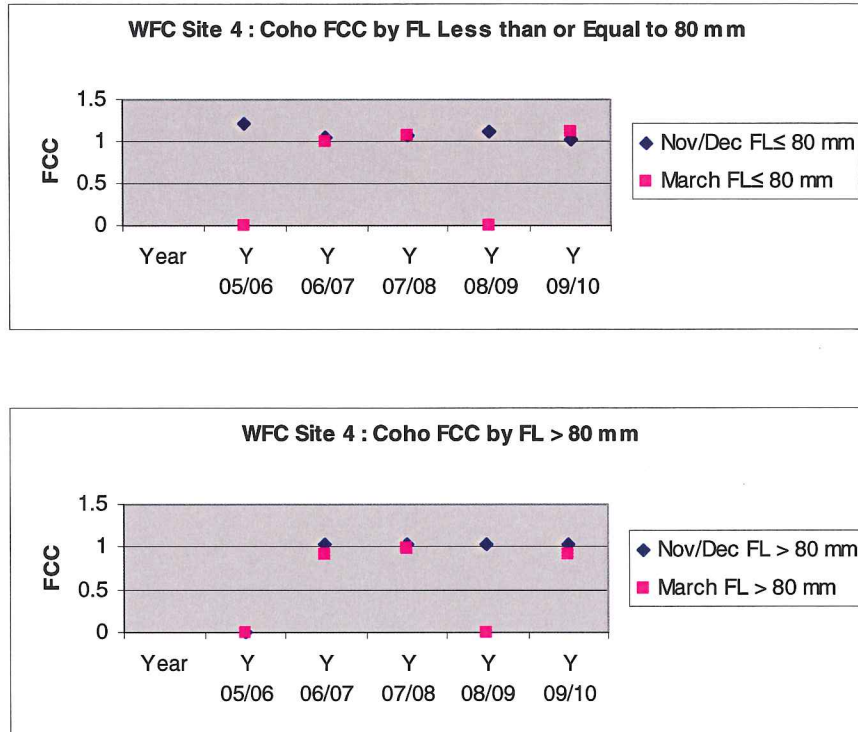


Figure 39. WFC Site 4 : Coho FCC by FL Category : 2005 - 2010

Overall, the Coho appeared to be in good condition from beginning to end of winter at all sites throughout the 2005 to 2010 studies where the mean FCC was found to be greater than 0.90 during all sampling dates (refer to Table 11). It should be noted that a slight decline in condition over the winter is to be expected since fish utilize their stored energy reserves to survive the stressful season (Dolloff 1987). It should be noted that an increase in condition of Coho at the end of winter in March could be attributed to increases in water temperature and improved environmental condition for feeding and growth (Donas and Saimoto 2001b). It should be noted that the air and water temperature recorded in March 2006 was slightly warmer than the other winter months; however, an increase in these variables did not produce the similar effect as speculated in the previous study (Donas and Saimoto 2001b) since condition of Coho declined overall in March.

Table 11. Comparison of Mean Fulton's Condition Factor for Coho at the beginning and end of winter at Waterfall Creek from 2005-2010.

Date	FCC for Coho WFC Site 1		FCC for Coho WFC Site 2		FCC for Coho WFC Site 3		FCC for Coho WFC Site 4	
	Beg.	End	Beg.	End	Beg.	End	Beg.	End
2005/06								
FL ≤ 80 mm	1.13	0.93	0.96	na	1.17	1.02	1.21	na
FL > 80 mm	1.02	0.93	1.08	0.96	1.08	0.95	na	na
2006/07								
FL ≤ 80 mm	1.06	1.11	1.02	1.14	1.00	1.03	1.05	0.99
FL > 80 mm	1.01	0.96	1.04	0.96	0.98	1.00	1.03	0.91
2007/08								
FL ≤ 80 mm	1.18	1.05	1.21	1.01	1.04	1.07	1.06	1.06
FL > 80 mm	1.08	0.97	1.02	0.92	1.04	0.98	1.04	0.98
2008/09								
FL ≤ 80 mm	1.11	1.02	1.09	1.05	1.03	0.98	1.11	na
FL > 80 mm	1.07	na	na	na	0.98	0.92	1.04	na
2009/10								
FL ≤ 80 mm	1.05	.97	1.04	1.08	1.03	.96	1.03	1.12
FL > 80 mm	1.02	.92	1.03	.94	1.04	.92	1.04	.92

*na = low numbers of Coho captured; therefore, mean FCC not calculated.

5.3.3 Dolly Varden – Waterfall Creek

Overall, the number of Dolly Varden (DV) captured in the traps has decreased substantially since the 2005/06 and 2000/01 studies. It is not certain why the number of DV captured in the years subsequent to the 2005/2006 year were substantially less at all the sites than previous overwintering studies conducted on Waterfall Creek (see Section 5.2 Species Composition and Diversity).

In 2005/06, almost all DV captured at site 1 were in the FL greater than 80 mm category, where they increased from beginning to end of winter, although only 2 DV were captured in January. The increase in DV overall may have been due to net immigration to this glide since potential for migration was noted to be high at site 1. In 2006/07, the number of DV captured was substantially less than in 2005/06, where only 9 DV were captured, all of which were caught at the beginning of winter. From 2007/08 to 2009/10, the number of DV captured was also substantially less than in 2005/06. Species Composition for Dolly Varden is summarized in Table 12 and Figure 40.

Table 12. Waterfall Creek : Proportion of DV in the Catch by Site and Year

Sites	Years				
	Y 05/06	Y 06/07	Y 07/08	Y 08/09	Y 09/10
WFC 1	0.22	0.02	0.03	0.03	0.08
WFC 2	0.73	0.02	0.01	0.07	0.08
WFC 3	0.58	0.25	0.25	0.1	0.05
WFC 4	0.74	0.04	0.12	0.05	0.23

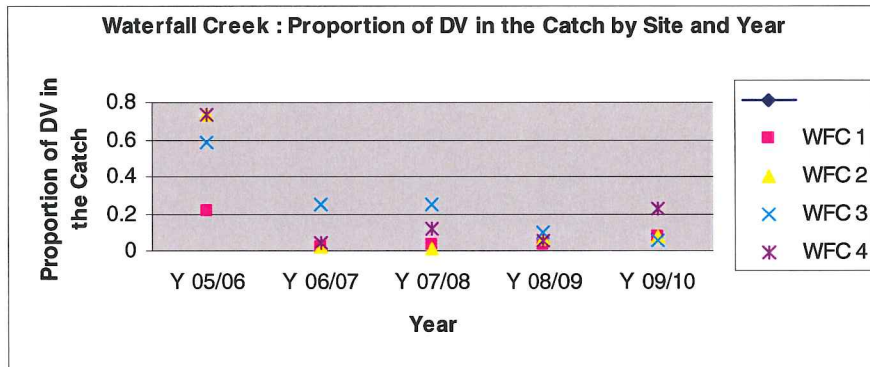
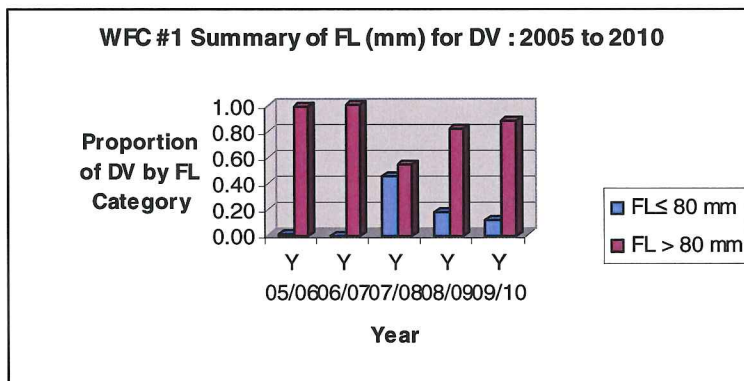


Figure 40. Waterfall Cr. : Proportion of DV in the Catch by Site and Year



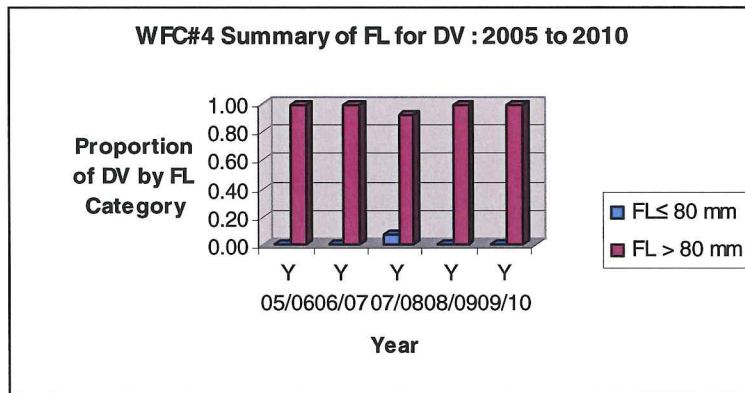
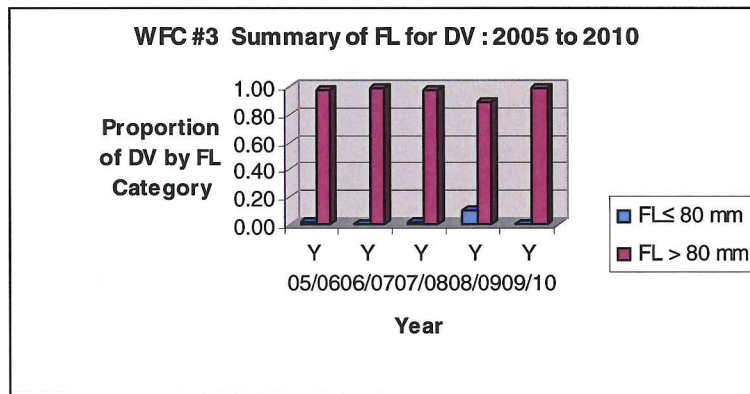
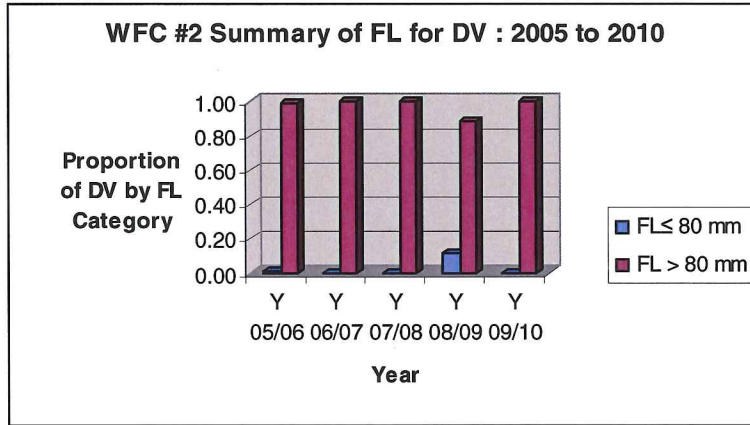


Figure 41. Fork Length Comparisons of DV at Waterfall Cr. Sites (2005-2010).

In general from the 2005/06 to the 2009/2010 studies, the condition (mean FCC) of the DV in both Fork Length categories decreases from beginning to end of winter at all sites (refer to Table 13). The decrease in mean FCC indicates that winter is difficult for the DV in the system, which is to be expected for all salmonids.

Table 13. Comparison of Mean Fulton's Condition Factor for Dolly Varden at the beginning and end of winter at Waterfall Creek from 2005-2010.

Date	FCC for DV WFC Site 1		FCC for DV WFC Site 2		FCC for DV WFC Site 3		FCC for DV WFC Site 4	
	Beg.	End	Beg.	End	Beg.	End	Beg.	End
2005/06								
< or = 80 mm	na	0.98	na	na	na	Na	na	na
> 80 mm	0.95	0.85	0.98	0.90	1.05	0.92	0.94	na
2006/07								
< or = 80 mm	na	na	na	na	na	Na	na	na
> 80 mm	na	na	na	na	na	0.89	na	na
2007/08								
< or = 80 mm	1.12	na	na	na	na	Na	na	na
> 80 mm	0.94	na	na	na	0.94	0.88	0.98	0.85
2008/09								
< or = 80 mm	na	na	na	na	na	Na	na	na
> 80 mm	na	na	na	na	na	0.86	na	na
2009/10								
< or = 80 mm	1.03	na	na	na	na	na	na	na
> 80 mm	.99	.89	1.01	.86	.95	.87	.88	.85

*na= low numbers of DV captured; therefore, mean FCC not calculated.

5.4 Density (CPUE)

5.4.1 CPUE for Coho

At all Waterfall Creek sites, the CPUE for Coho salmon decreased overall from beginning to end of winter during all study periods (Figure 42). The CPUE for Coho at Site 3 increased after large rock was added to provide further habitat. CPUE at Site 3 increased from an average CPUE of 16.5 during the 2005/2006 to 2007/2008 studies to an average CPUE of 33.0 after the addition of the rock. During some years the decrease in CPUE at sites 1,2 and 3 could have been due to a high potential for migration out of those sites to other rearing areas. Potential for migration at site 4 was usually low.

The CPUE for Coho may also be dependent on the number of female coho spawners released to and near to the study sampling sites. In general, in years where there are higher numbers of female spawners in Waterfall Creek, there are higher total coho CPUE's the winter following swim-up. The number of female coho spawners released to WFC is shown in Figure 43.

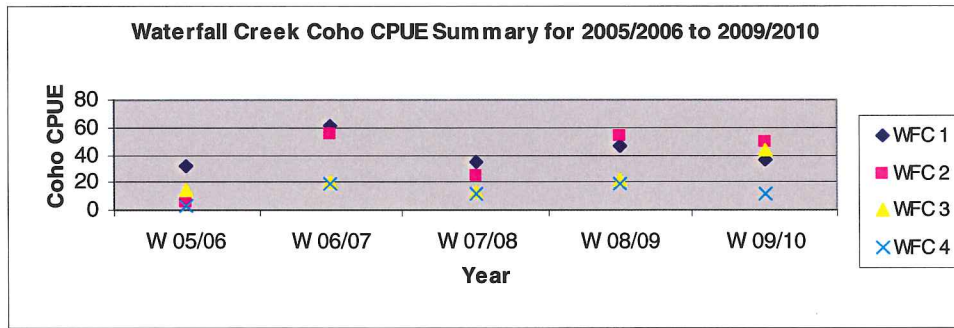


Figure 42. Coho CPUE Comparisons at Waterfall Cr. Sites 1 - 4 (2005-10).

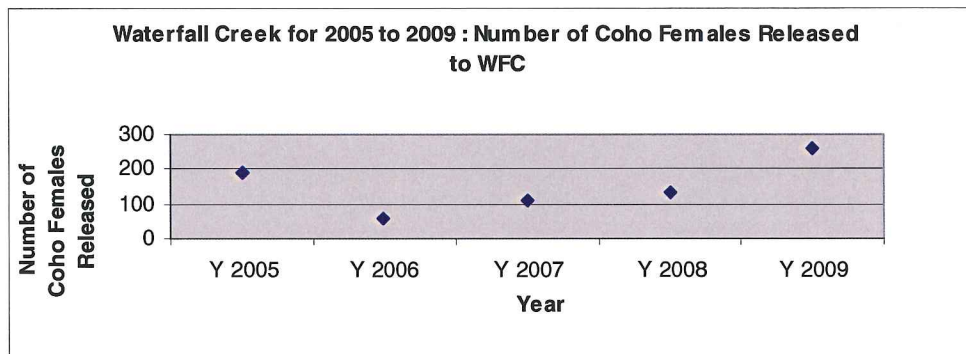


Figure 43. Number of Female Coho Spawners in Waterfall Creek from 2005-2009

At the Upper Bulkley sites, CPUE for coho decreased from beginning to end of winter. Coho CPUE during the 2009/2010 study was higher than in previous years at most sites. (Figure 44). The CPUE at Barren Creek was lower than in previous years and this was most likely due to the dredging that occurred at that site as part of the Ministry of Transportations culvert maintenance.

Total CPUE for Coho and RBT is shown in Figure 45. The total CPUE for RBT has been fairly consistent over the years except for the peak in CPUE during the 2009/2010 study. Total CPUE for coho seems to show a trend of slightly increasing CPUE with a peak in CPUE during the 2009/2010 study.

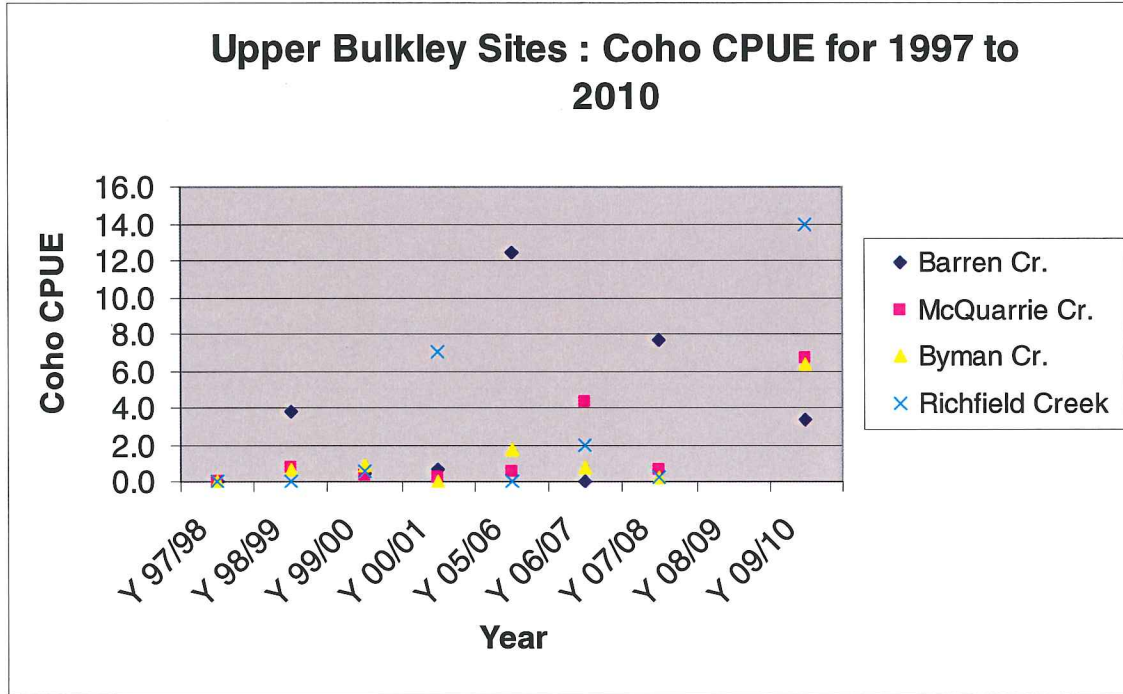


Figure 44. Upper Bulkley Sites : Coho CPUE 1997 to 2010

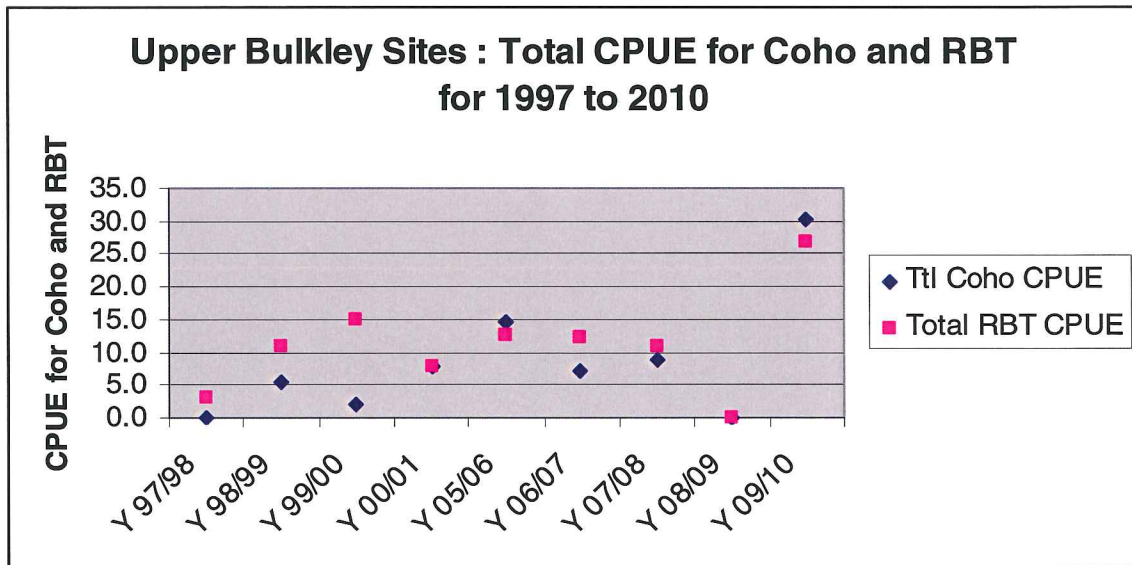


Figure 45 : Upper Bulkley Sites : Total CPUE for Coho and RBT for 1997 - 2010

5.4.2 CPUE for Dolly Varden

In 2005/06, the CPUE for DV at the Waterfall Creek sites varied over the duration of winter sampling with site 3 having the most consistent CPUE over all sampling dates. High potential for migration most likely affected CPUE for DV. In 2006/07, the CPUE

for DV at all sites decreased and this trend continued through the 2009/2010 study. It is not certain why the CPUE for DV was so much lower in the latter three study periods.

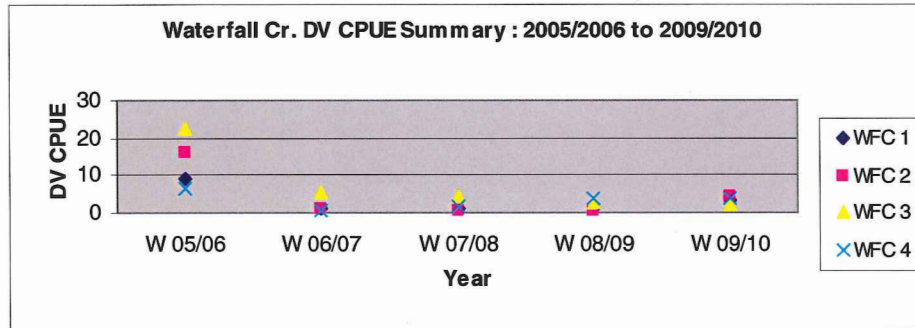


Figure 46. WFC Dolly Varden CPUE for 2005 to 2010

6.0 CONCLUSIONS AND RECOMMENDATIONS

1. Further monitoring at all sites, including habitat assessments, water quality sampling and overwintering trapping, of some or all of the sites sampled during this study is recommended to compare CPUE, and fish size and condition with 2005/06, 2006/07, 2007/08, 2008/09 and 2009/10 results.
2. Dolly Varden numbers in Waterfall Creek have decreased dramatically at the sites sampled in the winter, especially site 1 and 2, since 2005/06; therefore, it is recommended that a stream survey of Station and Waterfall Creeks be conducted in order to identify critical Dolly Varden rearing and spawning habitat, as well as possible recent disturbances to DV habitat, upstream of the impassable Culvert.
3. The Byman Creek Highway 16 culvert site appears to have important habitat for RBT and should be considered as important and sensitive habitat.
4. Further work should be done on Waterfall Creek to add habitat complexity i.e. further addition of rip rap rock to provide habitat for juvenile salmonids. This is based on the increase in CPUE at Site 3 on WFC.
5. Monitoring at UBR sites for habitat conditions and salmonid juveniles should continue. The UBR watershed has been impacted by agriculture, transportation corridors, forestry, mining and settlement. Water use and land clearing may be having significant impacts in terms of quantity and quality of juvenile rearing habitat.

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Appendix 1
Winter Fish Capture and Habitat Assessment Data (2009/10)

Appendix 1
Winter Fish Capture and Habitat Assessment Data (2009/10)

Site Identification

Waterfalls Creek - Site 1
crew: BD, GG, NN

Sampling Date

Nov. 25/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	Low
Potential for Migration	High

Water Depth (cm)	69.5
Ice thickness (cm)	10
Clarity of Ice	None
Snow Depth (cm)	5
Water Temp (°C)	0.7
Turbidity	Clear
DO (ppm)	13.7
pH	
Flow (m/s)	N/A

Nov-26

Nov-26

no meter

Number of traps set	3
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Set Locations

1 cluster set just d/s of new beaver dam, just past Signal "D".

Set duration	Overnight
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Comments

Photos 168 - u/s view of site
Photo 169 - close-up of fish in bucket
Photo 170 and 171 - work station at truck.
* other photos

Juvenile Capture and Sampling Summary

Location WFC#1
Date Nov. 26/09
crew: NN, BD

	<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO		200	43	102	95% % CO
DV		11	46	156	5% % DV

CPUE:	66.67	coho per trap per overnight set	3.67	DV per trap
	70.3	fish per trap per overnight set		

Individual Sampling Data

Y=Rmax
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	43	1.1	N=UNMAR	1.38
GMT	1	1	CO	48	0.9	N=UNMAR	0.81
GMT	1	1	CO	49	1.1	N=UNMAR	0.93
GMT	1	1	CO	49	1.5	N=UNMAR	1.27
GMT	1	1	CO	50	1.1	N=UNMAR	0.88
GMT	1	1	CO	50	1.3	N=UNMAR	1.04
GMT	1	1	CO	51	1.3	N=UNMAR	0.98
GMT	1	1	CO	51	1.4	N=UNMAR	1.06
GMT	1	1	CO	52	1.3	N=UNMAR	0.92
GMT	1	1	CO	52	1.6	N=UNMAR	1.14
GMT	1	1	CO	52	1.8	N=UNMAR	1.28
GMT	1	1	CO	53	1.4	N=UNMAR	0.94
GMT	1	1	CO	53	1.5	N=UNMAR	1.01
GMT	1	1	CO	54	1.3	N=UNMAR	0.83
GMT	1	1	CO	54	1.6	N=UNMAR	1.02
GMT	1	1	CO	54	1.7	N=UNMAR	1.08
GMT	1	1	CO	54	1.8	N=UNMAR	1.14
GMT	1	1	CO	55	1.6	N=UNMAR	0.96
GMT	1	1	CO	55	1.6	N=UNMAR	0.96
GMT	1	1	CO	55	1.8	Y=Rmax	1.08
GMT	1	1	CO	55	1.8	N=UNMAR	1.08
GMT	1	1	CO	55	1.8	N=UNMAR	1.08
GMT	1	1	CO	56	2	N=UNMAR	1.14
GMT	1	1	CO	57	1.9	N=UNMAR	1.03
GMT	1	1	CO	57	2.2	N=UNMAR	1.19
GMT	1	1	CO	58	1.9	N=UNMAR	0.97
GMT	1	1	CO	58	2	N=UNMAR	1.03
GMT	1	1	CO	60	2.2	N=UNMAR	1.02
GMT	1	1	CO	60	2.3	Y=Rmax	1.06
GMT	1	1	CO	61	2.2	N=UNMAR	0.97
GMT	1	1	CO	61	2.3	N=UNMAR	1.01
GMT	1	1	CO	61	2.4	N=UNMAR	1.06
GMT	1	1	CO	61	2.5	N=UNMAR	1.10
GMT	1	1	CO	62	2.2	N=UNMAR	0.92
GMT	1	1	CO	62	2.4	N=UNMAR	1.01
GMT	1	1	CO	63	n/a	N=UNMARK	
GMT	1	1	CO	64	2.6	Y=Rmax	0.99
GMT	1	1	CO	64	2.6	N=UNMAR	0.99

GMT	1	1	CO	65	2.9	N=UNMAR	1.06
GMT	1	1	CO	65	3	Y=Rmax	1.09
GMT	1	1	CO	66	2.8	Y=Rmax	0.97
GMT	1	1	CO	67	3.3	N=UNMAR	1.10
GMT	1	1	CO	72	5.1	Y=Rmax	1.37
GMT	1	1	CO	79	5.1	Y=Rmax	1.03
GMT	1	1	CO	82	5.3	N=UNMAR	0.96
GMT	1	1	CO	82	5.4	Y=Rmax	0.98
GMT	1	1	CO	83	5.9	N=UNMAR	1.03
GMT	1	1	CO	83	5.9	N=UNMAR	1.03
GMT	1	1	CO	85	6.2	N=UNMAR	1.01
GMT	1	1	CO	85	6.4	N=UNMAR	1.04
GMT	1	1	CO	90	7.3	N=UNMAR	1.00
GMT	1	1	CO	90	7.8	N=UNMAR	1.07
GMT	1	1	CO	94	8.6	N=UNMAR	1.04
GMT	1	1	CO	97	9.1	N=UNMAR	1.00
GMT	1	1	CO	99	9.7	N=UNMAR	1.00
GMT	1	1	CO	99	10.2	N=UNMAR	1.05
GMT	1	1	CO	99	10.2	N=UNMAR	1.05
GMT	1	1	CO	102	10.3	N=UNMAR	0.97
GMT	1	1	DV	46	1	N=UNMAR	1.03
GMT	1	1	DV	99	9.4	top caud	0.97
GMT	1	1	DV	156	38.1	N=UNMAR	1.00
GMT	1	2	DID NOT MEASURE				
GMT	1	3	DID NOT MEASURE				

Comments:

Trap 1: N/A
 Trap 2: Coho: 52, Dolly Varden: 3, one dead coho
 Trap 3: Coho: 91, Dolly Varden: 5

Coho

DV

mean FCC ≤ 80mm	1.05	mean FCC ≤ 80mm	1.03
mean FCC > 80mm	1.02	mean FCC > 80mm	0.99
mean FL ≤ 80mm	57	mean FL ≤ 80mm	46.00
mean FL > 80mm	91	mean FL > 80mm	128
mean Wt(g) ≤ 80mm	2.1	mean Wt(g) ≤ 80mm	1
mean Wt(g) > 80mm	7.7	mean Wt(g) > 80mm	23.8

Number of RMAX coho 8 % incidence of RMAX coho 13.8%

Number of coho ≤ 80 mm 44

Number of coho > 80 mm 14

Site Identification

Waterfalls Creek - Site 2
crew: NN, GG, BD

Sampling Date

Nov. 25/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	L-M
Potential for Migration	H

Water Depth (cm)	62
Ice thickness (cm)	17
Clarity of Ice	None
Snow Depth (cm)	10
Water Temp (°C)	0.5
Turbidity	Clear
DO (ppm)	11.8
pH	
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

1 cluster set 4 meters u/s of beaver dam, under the ice.

Set duration	Overnight
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Comments

Photos Taken

Juvenile Capture and Sampling Summary

Location WFC#2
Date Nov. 26/09
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	228	50	120	91.6%	% CO
DV	20	128	156	8.0%	% DV
CT	1			0.4%	%CT

CPUE:	76.0	coho per trap per overnight set	6.67	DV per trap
	83.0	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	50	1.5	N=UNMAR	1.20
GMT	1	1	CO	50	1.3	N=UNMAR	1.04
GMT	1	1	CO	51		N=UNMARK	
GMT	1	1	CO	52	1.6	N=UNMAR	1.14
GMT	1	1	CO	52	1.8	N=UNMAR	1.28
GMT	1	1	CO	52	1.3	N=UNMAR	0.92
GMT	1	1	CO	52	1.4	N=UNMAR	1.00
GMT	1	1	CO	53	1.7	N=UNMAR	1.14
GMT	1	1	CO	53	1.6	N=UNMAR	1.07
GMT	1	1	CO	57	1.7	N=UNMAR	0.92
GMT	1	1	CO	58	1.9	N=UNMAR	0.97
GMT	1	1	CO	59	2.1	N=UNMAR	1.02
GMT	1	1	CO	60	2	N=UNMAR	0.93
GMT	1	1	CO	61	2.3	N=UNMAR	1.01
GMT	1	1	CO	61	2.3	N=UNMAR	1.01
GMT	1	1	CO	62	2.6	N=UNMAR	1.09
GMT	1	1	CO	62		N=UNMARK	
GMT	1	1	CO	62		N=UNMARK	
GMT	1	1	CO	63	2.5	N=UNMAR	1.00
GMT	1	1	CO	63	2.7	N=UNMAR	1.08
GMT	1	1	CO	64	2.6	N=UNMAR	0.99
GMT	1	1	CO	65	2.8	N=UNMAR	1.02
GMT	1	1	CO	65	2.7	Y=RMAX	0.98
GMT	1	1	CO	65	2.9	Y=RMAX	1.06
GMT	1	1	CO	66	3.1	Y=RMAX	1.08
GMT	1	1	CO	66	3	N=UNMAR	1.04
GMT	1	1	CO	70	3.6	Y=RMAX	1.05
GMT	1	1	CO	82		N=UNMARK	
GMT	1	1	CO	82		N=UNMARK	
GMT	1	1	CO	83	6	N=UNMAR	1.05
GMT	1	1	CO	83	6.4	N=UNMAR	1.12
GMT	1	1	CO	84	5.8	N=UNMAR	0.98
GMT	1	1	CO	85	6.5	N=UNMAR	1.06
GMT	1	1	CO	85	6.6	N=UNMAR	1.07
GMT	1	1	CO	85		N=UNMARK	
GMT	1	1	CO	86	6.7	N=UNMAR	1.05
GMT	1	1	CO	86	6.7	N=UNMAR	1.05

GMT	1	1	CO	86	7.2	N=UNMAR	1.13
GMT	1	1	CO	86	7	N=UNMAR	1.10
GMT	1	1	CO	86	7.1	N=UNMAR	1.12
GMT	1	1	CO	86		N=UNMARK	
GMT	1	1	CO	86		N=UNMARK	
GMT	1	1	CO	87	6.8	N=UNMAR	1.03
GMT	1	1	CO	88	6.7	N=UNMAR	0.98
GMT	1	1	CO	88	7.7	N=UNMAR	1.13
GMT	1	1	CO	89	7.1	N=UNMAR	1.01
GMT	1	1	CO	89	6.9	N=UNMAR	0.98
GMT	1	1	CO	89	7	N=UNMAR	0.99
GMT	1	1	CO	89	7.1	N=UNMAR	1.01
GMT	1	1	CO	90	6.9	N=UNMAR	0.95
GMT	1	1	CO	90	7.5	N=UNMAR	1.03
GMT	1	1	CO	90	7.9	N=UNMAR	1.08
GMT	1	1	CO	90	7.5	N=UNMAR	1.03
GMT	1	1	CO	90	7.4	N=UNMAR	1.02
GMT	1	1	CO	90		N=UNMARK	
GMT	1	1	CO	91		N=UNMARK	
GMT	1	1	CO	92	8.1	N=UNMAR	1.04
GMT	1	1	CO	92	7.8	N=UNMAR	1.00
GMT	1	1	CO	92	7.7	N=UNMAR	0.99
GMT	1	1	CO	92		N=UNMARK	
GMT	1	1	CO	92		N=UNMARK	
GMT	1	1	CO	92		N=UNMARK	
GMT	1	1	CO	93	7.8	N=UNMAR	0.97
GMT	1	1	CO	94	8	N=UNMAR	0.96
GMT	1	1	CO	94		N=UNMARK	
GMT	1	1	CO	95	8.2	N=UNMAR	0.96
GMT	1	1	CO	95	8.4	N=UNMAR	0.98
GMT	1	1	CO	95	8.6	N=UNMAR	1.00
GMT	1	1	CO	95	8.1	N=UNMAR	0.94
GMT	1	1	CO	95	9.1	N=UNMAR	1.06
GMT	1	1	CO	96	9.7	N=UNMAR	1.10
GMT	1	1	CO	97	10.3	N=UNMAR	1.13
GMT	1	1	CO	97	9.9	N=UNMAR	1.08
GMT	1	1	CO	99		N=UNMARK	
GMT	1	1	CO	99		N=UNMARK	
GMT	1	1	CO	101		N=UNMARK	
GMT	1	1	CO	102	10.5	N=UNMAR	0.99
GMT	1	1	CO	102		N=UNMARK	
GMT	1	1	CO	103	11.1	N=UNMAR	1.02
GMT	1	1	CO	104	12	N=UNMAR	1.07
GMT	1	1	CO	109	13.5	N=UNMAR	1.04
GMT	1	1	CO	120		N=UNMARK	
GMT	1	1	DV	128		N=UNMARK	
GMT	1	1	DV	130		N=UNMARK	
GMT	1	1	DV	132		N=UNMARK	
GMT	1	1	DV	135	25.3	N=UNMAR	1.03
GMT	1	1	DV	136	24.7	N=UNMAR	0.98
GMT	1	1	DV	146		N=UNMARK	
GMT	1	1	DV	156		N=UNMARK	

Comments:

Trap 1:

Trap 2:

Trap 3:

CO: 47, DV: 10, CT: 1

CO: 100, DV: 3

Coho

DV

Coho		DV	
mean FCC ≤ 80mm	1.04	mean FCC ≤ 80mm	N/A
mean FCC > 80mm	1.03	mean FCC > 80mm	1.01
mean FL ≤ 80mm	59	mean FL ≤ 80mm	N/A
mean FL > 80mm	92	mean FL > 80mm	138
mean Wt(g) ≤ 80mm	2.2	mean Wt(g) ≤ 80mm	N/A
mean Wt(g) > 80mm	8.0	mean Wt(g) > 80mm	25.0

Number of RMAX coho

4 % incidence of RMAX coho

4.88%

Number of coho ≤ 80 mm

27

Number of coho > 80 mm

55

Site Identification

Waterfalls Creek - Site 3
crew: NN, GG, BD

Sampling Date

Nov. 25/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	80%
Stream Flow	L-M
Potential for Migration	H

Water Depth (cm)	~52
Ice thickness (cm)	skiff
Clarity of Ice	L-Clear
Snow Depth (cm)	9
Water Temp (°C)	0.8
Turbidity	Clear
DO (ppm)	11.8
pH	
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

under ice, about 5 m upstream of dam.

Set duration	Overnight
--------------	-----------

Comments

Skiff ice and a crooked depth measurement

Juvenile Capture and Sampling Summary

Location WFC#3
Date Nov. 26/09
crew: NN, GG, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	98	48	123	86.7%	% CO
DV	14	93	166	12.4%	% DV
CT	1	70	70	1%	%CT

CPUE:	32.7	coho per trap per overnight set	4.67	DV per trap
	37.7	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	48	1.1	N=UNMAR	0.99
GMT	1	1	CO	49	1.5	Y=RMAX	1.27
GMT	1	1	CO	50	1.1	N=UNMAR	0.88
GMT	1	1	CO	51	1.4	Y=RMAX	1.06
GMT	1	1	CO	52	1.5	Y=RMAX	1.07
GMT	1	1	CO	52	1.5	Y=RMAX	1.07
GMT	1	1	CO	53	1.6	Y=RMAX	1.07
GMT	1	1	CO	53	1.4	Y=RMAX	0.94
GMT	1	1	CO	55	1.8	Y=RMAX	1.08
GMT	1	1	CO	55	1.8	Y=RMAX	1.08
GMT	1	1	CO	55	1.5	Y=RMAX	0.90
GMT	1	1	CO	56	1.6	N=UNMAR	0.91
GMT	1	1	CO	60	2.1	Y=RMAX	0.97
GMT	1	1	CO	60	2	Y=RMAX	0.93
GMT	1	1	CO	61	2.3	Y=RMAX	1.01
GMT	1	1	CO	62	2.5	Y=RMAX	1.05
GMT	1	1	CO	63	2.6	Y=RMAX	1.04
GMT	1	1	CO	63	2.6	N=UNMAR	1.04
GMT	1	1	CO	64	2.3	Y=RMAX	0.88
GMT	1	1	CO	66	3.2	Y=RMAX	1.11
GMT	1	1	CO	66		N=UNMARK	
GMT	1	1	CO	67	3.3	Y=RMAX	1.10
GMT	1	1	CO	67	3.5	Y=RMAX	1.16
GMT	1	1	CO	68	3.3	N=UNMAR	1.05
GMT	1	1	CO	70	3.3	Y=RMAX	0.96
GMT	1	1	CO	71	4.1	Y=RMAX	1.15
GMT	1	1	CO	77	4.8	N=UNMAR	1.05
GMT	1	1	CO	77	4.6	N=UNMAR	1.01
GMT	1	1	CO	78	5	N=UNMAR	1.05
GMT	1	1	CO	80	4.8	N=UNMAR	0.94
GMT	1	1	CO	80	5.6	N=UNMAR	1.09
GMT	1	1	CO	83	5.6	Y=RMAX	0.98
GMT	1	1	CO	84	5.8	Y=RMAX	0.98
GMT	1	1	CO	85	6.5	N=UNMAR	1.06
GMT	1	1	CO	87	6.7	N=UNMAR	1.02
GMT	1	1	CO	87	7.5	N=UNMAR	1.14
GMT	1	1	CO	88	7.1	N=UNMAR	1.04

GMT	1	1	CO	88	7.6	N=UNMAR	1.12
GMT	1	1	CO	90	7.2	N=UNMAR	0.99
GMT	1	1	CO	93	8.5	N=UNMAR	1.06
GMT	1	1	CO	93	8.3	N=UNMAR	1.03
GMT	1	1	CO	96	8.5	N=UNMAR	0.96
GMT	1	1	CO	97	8.7	N=UNMAR	0.95
GMT	1	1	CO	97	9.8	N=UNMAR	1.07
GMT	1	1	CO	99	10.6	Y=RMAX	1.09
GMT	1	1	CO	99	11.8	Y=RMAX	1.22
GMT	1	1	CO	101	10.5	N=UNMAR	1.02
GMT	1	1	CO	123	19.4	N=UNMAR	1.04
GMT	1	1	CT	70	3.2	N=UNMAR	0.93
GMT	1	1	DV	93	8.5	N=UNMAR	1.06
GMT	1	1	DV	103	10.8	N=UNMAR	0.99
GMT	1	1	DV	129	20.8	N=UNMAR	0.97
GMT	1	1	DV	132	20.2	N=UNMAR	0.88
GMT	1	1	DV	154	33.5	N=UNMAR	0.92
GMT	1	1	DV	166	40.5	N=UNMAR	0.89

Comments: Photo taken of large DV in trap 3 (172)

Trap 1:

Trap 2:

Trap 3:

CO: 26, DV: 1

CO: 25, DV: 7

Coho

DV

mean FCC ≤ 80mm	1.03	mean FCC ≤ 80mm	N/A
mean FCC > 80mm	1.04	mean FCC > 80mm	0.95
mean FL ≤ 80mm	62	mean FL ≤ 80mm	N/A
mean FL > 80mm	94	mean FL > 80mm	129.50
mean Wt(g) ≤ 80mm	2.7	mean Wt(g) ≤ 80mm	N/A
mean Wt(g) > 80mm	8.8	mean Wt(g) > 80mm	22.38

Number of RMAX coho

24 % incidence of RMAX coho

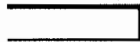
50.0%

Number of coho ≤ 80 mm

31

Number of coho > 80 mm

17



Site Identification

Waterfalls Creek - Site 4
crew: NN, GG, BD

Sampling Date

Nov. 25/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	0%
Stream Flow	H
Potential for Migration	H

Water Depth (cm)	66
Ice thickness (cm)	N/A
Clarity of Ice	N/A
Snow Depth (cm)	10
Water Temp (°C)	1.6
Turbidity	Clear
DO (ppm)	12.5
pH	
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

Just d/s of culverts in deepest part of the pool.
Pool has infilled a bit

Set duration	Overnight
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Comments

Photo 172 looking d/s at site from the top of culverts

Juvenile Capture and Sampling Summary

Location WFC#4
Date Nov. 26/09
crew: NN, GG, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO	54	46	107	77.1% % CO
DV	13	100	162	18.6% % DV
CT	0			0% %CT
RBT	3	102	132	4% %RBT

CPUE:	18.0	coho per trap per overnight set	4.33	DV per trap
	23.3	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	2	CO	46	1	N=UNMAR	1.03
GMT	1	2	CO	47	1.1	N=UNMAR	1.06
GMT	1	2	CO	48	1.1	N=UNMAR	0.99
GMT	1	2	CO	48	1.2	N=UNMAR	1.09
GMT	1	2	CO	50	1.3	N=UNMAR	1.04
GMT	1	2	CO	51	1.4	N=UNMAR	1.06
GMT	1	1	CO	52	1.3	N=UNMAR	0.92
GMT	1	2	CO	52	1.3	N=UNMAR	0.92
GMT	1	2	CO	52	1.4	N=UNMAR	1.00
GMT	1	1	CO	53	1.6	N=UNMAR	1.07
GMT	1	2	CO	53	1.7	N=UNMAR	1.14
GMT	1	2	CO	53	2.6	N=UNMAR	1.75
GMT	1	3	CO	53		N=UNMARK	
GMT	1	2	CO	54	1.6	Y=RMAX	1.02
GMT	1	2	CO	54	1.5	N=UNMAR	0.95
GMT	1	1	CO	55	1.8	N=UNMAR	1.08
GMT	1	1	CO	56	1.7	N=UNMAR	0.97
GMT	1	2	CO	56	1.8	N=UNMAR	1.02
GMT	1	2	CO	57	1.8	N=UNMAR	0.97
GMT	1	2	CO	57	1.9	N=UNMAR	1.03
GMT	1	2	CO	59	2	N=UNMAR	0.97
GMT	1	2	CO	59	1.7	N=UNMAR	0.83
GMT	1	2	CO	60	1.9	N=UNMAR	0.88
GMT	1	2	CO	60	2.2	N=UNMAR	1.02
GMT	1	2	CO	60	1.9	N=UNMAR	0.88
GMT	1	3	CO	60		N=UNMARK	
GMT	1	1	CO	61	2.4	Y=RMAX	1.06
GMT	1	2	CO	61	2.3	N=UNMAR	1.01
GMT	1	3	CO	61		N=UNMARK	
GMT	1	2	CO	62	2.5	N=UNMAR	1.05
GMT	1	2	CO	62	2.1	N=UNMAR	0.88
GMT	1	1	CO	64	2.6	Y=RMAX	0.99
GMT	1	2	CO	64	2.5	Y=RMAX	0.95
GMT	1	1	CO	65	2.8	Y=RMAX	1.02
GMT	1	3	CO	65		N=UNMARK	
GMT	1	2	CO	68	3.2	N=UNMAR	1.02

GMT	1	2	CO	68	3.1	Y=RMAX	0.99
GMT	1	3	CO	68		N=UNMARK	
GMT	1	2	CO	69	3.4	Y=RMAX	1.03
GMT	1	2	CO	69	3.9	Y=RMAX	1.19
GMT	1	1	CO	71	3.9	Y=RMAX	1.09
GMT	1	1	CO	71	3.8	Y=RMAX	1.06
GMT	1	1	CO	74	4	N=UNMAR	0.99
GMT	1	2	CO	81	5.4	N=UNMAR	1.02
GMT	1	2	CO	84	5.6	N=UNMAR	0.94
GMT	1	2	CO	86	6.3	N=UNMAR	0.99
GMT	1	2	CO	87	6.7	N=UNMAR	1.02
GMT	1	3	CO	92		N=UNMARK	
GMT	1	3	CO	94		N=UNMARK	
GMT	1	2	CO	95	7.4	N=UNMAR	0.86
GMT	1	1	CO	96	8.6	N=UNMAR	0.97
GMT	1	2	CO	99	9.7	N=UNMAR	1.00
GMT	1	2	CO	102	9.6	N=UNMAR	0.90
GMT	1	1	CO	104	11.5	N=UNMAR	1.02
GMT	1	2	CO	107	11.8	N=UNMAR	0.96
GMT	1	1	DV	100	9.2	N=UNMAR	0.92
GMT	1	1	DV	105	10	N=UNMAR	0.86
GMT	1	1	DV	107	10.4	N=UNMAR	0.85
GMT	1	3	DV	120		N=UNMARK	
GMT	1	3	DV	120		N=UNMARK	
GMT	1	3	DV	125		N=UNMARK	
GMT	1	3	DV	129		N=UNMARK	
GMT	1	3	DV	133		N=UNMARK	
GMT	1	3	DV	135		N=UNMARK	
GMT	1	3	DV	136		N=UNMARK	
GMT	1	3	DV	149		N=UNMARK	
GMT	1	3	DV	160		N=UNMARK	
GMT	1	3	DV	162		N=UNMARK	
GMT	1	2	RBT	102	9.9	N=UNMAR	0.93
GMT	1	1	RBT	106	11.3	N=UNMAR	0.95
GMT	1	1	RBT	132	23.4	N=UNMAR	1.02

Comments:

Trap 1:

Trap 2:

Trap 3:

Coho

DV

mean FCC ≤ 80mm	1.03	mean FCC ≤ 80mm	N/A
mean FCC > 80mm	0.97	mean FCC > 80mm	0.88
mean FL ≤ 80mm	59	mean FL ≤ 80mm	N/A
mean FL > 80mm	94	mean FL > 80mm	129.31
mean Wt(g) ≤ 80mm	2.1	mean Wt(g) ≤ 80mm	N/A
mean Wt(g) > 80mm	8.3	mean Wt(g) > 80mm	9.87

Number of RMAX coho

10 % incidence of RMAX coho

18.2%

Number of coho ≤ 80 mm

43

Number of coho > 80 mm

12

Site Identification

Waterfalls Creek - Site 1
crew: BD, GG, NN

Sampling Date

Feb. 2/2010

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	Low
Potential for Migration	High

Water Depth (cm)	53
Ice thickness (cm)	31.5
Clarity of Ice	None
Snow Depth (cm)	1
Water Temp (°C)	1.2
Turbidity	Clear
DO (ppm)	11.2
pH	7.5
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

1 cluster set just d/s of new beaver dam,
just past Signal "D".

Set duration	Overnight
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Comments

Juvenile Capture and Sampling Summary

Location WFC#1
Date Feb. 3/10
crew: NN, BD, GG

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO	74	45	115	91.4% % CO
DV	6	96	164	7.4% % DV
CT	1	110	110	1.2% %CT
CPUE:	24.67	coho per trap per overnight set		
	27.0	fish per trap per overnight set		2 DV per trap

Individual Sampling Data

Y=Rmax
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	45	0.8		0.88
GMT	1	2	CO	47	1		0.96
GMT	1	3	CO	49	1.1		0.93
GMT	1	3	CO	49	1.1		0.93
GMT	1	2	CO	50	1.2		0.96
GMT	1	2	CO	50	1.2		0.96
GMT	1	3	CO	54	1.4		0.89
GMT	1	2	CO	55	1.5		0.90
GMT	1	2	CO	55	1.6		0.96
GMT	1	1	CO	55	1.7	Y=Rmax	1.02
GMT	1	1	CO	57	1.7		0.92
GMT	1	2	CO	57	1.7		0.92
GMT	1	1	CO	57	1.9		1.03
GMT	1	2	CO	58	1.9		0.97
GMT	1	3	CO	59	1.7		0.83
GMT	1	3	CO	59	1.8		0.88
GMT	1	2	CO	60	2		0.93
GMT	1	1	CO	60	2.1		0.97
GMT	1	3	CO	61	2.2		0.97
GMT	1	1	CO	61	2.3		1.01
GMT	1	1	CO	62	2.4		1.01
GMT	1	1	CO	62	2.5	Y=Rmax	1.05
GMT	1	3	CO	63	2.3		0.92
GMT	1	1	CO	63	2.4		0.96
GMT	1	1	CO	63	2.5	Y=Rmax	1.00
GMT	1	1	CO	63	2.5	Y=Rmax	1.00
GMT	1	1	CO	63	2.9		1.16
GMT	1	3	CO	64	2.4		0.92
GMT	1	1	CO	64	2.6		0.99
GMT	1	1	CO	66	2.7	Y=Rmax	0.94
GMT	1	1	CO	66	2.8		0.97
GMT	1	2	CO	66	2.8		0.97
GMT	1	1	CO	67	2.9	Y=Rmax	0.96
GMT	1	3	CO	67	2.9		0.96
GMT	1	2	CO	68	3.1		0.99
GMT	1	1	CO	70	3.4		0.99
GMT	1	2	CO	72	3.7		0.99
GMT	1	1	CO	73	3.9	Y=Rmax	1.00

GMT	1	2	CO	73	4.6		1.18
GMT	1	1	CO	76	4		0.91
GMT	1	1	CO	77	4.2		0.92
GMT	1	1	CO	78	4.5	Y=Rmax	0.95
GMT	1	1	CO	79	4.7		0.95
GMT	1	1	CO	82	5.2		0.94
GMT	1	2	CO	82	5.9		1.07
GMT	1	2	CO	84	6		1.01
GMT	1	1	CO	85	5.6		0.91
GMT	1	1	CO	86	5.8		0.91
GMT	1	3	CO	88	6.3		0.92
GMT	1	1	CO	89	6.3		0.89
GMT	1	3	CO	89	6.3		0.89
GMT	1	1	CO	89	6.4		0.91
GMT	1	2	CO	89	6.4		0.91
GMT	1	1	CO	90	7.4		1.02
GMT	1	1	CO	91	6.8		0.90
GMT	1	2	CO	92	7.2		0.92
GMT	1	1	CO	92	7.8		1.00
GMT	1	2	CO	93	7.1		0.88
GMT	1	3	CO	93	7.7		0.96
GMT	1	2	CO	93	8.3		1.03
GMT	1	1	CO	95	8.6		1.00
GMT	1	1	CO	96	8.2		0.93
GMT	1	1	CO	97	9.3		1.02
GMT	1	2	CO	99	9.6		0.99
GMT	1	3	CO	115	14.1		0.93
GMT	1	3	CT	110	12.3		0.92
GMT	1	3	DV	96	7.9		0.89
GMT	1	1	DV	132	22.7		0.99
GMT	1	3	DV	135	22.4		0.91
GMT	1	1	DV	141	26.2		0.93
GMT	1	2	DV	157	36.3		0.94
GMT	1	3	DV	164	42.1		0.95

Comments:

Trap 1: N/A
 Trap 2: N/A
 Trap 3: Coho not sampled= 8 Unmarked, 1 Rmax.

Coho

DV

mean FCC ≤ 80mm	0.97	mean FCC ≤ 80mm	NA
mean FCC > 80mm	0.95	mean FCC > 80mm	0.94
mean FL ≤ 80mm	62	mean FL ≤ 80mm	NA
mean FL > 80mm	91	mean FL > 80mm	138
mean Wt(g) ≤ 80mm	2.4	mean Wt(g) ≤ 80mm	NA
mean Wt(g) > 80mm	7.4	mean Wt(g) > 80mm	26

Number of RMAX coho 8 % incidence of RMAX coho 12.3%

Number of coho ≤ 80 mm 43
 Number of coho > 80 mm 22

Site Identification

Waterfalls Creek - Site 2
crew: NN, GG, BD

Sampling Date

03-Feb-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	Low
Potential for Migration	High

Water Depth (cm)	53
Ice thickness (cm)	35
Clarity of Ice	None
Snow Depth (cm)	1
Water Temp (°C)	0.6
Turbidity	Clear
DO (ppm)	12.3
pH	8.0
Flow (m/s)	na

Number of traps set 3

Set Locations

Traps set just upstream of the beaver dam at this site.

Set duration Overnight

Comments

There was a slight hydrogen sulfide odor at this site on the trap set date but the odor was not apparent at time of trap pick-up the next day.

Juvenile Capture and Sampling Summary

Location WFC#2
Date 03-Feb-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	154			98.1%	% CO
DV	3			1.9%	% DV
CT	0			0.0%	%CT

CPUE:	51.3	coho per trap per overnight set	1	DV per trap
	52.3	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	46	0.9		0.92
GMT	1	1	CO	48	1.4		1.27
GMT	1	1	CO	49	1.4		1.19
GMT	1	1	CO	50	1.2		0.96
GMT	1	1	CO	50	1.5		1.20
GMT	1	1	CO	51	1.7		1.28
GMT	1	1	CO	53	1.3		0.87
GMT	1	1	CO	53	1.4		0.94
GMT	1	1	CO	53	1.9		1.28
GMT	1	1	CO	53	1.9		1.28
GMT	1	1	CO	55	1.9		1.14
GMT	1	1	CO	55	1.4		0.84
GMT	1	1	CO	55	2		1.20
GMT	1	1	CO	55	1.9		1.14
GMT	1	1	CO	56	1.7		0.97
GMT	1	1	CO	57	2.1		1.13
GMT	1	1	CO	57	2.4	Y=RMAX	1.30
GMT	1	1	CO	59	2		0.97
GMT	1	1	CO	60	2.4	Y=RMAX	1.11
GMT	1	1	CO	69	3		0.91
GMT	1	1	CO	72	3.5	Y=RMAX	0.94
GMT	1	1	CO	72	4	Y=RMAX	1.07
GMT	1	1	CO	73	3.8		0.98
GMT	1	1	CO	79	4.8		0.97
GMT	1	1	CO	79	5.1		1.03
GMT	1	1	CO	81	5.3	Y=RMAX	1.00
GMT	1	1	CO	84	7.8		1.32
GMT	1	1	CO	86	6		0.94
GMT	1	1	CO	86	6.3		0.99
GMT	1	1	CO	86	5.7		0.90
GMT	1	1	CO	89	7.3		1.04
GMT	1	1	CO	90	6.5		0.89
GMT	1	1	CO	91	6.6		0.88
GMT	1	1	CO	91	8.2		1.09
GMT	1	1	CO	92	8		1.03
GMT	1	1	CO	93	6.9		0.86
GMT	1	1	CO	94	7.4		0.89

GMT	1	1	CO	95	9		1.05
GMT	1	1	CO	95	8.9		1.04
GMT	1	1	CO	98	9.8		1.04
GMT	1	1	CO	99	8.4		0.87
GMT	1	1	CO	100	9.2	Y=RMAX	0.92
GMT	1	1	CO	104	11.4		1.01
GMT	1	1	CO	104	10.6		0.94
GMT	1	1	CO	107	12		0.98
GMT	1	1	CO	194			0.00
GMT	1	1	DV	123	15.1		0.81
GMT	1	1	DV	156	30.1		0.79

Number of RMAX coho 6 % incidence of RMAX coho 13.0%

Comments:

Trap 1: 14 CO not sampled
 Trap 2: 33 CO and 1 DV not sampled
 Trap 3: 61 CO not sampled (no DV in this trap)

Coho

DV

mean FCC ≤ 80mm	1.08	mean FCC ≤ 80mm	N/A
mean FCC > 80mm	0.94	mean FCC > 80mm	0.80
mean FL ≤ 80mm	58	mean FL ≤ 80mm	N/A
mean FL > 80mm	98	mean FL > 80mm	140
mean Wt(g) ≤ 80mm	2.3	mean Wt(g) ≤ 80mm	N/A
mean Wt(g) > 80mm	8.1	mean Wt(g) > 80mm	22.6

Number of coho ≤ 80 mm 25

Number of coho > 80 mm 21

Site Identification

Waterfalls Creek - Site 3 crew: NN, GG, BD

Sampling Date

04-Feb-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	Low
Potential for Migration	High

Water Depth (cm)	69
Ice thickness (cm)	26
Clarity of Ice	None
Snow Depth (cm)	1
Water Temp (°C)	0.7
Turbidity	Clear
DO (ppm)	10.9
pH	7.8
Flow (m/s)	na

Number of traps set	3
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Set Locations

Middle of pool u/s of Boulders about 12 m u/s of the beaver dam

Set duration	Overnight
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Comments

There was a strong hydrogen sulphide odor at this site on Feb 2'nd(trap set day) The H2S odor was not apparent at trap pick-up time.

Juvenile Capture and Sampling Summary

Location WFC#3
Date 03-Feb-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	238			99.2%	% CO
DV	2			0.8%	% DV
CT	0			0.0%	%CT

CPUE:	79.3	coho per trap per overnight set fish per trap per overnight set	0.67	DV per trap
	80.0			

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	47	1		0.96
GMT	1	1	CO	48	1.1		0.99
GMT	1	1	CO	49	1.1		0.93
GMT	1	1	CO	49	0.9		0.76
GMT	1	1	CO	50	1.2		0.96
GMT	1	1	CO	51	1.2		0.90
GMT	1	1	CO	52	1.4	Y=RMAX	1.00
GMT	1	1	CO	54	1.4	Y=RMAX	0.89
GMT	1	1	CO	54	1.3		0.83
GMT	1	1	CO	54	1.5		0.95
GMT	1	1	CO	54	1.3	Y=RMAX	0.83
GMT	1	1	CO	54	2		1.27
GMT	1	1	CO	55	1.7	Y=RMAX	1.02
GMT	1	1	CO	56	1.7		0.97
GMT	1	1	CO	56	1.6		0.91
GMT	1	1	CO	56	1.7		0.97
GMT	1	1	CO	56	1.7		0.97
GMT	1	1	CO	57	1.6	Y=RMAX	0.86
GMT	1	1	CO	57	2		1.08
GMT	1	1	CO	57	1		0.54
GMT	1	1	CO	59	1.3	Y=RMAX	0.63
GMT	1	1	CO	59	2.2	Y=RMAX	1.07
GMT	1	1	CO	60	2.3	Y=RMAX	1.06
GMT	1	1	CO	61	2.3	Y=RMAX	1.01
GMT	1	1	CO	62	2.5		1.05
GMT	1	1	CO	62	2.4	Y=RMAX	1.01
GMT	1	1	CO	63	2.3	Y=RMAX	0.92
GMT	1	1	CO	63	2.2		0.88
GMT	1	1	CO	63	2.4	Y=RMAX	0.96
GMT	1	1	CO	63	2.4		0.96
GMT	1	1	CO	63	2.5		1.00
GMT	1	1	CO	63	2.4		0.96
GMT	1	1	CO	64	2.5		0.95
GMT	1	1	CO	64	2.7	Y=RMAX	1.03
GMT	1	1	CO	64	2.5		0.95
GMT	1	1	CO	64	2.5		0.95
GMT	1	1	CO	64	2.6	Y=RMAX	0.99

GMT	1	1	CO	64	2.5	Y=RMAX	0.95
GMT	1	1	CO	65	2.4		0.87
GMT	1	1	CO	65	2.8	Y=RMAX	1.02
GMT	1	1	CO	65	2.7		0.98
GMT	1	1	CO	65	3	Y=RMAX	1.09
GMT	1	1	CO	65	3.2		1.17
GMT	1	1	CO	66	3		1.04
GMT	1	1	CO	66	2.8		0.97
GMT	1	1	CO	67	2.8		0.93
GMT	1	1	CO	67	2.9	Y=RMAX	0.96
GMT	1	1	CO	68	3.2	Y=RMAX	1.02
GMT	1	1	CO	69	3.1	Y=RMAX	0.94
GMT	1	1	CO	70	3.3	Y=RMAX	0.96
GMT	1	1	CO	71	3.6	Y=RMAX	1.01
GMT	1	1	CO	72	3.7		0.99
GMT	1	1	CO	72	3.8	Y=RMAX	1.02
GMT	1	1	CO	72	4.1		1.10
GMT	1	1	CO	72	4	Y=RMAX	1.07
GMT	1	1	CO	76	4.4	Y=RMAX	1.00
GMT	1	1	CO	76	4.3		0.98
GMT	1	1	CO	76	5.1		1.16
GMT	1	1	CO	78	4.6		0.97
GMT	1	1	CO	78	5	Y=RMAX	1.05
GMT	1	1	CO	81	5.3	Y=RMAX	1.00
GMT	1	1	CO	81	5.4		1.02
GMT	1	1	CO	81	5.6		1.05
GMT	1	1	CO	82	5.2		0.94
GMT	1	1	CO	82	5.8		1.05
GMT	1	1	CO	83	5.2		0.91
GMT	1	1	CO	83	6		1.05
GMT	1	1	CO	86	6		0.94
GMT	1	1	CO	87	6.6	Y=RMAX	1.00
GMT	1	1	CO	94	8.8		1.06
GMT	1	1	CO	97	8.8		0.96
GMT	1	1	CO	97	9		0.99
GMT	1	1	CO	105	12.6		1.09
GMT	1	1	CO	118	14.2		0.86

Number of RMAX coho

28

% incidence of RMAX coho

37.8%

Comments:

Trap 1:

All fish sampled

Trap 2:

79 CO not sampled

Trap 3:

85 CO not sampled and 2 DV not sampled

Coho**DV**

mean FCC \leq 80mm	0.97	mean FCC \leq 80mm	na
mean FCC $>$ 80mm	0.99	mean FCC $>$ 80mm	na
mean FL \leq 80mm	62	mean FL \leq 80mm	na
mean FL $>$ 80mm	90	mean FL $>$ 80mm	na
mean Wt(g) \leq 80mm	2.5	mean Wt(g) \leq 80mm	na
mean Wt(g) $>$ 80mm	7.5	mean Wt(g) $>$ 80mm	na

Number of coho \leq 80 mm 60
Number of coho $>$ 80 mm 14

Site Identification

Waterfalls Creek - Site 4
crew: NN, GG, BD

Sampling Date

02-Feb-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	1
Ice Cover	100%
Stream Flow	Low
Potential for Migration	Moderate

Water Depth (cm)	37
Ice thickness (cm)	47
Clarity of Ice	None
Snow Depth (cm)	1
Water Temp (°C)	0.7
Turbidity	Clear
DO (ppm)	11.9
pH	7.5
Flow (m/s)	na

Number of traps set 3

Set Locations

Just d/s of the culverts at site 4

Set duration Overnight

Comments

No hydrogen sulphide odor here as at sites 2 and 3

Juvenile Capture and Sampling Summary

Location WFC#4
Date 03-Feb-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	44			77.2%	% CO
DV	8			14.0%	% DV
RBT	5			8.8%	%RBT

CPUE:	14.7	coho per trap per overnight set	2.67	DV per trap
	19.0	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	2	CO	46	1.3		1.34
GMT	1	2	CO	48	1.4		1.27
GMT	1	2	CO	50	1.8		1.44
GMT	1	2	CO	50	1.2		0.96
GMT	1	1	CO	51	1.4		1.06
GMT	1	1	CO	51	1.4		1.06
GMT	1	2	CO	52	1.4		1.00
GMT	1	2	CO	52	1.8		1.28
GMT	1	2	CO	53	1.4		0.94
GMT	1	2	CO	55	1.6		0.96
GMT	1	2	CO	56	2	Y=RMAX	1.14
GMT	1	2	CO	56	1.8		1.02
GMT	1	2	CO	58	2.2		1.13
GMT	1	1	CO	59	2.3		1.12
GMT	1	1	CO	59	2.2		1.07
GMT	1	2	CO	59	2.2	Y=RMAX	1.07
GMT	1	1	CO	62	2.1		0.88
GMT	1	2	CO	62	2.3	Y=RMAX	0.97
GMT	1	2	CO	62	2.6		1.09
GMT	1	2	CO	62	2.5	Y=RMAX	1.05
GMT	1	2	CO	63	3.7	Y=RMAX	1.48
GMT	1	2	CO	63	2.7		1.08
GMT	1	2	CO	66	3	Y=RMAX	1.04
GMT	1	1	CO	67	3.1	Y=RMAX	1.03
GMT	1	2	CO	67	3.1		1.03
GMT	1	2	CO	68	3.1	Y=RMAX	0.99
GMT	1	2	CO	68	3.6	Y=RMAX	1.14
GMT	1	2	CO	72	4	Y=RMAX	1.07
GMT	1	1	CO	77	4.6	Y=RMAX	1.01
GMT	1	2	CO	82	6		1.09
GMT	1	2	CO	83	6.4		1.12
GMT	1	1	CO	86	5.8		0.91
GMT	1	2	CO	93	8.5		1.06
GMT	1	1	CO	94	7.4		0.89
GMT	1	2	DV	106	10.5		0.88
GMT	1	2	DV	117	14.1		0.88
GMT	1	1	DV	146	27.8		0.89

GMT	1	1	RBT	98	8.9		0.95
GMT	1	2	RBT	106	11.3		0.95
GMT	1	1	RBT	131	22.6		1.01

Number of RMAX coho 11 % incidence of RMAX coho 45.8%

Comments:

Trap 1: All fish sampled
 Trap 2: All fish sampled
 Trap 3: 10 coho not sampled plus 5 DV and 2 RBT not sampled

Coho

DV

mean FCC ≤ 80mm	1.09	mean FCC ≤ 80mm	na
mean FCC > 80mm	1.01	mean FCC > 80mm	0.89
mean FL ≤ 80mm	59	mean FL ≤ 80mm	na
mean FL > 80mm	88	mean FL > 80mm	123
mean Wt(g) ≤ 80mm	2.3	mean Wt(g) ≤ 80mm	na
mean Wt(g) > 80mm	6.8	mean Wt(g) > 80mm	17.5

RBT

mean FCC ≤ 80mm	na
mean FCC > 80mm	0.97
mean FL ≤ 80mm	na
mean FL > 80mm	111.7
mean Wt(g) ≤ 80mm	na
mean Wt(g) > 80mm	14.3

Number of coho ≤ 80 mm 29
 Number of coho > 80 mm 5

Site Identification

Waterfalls Creek - Site 1
crew: BD, NN

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	10
Ice Cover	40%
Stream Flow	Mod
Potential for Migration	Low

Water Depth (cm)	59
Ice thickness (cm)	Skiff
Clarity of Ice	None
Snow Depth (cm)	0
Water Temp (°C)	2.6
Turbidity	Clear
DO (ppm)	13.3
pH	7.1
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

1 cluster set just d/s of new beaver dam, just past Signal "D".

Set duration	Overnight
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Comments

Sampling method was changed - all captured fish were counted into ONE bucket and then a random sample of fish to be individually sampled was removed. This meant that a portion of fish from ALL traps were sampled.

Juvenile Capture and Sampling Summary

Location WFC#1
Date 23-Mar-10
crew: NN, BD

Species	No. Caught	Min Ln (mm)	Max Ln (mm)	species composition	
CO	53	47	96	80.3%	% CO
DV	13	52	148	19.7%	% DV
CT	0			0.0%	%RBT
CPUE:	17.7	coho per trap per overnight set			
	22.0	fish per trap per overnight set		4.33	DV per trap

Individual Sampling Data

Y=Rmax
 N=UNMARK

Capture Method	Cluster #	Trap #	Species	FL(mm)	Weight(g)	Mark type	FCC
GMT	1		CO	47	1		0.96
GMT	1		CO	50	1.3		1.04
GMT	1		CO	50	1.3		1.04
GMT	1		CO	50	1.3		1.04
GMT	1		CO	51	1.3		0.98
GMT	1		CO	53	1.4		0.94
GMT	1		CO	54	1.5		0.95
GMT	1		CO	54	1.6	Y=Rmax	1.02
GMT	1		CO	55	1.3		0.78
GMT	1		CO	55	1.4		0.84
GMT	1		CO	55	1.4		0.84
GMT	1		CO	55	1.6		0.96
GMT	1		CO	55	1.7		1.02
GMT	1		CO	55	1.7		1.02
GMT	1		CO	56	1.6		0.91
GMT	1		CO	56	1.8		1.02
GMT	1		CO	56	2.1		1.20
GMT	1		CO	57	1.9		1.03
GMT	1		CO	58	2	Y=Rmax	1.03
GMT	1		CO	60	2		0.93
GMT	1		CO	60	2.2		1.02
GMT	1	1,2 and 3	CO	65	2.5		0.91
GMT	1		CO	66	2.7		0.94
GMT	1		CO	67	2.8		0.93
GMT	1		CO	70	3.2		0.93
GMT	1		CO	72	3.8	Y=Rmax	1.02
GMT	1		CO	75	3.7		0.88
GMT	1		CO	82	5.6		1.02
GMT	1		CO	83	4.9		0.86
GMT	1		CO	84	5.8		0.98
GMT	1		CO	86	5.5		0.86
GMT	1		CO	86	5.8		0.91
GMT	1		CO	87	6.2		0.94
GMT	1		CO	96	7.8		0.88
GMT	1		DV	52	1.9		1.35
GMT	1		DV	127	17.2		0.84
GMT	1		DV	131	19.7		0.88
GMT	1		DV	136	22.8		0.91

Site Identification

Waterfalls Creek - Site 2
crew: NN, BD

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	10
Ice Cover	100%
Stream Flow	Low
Potential for Migration	High

Water Depth (cm)	70
Ice thickness (cm)	14
Clarity of Ice	None
Snow Depth (cm)	0
Water Temp (°C)	2.5
Turbidity	Clear
DO (ppm)	12.8
pH	6.9
Flow (m/s)	na

Number of traps set	3
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Set Locations

Traps set just upstream of the beaver dam at this site.

Set duration	Overnight
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Comments

2 photos (2032-31)
Sampling process same as for Trap 1 - random sample from all three traps.

Juvenile Capture and Sampling Summary

Location WFC#2
Date 23-Mar-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	65	50	111	82.3%	% CO
DV	14	93	145	17.7%	% DV
CT	0			0.0%	%RBT

CPUE:	21.7	coho per trap per overnight set fish per trap per overnight set	4.67	DV per trap
	26.3			

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1		CO	50	1.8	N=UNMAR	1.44
GMT	1		CO	52	1.4		1.00
GMT	1		CO	54	1.7		1.08
GMT	1		CO	56	2.1		1.20
GMT	1		CO	58	1.9		0.97
GMT	1		CO	59	2		0.97
GMT	1		CO	62	2.4		1.01
GMT	1		CO	63	2.5		1.00
GMT	1		CO	83	5.8		1.01
GMT	1		CO	87	6.5		0.99
GMT	1		CO	87	6.5		0.99
GMT	1		CO	88	6.7		0.98
GMT	1		CO	88	6.9		1.01
GMT	1		CO	89	6.8		0.96
GMT	1		CO	90	6.5		0.89
GMT	1		CO	90	6.8		0.93
GMT	1		CO	91	6.5		0.86
GMT	1		CO	91	7.1		0.94
GMT	1		CO	91	7.6		1.01
GMT	1		CO	92	6.5		0.83
GMT	1		CO	92	7.3		0.94
GMT	1		CO	93	7.4		0.92
GMT	1		CO	93	7.4		0.92
GMT	1		CO	93	7.7		0.96
GMT	1		CO	94	7.9		0.95
GMT	1		CO	94	8.2		0.99
GMT	1		CO	95	8.9		1.04
GMT	1		CO	96	8.1		0.92
GMT	1		CO	96	8.4		0.95
GMT	1		CO	97	8		0.88
GMT	1	1,2 and 3	CO	97	8.1		0.89
GMT	1		CO	97	8.6		0.94
GMT	1		CO	98	8.5		0.90
GMT	1		CO	98	8.6		0.91
GMT	1		CO	99	9	Y=RMAX	0.93
GMT	1		CO	100	9.4	Y=RMAX	0.94
GMT	1		CO	100	9.6		0.96

GMT	1		CO	100	10.2	Y=RMAX	1.02
GMT	1		CO	104	11		0.98
GMT	1		CO	105	10.1	Y=RMAX	0.87
GMT	1		CO	107	10.6		0.87
GMT	1		CO	111	12.7		0.93
GMT	1		DV	93	7.6		0.94
GMT	1		DV	95	7.7		0.90
GMT	1		DV	96	8.5		0.96
GMT	1		DV	101			0.00
GMT	1		DV	103	9.3		0.85
GMT	1		DV	115	14.2		0.93
GMT	1		DV	119	16		0.95
GMT	1		DV	125	18.6		0.95
GMT	1		DV	126	20.3		1.01
GMT	1		DV	129	18		0.84
GMT	1		DV	131	20.7		0.92
GMT	1		DV	138	24.4		0.93
GMT	1		DV	145	29.8		0.98
GMT	1						

Number of RMAX coho 4 % incidence of RMAX coho 9.5%

Comments:	No. Coho	No. DV	No. RBT	
Trap 1:	18	1	0	
Trap 2:	22	10	0	
Trap 3:	25	3	0	
Totals	65	14	0	79

Coho		DV	
mean FCC ≤ 80mm	1.08		mean FCC ≤ 80mm
mean FCC > 80mm	0.94		mean FCC > 80mm 0.86
mean FL ≤ 80mm	57		mean FL ≤ 80mm
mean FL > 80mm	95		mean FL > 80mm 117
mean Wt(g) ≤ 80mm	2.0		mean Wt(g) ≤ 80mm
mean Wt(g) > 80mm	8.1		mean Wt(g) > 80mm 16.3

Number of coho ≤ 80 mm 8

Number of coho > 80 mm 34

Site Identification

Waterfalls Creek - Site 3
crew: NN, BD

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	10
Ice Cover	0%
Stream Flow	Mod
Potential for Migration	High

Water Depth (cm)	78
Ice thickness (cm)	0
Clarity of Ice	Na
Snow Depth (cm)	0
Water Temp (°C)	2.9
Turbidity	Clear
DO (ppm)	11.5
pH	7.0
Flow (m/s)	na

Number of traps set 3

Set Locations

Middle of pool u/s of Boulders about 12 m u/s of the beaver dam

Set duration Overnight

Comments

Sampling procedure is as per new procedure - see Waterfalls 1 for details.

Juvenile Capture and Sampling Summary

Location WFC#3
Date 23-Mar-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	56	47	115	90.3%	% CO
DV	5	122	180	8.1%	% DV
RBT	1	70	70	1.6%	%RBT

CPUE:	18.7	coho per trap per overnight set	1.67	DV per trap
	20.7	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1		CO	47	0.8		0.77
GMT	1		CO	48	1		0.90
GMT	1		CO	52	1.2		0.85
GMT	1		CO	53	1.2	Y=RMAX	0.81
GMT	1		CO	53	1.3		0.87
GMT	1		CO	53	1.8		1.21
GMT	1		CO	55	1.8		1.08
GMT	1		CO	60	2		0.93
GMT	1		CO	62	2.3	Y=RMAX	0.97
GMT	1		CO	75	3.9		0.92
GMT	1		CO	75	4.2	Y=RMAX	1.00
GMT	1		CO	75	4.4	Y=RMAX	1.04
GMT	1		CO	77	4.9	Y=RMAX	1.07
GMT	1		CO	78	4.4		0.93
GMT	1		CO	78	5		1.05
GMT	1		CO	79	4.6		0.93
GMT	1		CO	80	4.7		0.92
GMT	1		CO	81	4.8		0.90
GMT	1		CO	82	4.4		0.80
GMT	1		CO	83	5.4		0.94
GMT	1		CO	85	5.5		0.90
GMT	1		CO	85	5.7		0.93
GMT	1		CO	86	6.1		0.96
GMT	1		CO	92	7.8		1.00
GMT	1		CO	93	7.2		0.90
GMT	1		CO	95	8.4		0.98
GMT	1		CO	95	8.4		0.98
GMT	1		CO	98	6.5		0.69
GMT	1		CO	102	11		1.04
GMT	1		CO	104	10.7		0.95
GMT	1		CO	110	11.7		0.88
GMT	1		CO	115	14.9		0.98
GMT	1		DV	122	18		0.99
GMT	1		DV	130	19.1		0.87
GMT	1		DV	140	25.5		0.93
GMT	1		DV	145	23.1		0.76
GMT	1		DV	180	46.2		0.79

Site Identification

Waterfalls Creek - Site 4
crew: NN, BD

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	10
Ice Cover	30%
Stream Flow	Moderate
Potential for Migration	High

Water Depth (cm)	42
Ice thickness (cm)	6
Clarity of Ice	None
Snow Depth (cm)	1
Water Temp (°C)	2.8
Turbidity	Clear
DO (ppm)	12.2
pH	7.2
Flow (m/s)	na

Number of traps set 3

Set Locations

Just d/s of the culverts at site 4

Set duration Overnight

Comments

Sampling procedure as per new procedure described in Site 1

Juvenile Capture and Sampling Summary

Location WFC#4
Date 23-Mar-10
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	8	50	92	33.3%	% CO
DV	13	89	152	54.2%	% DV
RBT	3	59	135	12.5%	%RBT

CPUE:	2.7	coho per trap per overnight set	4.33	DV per trap
	8.0	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1		CO	50	1.2		0.96
GMT	1		CO	52	1.7		1.21
GMT	1		CO	59	2.3		1.12
GMT	1		CO	62	2.7		1.13
GMT	1	1,2 and 3	CO	62	2.9	Y=RMAX	1.22
GMT	1		CO	73	4.2	Y=RMAX	1.08
GMT	1		CO	86	5.6		0.88
GMT	1		CO	92	7.5		0.96
GMT	1		DV	89	5.6		0.79
GMT	1		DV	104	9.4		0.84
GMT	1		DV	104	9.9		0.88
GMT	1		DV	105	9.1		0.79
GMT	1		DV	106	10.3		0.86
GMT	1		DV	110	10.6		0.80
GMT	1		DV	111	12.4		0.91
GMT	1		DV	121	15		0.85
GMT	1		DV	124	20.6		1.08
GMT	1		DV	129	17.7		0.82
GMT	1		DV	133	19.1		0.81
GMT	1		DV	151	27.4		0.80
GMT	1		DV	152	27		0.77
GMT	1		RBT	59	2.1		1.02
GMT	1		RBT	62	2.8		1.17
GMT	1		RBT	135	24.8		1.01

Number of RMAX coho 2 % incidence of RMAX coho 25.0%

Comments:	No. Coho	No. DV	No. RBT
Trap 1:	0	3	1
Trap 2:	5	8	2
Trap 3:	3	2	0
Total	8	13	3

24

Coho**DV**

mean FCC \leq 80mm	1.12	mean FCC \leq 80mm	
mean FCC $>$ 80mm	0.92	mean FCC $>$ 80mm	0.85
mean FL \leq 80mm	60	mean FL \leq 80mm	
mean FL $>$ 80mm	89	mean FL $>$ 80mm	118
mean Wt(g) \leq 80mm	2.5	mean Wt(g) \leq 80mm	
mean Wt(g) $>$ 80mm	6.6	mean Wt(g) $>$ 80mm	14.9

RBT

mean FCC \leq 80mm	1.10
mean FCC $>$ 80mm	
mean FL \leq 80mm	60.5
mean FL $>$ 80mm	
mean Wt(g) \leq 80mm	2.45
mean Wt(g) $>$ 80mm	

Number of coho \leq 80 mm 6

Number of coho $>$ 80 mm 2

Site Identification

Barren Creek crew: GG, BD

Sampling Date

Nov. 30/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	-7
Ice Cover	100%
Stream Flow	L
Potential for Migration	L

Water Depth (cm)	50
Ice thickness (cm)	5
Clarity of Ice	None
Snow Depth (cm)	5
Water Temp (°C)	1.3
Turbidity	Clear
DO (ppm)	13.6
pH	
Flow (m/s)	N/A

Number of traps set	2
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Set Locations

2m u/s of hwy 16 culvert off of left bank

Set duration	Overnight
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Comments

Some potential for migration upstream

Juvenile Capture and Sampling Summary

Location Barren Creek
Date Dec. 1/09
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO	6			85.7% % CO
RBT	1			14.3% % RBT

CPUE:	3.0	coho per trap per overnight set
	3.5	fish per trap per overnight set

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO				
GMT	1	1	CO				
GMT	1	2	CO				
GMT	1	2	CO				
GMT	1	2	CO				
GMT	1	2	CO				
GMT	1	2	RBT				

Comments: not sampled due to lack of numbers and air temperature (-10)

Trap 1:

Trap 2:

Trap 3:

Coho

RBT

mean FCC ≤ 80mm		mean FCC ≤ 80mm	
mean FCC > 80mm		mean FCC > 80mm	
mean FL ≤ 80mm		mean FL ≤ 80mm	
mean FL > 80mm		mean FL > 80mm	
mean Wt(g) ≤ 80mm		mean Wt(g) ≤ 80mm	
mean Wt(g) > 80mm		mean Wt(g) > 80mm	

Site Identification

McQuarrie Creek
crew: BD, GG,

Sampling Date

Nov. 30/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	-9
Ice Cover	100%
Stream Flow	M
Potential for Migration	High

Water Depth (cm)	60
Ice thickness (cm)	30
Clarity of Ice	None
Snow Depth (cm)	7
Water Temp (°C)	0.6
Turbidity	Clear
DO (ppm)	14.0
pH	no meter
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

2m downstream of Hwy 16 culvert

Set duration	Overnight
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Comments

photos taken

Juvenile Capture and Sampling Summary

Location McQuarrie Creek
Date Dec. 1/09
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>
CO	20	65	83
RBT	57	53	116

species composition

Coho	26%
RBT	74%

CPUE:	6.7	coho per trap per overnight set
	25.7	fish per trap per overnight set

Individual Sampling Data

Y=Rmax
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	2	CO	65	2.7		0.98
GMT	1	2	CO	67	2.4		0.80
GMT	1	2	CO	70	3.2		0.93
GMT	1	2	CO	71	3.4		0.95
GMT	1	2	CO	72	3.7		0.99
GMT	1	1	CO	73	4.2		1.08
GMT	1	2	CO	74	4		0.99
GMT	1	2	CO	74	3.1		0.77
GMT	1	2	CO	75	3.8		0.90
GMT	1	2	CO	75	3.9		0.92
GMT	1	2	CO	76	4.4		1.00
GMT	1	2	CO	77	4.5		0.99
GMT	1	2	CO	79	4.4		0.89
GMT	1	2	CO	82	4.7		0.85
GMT	1	2	CO	83	5.9		1.03
GMT	1	2	RBT	53	1.1		0.74
GMT	1	2	RBT	59	2.4		1.17
GMT	1	2	RBT	60	1		0.46
GMT	1	2	RBT	60	1.8		0.83
GMT	1	2	RBT	66	2.3		0.80
GMT	1	2	RBT	68	3.4		1.08
GMT	1	1	RBT	69	2.6		0.79
GMT	1	2	RBT	69	3.9		1.19
GMT	1	2	RBT	70	2.9		0.85
GMT	1	2	RBT	73	4.1		1.05
GMT	1	2	RBT	76	4.3		0.98
GMT	1	2	RBT	77	3.9		0.85
GMT	1	2	RBT	78			
GMT	1	2	RBT	78	5.9		1.24
GMT	1	1	RBT	81	5.4		1.02
GMT	1	2	RBT	82	5.2		0.94
GMT	1	2	RBT	85	4.5		0.73
GMT	1	2	RBT	85	4.5		0.73
GMT	1	2	RBT	85	5.1		0.83
GMT	1	2	RBT	86	6.3		0.99
GMT	1	2	RBT	88	4		0.59
GMT	1	2	RBT	88			

GMT	1	2	RBT	90	8	1.10
GMT	1	2	RBT	98	9.7	1.03
GMT	1	2	RBT	105	11.5	0.99
GMT	1	2	RBT	107	8.5	0.69
GMT	1	2	RBT	110	12.6	0.95
GMT	1	2	RBT	110	13.1	0.98
GMT	1	2	RBT	110	11.1	0.83
GMT	1	1	RBT	116	15.1	0.97
GMT	1	3	DID NOT MEASURE			

Comments:

	No Coho	No. RBT	
Trap 1:	1	3	
Trap 2:	15	33	
Trap 3:	4	21	
Totals	20	57	77

No coho ≤ 80 mm	13
No coho > 80 mm	2
No RBT ≤ 80 mm	14
No RBT > 80 mm	16

Coho		RBT	
mean FCC ≤ 80mm	0.94	mean FCC ≤ 80mm	0.93
mean FCC > 80mm	0.94	mean FCC > 80mm	0.89
mean FL ≤ 80mm	73	mean FL ≤ 80mm	68.29
mean FL > 80mm	83	mean FL > 80mm	95
mean Wt(g) ≤ 80mm	3.7	mean Wt(g) ≤ 80mm	3
mean Wt(g) > 80mm	5.3	mean Wt(g) > 80mm	8.3

Site Identification

Byman Creek
crew: GG, BD

Sampling Date

Nov. 30/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	-9
Ice Cover	100%
Stream Flow	M
Potential for Migration	H

Water Depth (cm)	72
Ice thickness (cm)	8
Clarity of Ice	None
Snow Depth (cm)	16
Water Temp (°C)	0.5
Turbidity	Clear
DO (ppm)	13.6
pH	
Flow (m/s)	N/A

Number of traps set 3

Set Locations

Off left bank, 6m d/s of hwy 16 culvert

Set duration Overnight

Comments

Photo 530- looking at site

Juvenile Capture and Sampling Summary

Location Byman Creek
Date Dec. 1/09
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO	11	83	99	24.4% % CO
DV	0			0.0% % DV
RBT	34	82	136	76% %RBT
CH	0			0% %CH
CPUE:	3.7 15.0	coho per trap per overnight set fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	83	5.7		1.00
GMT	1	2	CO	86	6		0.94
GMT	1	1	CO	87	6.1		0.93
GMT	1	1	CO	88	7.6		1.12
GMT	1	2	CO	91	5.7		0.76
GMT	1	3	CO	92	4.9		0.63
GMT	1	1	CO	92	7.7		0.99
GMT	1	2	CO	92	7.4		0.95
GMT	1	1	CO	94	8.7		1.05
GMT	1	3	CO	98	4.8		0.51
GMT	1	1	CO	99	10.9		1.12
GMT	1	3	RBT	82	3.5		
GMT	1	3	RBT	84	4.6		
GMT	1	2	RBT	85	5.9		0.96
GMT	1	1	RBT	89	7.2		1.02
GMT	1	3	RBT	90	4.2		
GMT	1	1	RBT	94	7.3		0.88
GMT	1	1	RBT	99	9.1		0.94
GMT	1	3	RBT	103	5.2		
GMT	1	3	RBT	103	6.7		
GMT	1	1	RBT	105	10.5		0.91
GMT	1	2	RBT	105	11.9		1.03
GMT	1	3	RBT	105	10.4		0.90
GMT	1	2	RBT	106	12.1		1.02
GMT	1	2	RBT	107	10.6		0.87
GMT	1	2	RBT	107	10.8		0.88
GMT	1	3	RBT	107	5.3		
GMT	1	1	RBT	108	10		0.79
GMT	1	1	RBT	108	13.8		1.10
GMT	1	3	RBT	109	9.1		0.70
GMT	1	1	RBT	110	15		1.13
GMT	1	2	RBT	110	11.6		0.87
GMT	1	3	RBT	110	6		
GMT	1	2	RBT	115	14.2		0.93
GMT	1	3	RBT	115	9.3		
GMT	1	3	RBT	115	10.2	B Cad clip	
GMT	1	3	RBT	121	10.7		

GMT	1	3	RBT	122	8.9		
GMT	1	3	RBT	126	9.2		
GMT	1	3	RBT	126	11.6		
GMT	1	3	RBT	126	12.2		
GMT	1	1	RBT	132	23.4		1.02
GMT	1	3	RBT	134	13.1		
GMT	1	1	RBT	135	21.2		0.86
GMT	1	3	RBT	136	16.1	T Cad clip	

Trap 1:

Trap 2:

Trap 3:

Coho

RBT

mean FCC ≤ 80mm		mean FCC ≤ 80mm	
mean FCC > 80mm	0.91	mean FCC > 80mm	0.93
mean FL ≤ 80mm		mean FL ≤ 80mm	
mean FL > 80mm	91	mean FL > 80mm	110
mean Wt(g) ≤ 80mm		mean Wt(g) ≤ 80mm	
mean Wt(g) > 80mm	6.9	mean Wt(g) > 80mm	10.3

No coho ≤ 80 mm	0
No coho > 80 mm	11
No RBT ≤ 80 mm	0
No RBT > 80 mm	34

Site Identification

Richfield Creek
crew: GG, BD

Sampling Date

Nov. 30/09

Atmospheric and Water Conditions

Air Temp (deg Celsius)	-9
Ice Cover	100%
Stream Flow	M
Potential for Migration	H

Water Depth (cm)	42
Ice thickness (cm)	7.5
Clarity of Ice	None
Snow Depth (cm)	18
Water Temp (°C)	0.6
Turbidity	Clear
DO (ppm)	13.6
pH	
Flow (m/s)	N/A

Number of traps set	3
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Set Locations

30m u/s of CNR crossing off left bank

Set duration	Overnight
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Comments

Photos 533- looking at site 532- looking upstream 531- looking downstream

Juvenile Capture and Sampling Summary

Location Richfield Creek
Date Dec. 1/09
crew: NN, BD

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>
CO	39	50	128	58.2% % CO
DV	0			0.0% % DV
RBT	28	49	124	41.8% %RBT
CH	0			0% %CH
CPUE:	13.0	coho per trap per overnight set		
	22.3	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	50	1.6		1.28
GMT	1	2	CO	52	1.3		0.92
GMT	1	2	CO	53	1.5		1.01
GMT	1	2	CO	54	1.5		0.95
GMT	1	1	CO	57	3.9		2.11
GMT	1	1	CO	57	3.3		1.78
GMT	1	3	CO	57	1.7		0.92
GMT	1	1	CO	58	2.5		1.28
GMT	1	1	CO	59	2.2		1.07
GMT	1	1	CO	60	2.3		1.06
GMT	1	1	CO	61	2.7		1.19
GMT	1	1	CO	61	3.4		1.50
GMT	1	1	CO	62	3.1		1.30
GMT	1	1	CO	62	3.8		1.59
GMT	1	1	CO	63	2.8		1.12
GMT	1	1	CO	63	2.9		1.16
GMT	1	1	CO	63	2.7		1.08
GMT	1	3	CO	63	2.9		1.16
GMT	1	3	CO	63	3	dmg caud	1.20
GMT	1	1	CO	66	3.6		1.25
GMT	1	1	CO	67	4		1.33
GMT	1	1	CO	68	3.8		1.21
GMT	1	1	CO	68	4.3		1.37
GMT	1	3	CO	71	3.7		1.03
GMT	1	1	CO	77	5.4		1.18
GMT	1	1	CO	80	5.8		1.13
GMT	1	1	CO	85	8.2		1.34
GMT	1	3	CO	88	8.6		1.26
GMT	1	1	CO	92	9.3		1.19
GMT	1	1	CO	128	22.9		1.09
GMT	1	2	RBT	49	1		0.85
GMT	1	3	RBT	49	1.3		1.10
GMT	1	3	RBT	50	1.6		1.28
GMT	1	3	RBT	56	1.7		0.97
GMT	1	1	RBT	57	2.5		1.35
GMT	1	1	RBT	71	3.9		1.09
GMT	1	3	RBT	71	3.8		1.06

GMT	1	2	RBT	72	4.1	1.10
GMT	1	1	RBT	74	4.8	1.18
GMT	1	3	RBT	75	4.7	1.11
GMT	1	1	RBT	78	5.5	1.16
GMT	1	1	RBT	82	5.1	0.92
GMT	1	2	RBT	83	6.4	1.12
GMT	1	2	RBT	86	6.1	0.96
GMT	1	3	RBT	99	11.1	1.14
GMT	1	3	RBT	114	15.1	1.02
GMT	1	3	RBT	124	20.3	1.06

Comments:

Trap 1:

Trap 2:

Trap 3:

CO: 9, RBT: 11,

Coho

RBT

mean FCC ≤ 80mm	1.24	mean FCC ≤ 80mm	1.11
mean FCC > 80mm	1.20	mean FCC > 80mm	1.04
mean FL ≤ 80mm	62	mean FL ≤ 80mm	63.82
mean FL > 80mm	98	mean FL > 80mm	98.00
mean Wt(g) ≤ 80mm	3.1	mean Wt(g) ≤ 80mm	3.17
mean Wt(g) > 80mm	12.3	mean Wt(g) > 80mm	10.68

No coho ≤ 80 mm	26
No coho > 80	4
No RBT ≤ 80 mm	11
No RBT > 80	6

Site Identification

Barren Creek
BD NN CV ML

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	2
Ice Cover	50%
Stream Flow	Mod
Potential for Migration	High

Water Depth (cm)	92
Ice thickness (cm)	skiff
Clarity of Ice	none
Snow Depth (cm)	0
Water Temp (°C)	0.8
Turbidity	clear
DO (ppm)	12.4
pH	7.2
Flow (m/s)	na

Number of traps set 3

Set Locations

u/s side of Hwy 16 culvert

Set duration Overnight

Comments

d/s of culvert is open and flowing

Juvenile Capture and Sampling Summary

Location Barren Creek
Date 23-Mar-10
crew: BD, NN, CV, ML

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>
CO	1	51	51
RBT	6	88	132

<u>species composition</u>	
Coho	14%
RBT	86%

CPUE:	0.3	coho per trap per overnight set fish per trap per overnight set	2	RBT per trap
	2.3			

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	CO	51	1.6	N=UNMAR	1.21
GMT	1	2	RBT	88	7.6	N=UNMAR	1.12
GMT	1	2	RBT	89	7.8	N=UNMAR	1.11
GMT	1	1	RBT	94	8.5	N=UNMAR	1.02
GMT	1	2	RBT	116	17.1	N=UNMAR	1.10
GMT	1	1	RBT	120	17.1	N=UNMAR	0.99
GMT	1	2	RBT	132	23.9	N=UNMAR	1.04

Comments:

	No. Coho	No. RBT
Trap 1:	1	2
Trap 2:	0	4
Trap 3:	0	0
Totals	1	6

7
RBT

mean FCC ≤ 80mm		mean FCC ≤ 80mm	
mean FCC > 80mm		mean FCC > 80mm	1.06
mean FL ≤ 80mm		mean FL ≤ 80mm	
mean FL > 80mm		mean FL > 80mm	106.50
mean Wt(g) ≤ 80mm		mean Wt(g) ≤ 80mm	
mean Wt(g) > 80mm		mean Wt(g) > 80mm	13.67

No coho ≤ 80 mm	1
No coho > 80 mm	0
No RBT ≤ 80 mm	0
No RBT > 80 mm	6

Site Identification

McQuarrie Creek
BD NN CV ML

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	5
Ice Cover	70%
Stream Flow	Mod
Potential for Migration	Mod

Water Depth (cm)	69
Ice thickness (cm)	6
Clarity of Ice	none
Snow Depth (cm)	20
Water Temp (°C)	1
Turbidity	clear
DO (ppm)	13.0
pH	7.7
Flow (m/s)	na

Number of traps set 3

Set Locations

d/s side of Hwy 16 culvert

Set duration Overnight

Comments

Juvenile Capture and Sampling Summary

Location McQuarrie Creek
Date 23-Mar-10
crew: BD NN CV ML

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>	<u>species composition</u>	
CO	0			Coho	0%
RBT	4	52	120	RBT	100%

CPUE:	0.0	coho per trap per overnight set	1.33	RBT per trap
	1.3	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	1	RBT	52	1.7	N=UNMAR	1.21
GMT	1	1	RBT	75	4.2	N=UNMAR	1.00
GMT	1	3	RBT	120	16.7	N=UNMAR	0.97
GMT	1	3	RBT	68	4	N=UNMAR	1.27

	<u>No Coho</u>	<u>No RBT</u>	<u>Comments:</u>
Trap 1:	0	2	the large 120mm RBT was smolting Trap 2 had fish escape - it was damaged
Trap 2:	0	0	
Trap 3:	0	2	
Totals	0	4	

<u>Coho</u>		<u>RBT</u>	
mean FCC ≤ 80mm		mean FCC ≤ 80mm	1.10
mean FCC > 80mm		mean FCC > 80mm	1.12
mean FL ≤ 80mm		mean FL ≤ 80mm	63.50
mean FL > 80mm		mean FL > 80mm	94.00
mean Wt(g) ≤ 80mm		mean Wt(g) ≤ 80mm	2.95
mean Wt(g) > 80mm		mean Wt(g) > 80mm	10.35

No coho ≤ 80 mm	0
No coho > 80 mm	0
No RBT ≤ 80 mm	3
No RBT > 80 mm	1

Site Identification

Byman Creek
BD NN CV ML

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	5
Ice Cover	80%
Stream Flow	Mod
Potential for Migration	High

Water Depth (cm)	71
Ice thickness (cm)	5
Clarity of Ice	none
Snow Depth (cm)	14
Water Temp (°C)	1
Turbidity	clear
DO (ppm)	13.6
pH	7.7
Flow (m/s)	Mod

Number of traps set	3
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Set Locations

d/s side of Hwy 16 culvert

Set duration	Overnight
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Comments

Juvenile Capture and Sampling Summary

Location Byman Creek
Date 23-Mar-10
crew: BD NN CV ML

<u>Species</u>	<u>No. Caught</u>	<u>Min Ln (mm)</u>	<u>Max Ln (mm)</u>
CO	8	85	97
RBT	27.0	71	145

<u>species composition</u>	
Coho	23%
RBT	77%

CPUE:	2.7	coho per trap per overnight set	9	RBT per trap
	11.7	fish per trap per overnight set		

Individual Sampling Data

Y=RMAX
 N=UNMARK

<u>Capture Method</u>	<u>Cluster #</u>	<u>Trap #</u>	<u>Species</u>	<u>FL(mm)</u>	<u>Weight(g)</u>	<u>Mark type</u>	<u>FCC</u>
GMT	1	3	CO	85	8.6	N	1.40
GMT	1	3	CO	86	6.6	N	1.04
GMT	1	1	CO	91	7.1	N=UNMAR	0.94
GMT	1	1	CO	91	8	N	1.06
GMT	1	3	CO	92	6.7	N	0.86
GMT	1	3	CO	92	7.4	N	0.95
GMT	1	2	CO	92	7.5	N *	0.96
GMT	1	1	CO	97	9.2	N	1.01
GMT	1	3	RBT	71	3.8	N	1.06
GMT	1	1	RBT	75	4.4	N	1.04
GMT	1	2	RBT	76	3.8	N	0.87
GMT	1	3	RBT	78	4.4	N	0.93
GMT	1	1	RBT	82	5.3	N	0.96
GMT	1	3	RBT	82	5.5	N	1.00
GMT	1	2	RBT	86	5.2	N	0.82
GMT	1	3	RBT	86	6.5	N	1.02
GMT	1	2	RBT	92	6.7	N	0.86
GMT	1	3	RBT	92	7.6	N	0.98
GMT	1	2	RBT	94	8	N	0.96
GMT	1	3	RBT	98	9.2	N	0.98
GMT	1	1	RBT	102	9.9	N	0.93
GMT	1	2	RBT	102	10.9	N	1.03
GMT	1	2	RBT	105	10.1	N	0.87
GMT	1	2	RBT	106	11.1	N	0.93
GMT	1	2	RBT	108	10.7	N	0.85
GMT	1	2	RBT	110	10.3	N	0.77
GMT	1	2	RBT	110	12.3	N	0.92
GMT	1	2	RBT	110	13	N *	0.98
GMT	1	2	RBT	120	15.5	N *	0.90
GMT	1	2	RBT	120	16.6	N	0.96
GMT	1	1	RBT	122	16.4	N	0.90
GMT	1	2	RBT	123	16.5	N *	0.89
GMT	1	1	RBT	127	19.5	N	0.95
GMT	1	2	RBT	135	21.2	N *	0.86
GMT	1	1	RBT	145	28.6	N	0.94

* FISH WERE SMOLTING

No. Coho No. RBT

Trap 1:	3	6	
Trap 2:	1	15	
Trap 3:	4	6	
Totals	8	27	35

Coho

RBT

mean FCC \leq 80mm			mean FCC \leq 80mm	0.97
mean FCC $>$ 80mm	1.03		mean FCC $>$ 80mm	0.92
mean FL \leq 80mm			mean FL \leq 80mm	75.00
mean FL $>$ 80mm	91		mean FL $>$ 80mm	106.83
mean Wt(g) \leq 80mm			mean Wt(g) \leq 80mm	4.10
mean Wt(g) $>$ 80mm	7.6		mean Wt(g) $>$ 80mm	12.03

No coho \leq 80 mm	0
No coho $>$ 80 mm	8
No RBT \leq 80 mm	4
No RBT $>$ 80 mm	23

Site Identification

Richfield Creek
BD NN CV ML

Sampling Date

22-Mar-10

Atmospheric and Water Conditions

Air Temp (deg Celsius)	0
Ice Cover	100%
Stream Flow	Mod
Potential for Migration	Mod

Water Depth (cm)	62
Ice thickness (cm)	65
Clarity of Ice	none
Snow Depth (cm)	20
Water Temp (°C)	0.7
Turbidity	clear
DO (ppm)	13.4
pH	7.4
Flow (m/s)	na

Number of traps set	3
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Set Locations

The pool along left bank looking downstream and the pool is just u/s of the CNR bridge

Set duration	Overnight
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Comments

Juvenile Capture and Sampling Summary

Location Richfield Creek
Date 23-Mar-10
crew: BD NN CV ML

Species	No. Caught	Min Ln (mm)	Max Ln (mm)	species composition	
CO	3	67	92	Coho	43%
RBT	3	52	76	RBT	43%
NPM	1			NPM	14%
CPUE:	1.0	coho per trap per overnight set		1	RBT per trap
	2.3	fish per trap per overnight set			

Individual Sampling Data

Y=RMAX
 N=UNMARK

Capture Method	Cluster #	Trap #	Species	FL(mm)	Weight(g)	Mark type	FCC
GMT	1	3	CO	67	3.3	N=UNMAR	1.10
GMT	1	3	CO	83	5.4	N=UNMAR	0.94
GMT	1	1	CO	92	7.5	N=UNMAR	0.96
GMT	1	1	N. pike mi	105	11.5	N=UNMAR	0.99
GMT	1	3	RBT	52	1.3	N=UNMAR	0.92
GMT	1	3	RBT	69	4.6	N=UNMAR	1.40
GMT	1	2	RBT	76	4.3	N=UNMAR	0.98

	No. Coho	No. RBT	NPM	
Trap 1:	1	0	1	
Trap 2:	0	1	0	
Trap 3:	2	2	0	
Totals	3	3	1	7

Coho

RBT

mean FCC ≤ 80mm		mean FCC ≤ 80mm	1.10
mean FCC > 80mm	0.95	mean FCC > 80mm	
mean FL ≤ 80mm		mean FL ≤ 80mm	65.67
mean FL > 80mm	88	mean FL > 80mm	
mean Wt(g) ≤ 80mm		mean Wt(g) ≤ 80mm	3.40
mean Wt(g) > 80mm	6.5	mean Wt(g) > 80mm	

No coho ≤ 80 mm	1
No coho > 80 mm	2
No RBT ≤ 80 mm	3
No RBT > 80 mm	0

Appendix 2
Fall Habitat Assessment Data (2009)

Appendix 2
Fall Habitat Assessment Data (2009)

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Nov 12/09	Photos:	DO (ppm)	13.7
Surveyors initials	NN, GG		T (°C)	3
Location			pH	n.working
Type of pool (culvert, nonculvert)	nonculvert	Marked by old orange ribbon on right bank near beaver dam	Waypoint	
		Set traps~3m d/s of beaver dam		

Site Measurements

Comments

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	15	15m downstream of dam *all traps set on d/s side of dam
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	glide	Surface Area 76.5
Wetted Width (m)	5.1	
Max. Depth (at deepest point) (cm) (estimate if necessary)	83	
Depth at trap cluster location (cm) (estimate if necessary)	77	
Depth of riffle crest (at pool outlet) (if applicable)	N/A	
Area of site (m2)		used 16.7 m as length of habitat (attraction distance)
Cover (Low, Moderate or High)	Moderate	
Cover % breakdown (adds to 100%)		
Small Woody Debris (<10cm diam)	50%	Lots of SWD from beaver dam just u/s
Large Woody Debris (>10cm diam)	0%	
Instream Vegetation (type, % of area)	50%	
Canopy cover (0% - 100%)	0%	
Undercut Banks (present, absent)	0	
total length of undercut area	n/a	
average distance undercut from edge	n/a	
Deep Pool	0%	
Cobble	0%	
Boulders	0%	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	100	
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	0	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>	0	
% boulder (> 256 mm) <i>bigger than a basketball</i>	0	
% bedrock	0	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Coho salmon spawners observed at site

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Nov 12/09	Photos:	DO (ppm)	11.5
Surveyors initials	NN, GG		T (°C)	2
Location			pH	n.working
Type of pool (culvert, nonculvert)	nonculvert	Large beaver dam just d/s of trap location		

Site Measurements

Comments

Length of habitat unit (m)

e.g. riffle crest-crest, dam-dam, etc.

Habitat Unit Type

(i.e. pool, riffle or glide)

Wetted Width (m)

Max. Depth (at deepest point) (cm)

(estimate if necessary)

Depth at trap cluster location (cm)

(estimate if necessary)

Depth of riffle crest (at pool outlet)

(if applicable)

Area of site (m²)

Cover (Low, Moderate or High)

Cover % breakdown (add to 100%)

Small Woody Debris (<10cm diam)

Large Woody Debris (>10cm diam)

Instream Vegetation (type, % of area)

Overhanging Vegetation

Undercut Banks

total length of undercut area

average distance undercut from edge

Deep pools

Cobble

Boulder

Bed Material (adds to 100%)

% fines (< 2 mm)
grain of sand and smaller
% gravel (2-64 mm)
btwn grain of sand and tennisball
% cobble (64-256 mm)
btwn tennisball and basketball
% boulder (> 256 mm)
bigger than a basketball
% bedrock

15	15m downstream of dam *all traps set on d/s side of dam
Pool/Glide	Surface Area
N/A	Very flooded
>1m	
98	
N/A	
Moderate	
40%	
0%	
60%	
0%	
N/A	
n/a	
n/a	
100%	
0%	
0%	
0%	
0	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Recent, large beaver dam ~0.8m high and >25m wide

~25m up from bridge

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Nov. 12/09	Photos:	DO (ppm)	11.5
Surveyors initials	NN, GG		T (°C)	1.9
Location	Beaver dam is ~7m d/s of trap location			
Type of pool (culvert, nonculvert)	Nonculvert			

Site Measurements

Comments:

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	15	15m downstream of dam *all traps set on d/s side of dam
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	glide	Surface Area
Wetted Width (m)	4.3	
Max. Depth (at deepest point) (cm) (estimate if necessary)	69	
Depth at trap cluster location (cm) (estimate if necessary)	69	
Depth of riffle crest (at pool outlet) (if applicable)	N/A	
Area of site (m ²)		
Cover (Low, Moderate or High)	Moderate	
Cover % breakdown (adds to 100%)		
Small Woody Debris (<10cm diam)	1	
Large Woody Debris (>10cm diam)	0	
Instream Vegetation (type, % of area)	20	
Canopy cover (0% - 100%)	1	
Undercut Banks (present, absent)	absent	
total length of undercut area	N/A	
average distance undercut from edge	N/A	
Deep pool		
Cobbles		
Boulders	78	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	75	
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	5	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>		
% boulder (> 256 mm) <i>bigger than a basketball</i>	20	
% bedrock		

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Rip rap placed in channel in 2008 for cover and habitat complexing

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Nov 12/09	Photos:	DO (ppm)	12.7
Surveyors initials	NN, GG		T (°C)	1.9
Location		Need to trap just under overhanging branches near the centre of the pool	pH	n.working
Type of pool (culvert, nonculvert)	culvert		Waypoint	n/a

Site Measurements

Length of habitat unit (m)
e.g. riffle crest-crest, dam-dam, etc.

Habitat Unit Type

(i.e. pool, riffle or glide)

Wetted Width (m)

Max. Depth (at deepest point) (cm)

(estimate if necessary)

Depth at trap cluster location (cm)

(estimate if necessary)

Depth of riffle crest (at pool outlet)

(if applicable)

Area of site (m2)

Cover (Low, Moderate or High)

Cover % breakdown (add to 100%)

Small Woody Debris (<10cm diam)

Large Woody Debris (>10cm diam)

Instream Vegetation (type,% of area)

Overhanging Vegetation

Undercut Banks

total length of undercut area

average distance undercut from edge

Deep pools

Cobble

Boulder

Bed Material (adds to 100%)

% fines (< 2 mm)
grain of sand and smaller

% gravel (2-64 mm)
btwn grain of sand and tennisball

% cobble (64-256 mm)
btwn tennisball and basketball

% boulder (> 256 mm)
bigger than a basketball

% bedrock

Comments

15	15m downstream of dam *all traps set on d/s side of dam
Pool	Surface Area
6.55	
71.5	
71.5	
14.5	
Moderate	
2%	
0%	
10%	
50%	
absent -0	
n/a	
n/a	
38%	
60%	
10%	
15%	
15%	
N/A	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Oct 28/09	Photos:	DO (ppm)	12.6
Surveyors initials	NN, GG		T (°C)	0.9
Location	Barren u/s of hwy16		pH	7.5
Type of pool (culvert, nonculvert)	culvert	u/s of culvert	Waypoint	

Site Measurements

Comments

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	13.1	Surface area
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	pool	
Wetted Width (m)	4.8	
Max. Depth (at deepest point) (cm) <i>(estimate if necessary)</i>	103	middle of pool just u/s of culvert
Depth at trap cluster location (cm) <i>(estimate if necessary)</i>	103	middle of pool just u/s of culvert
Depth of riffle crest (at pool outlet) <i>(if applicable)</i>	N/A	pool flows into culvert
Area of site (m ²)	62.88	
Cover (Low, Moderate or High)	Low	
Cover % breakdown (adds to 100%)		
Small Woody Debris (<10cm diam)	0%	
Large Woody Debris (>10cm diam)	0%	
Instream Vegetation (type, % of area)	90%	some algae at top end of pool
Canopy cover (0% - 100%)	0%	
Undercut Banks (present, absent)	0	
total length of undercut area	n/a	
average distance undercut from edge	n/a	
Deep Pool	0%	
Cobble	5%	
Boulders	5%	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	20	
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	70	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>	5	
% boulder (> 256 mm) <i>bigger than a basketball</i>	5	
% bedrock	0	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

recently dredged and very prone to erosion

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Oct 28/09	Photos:	DO (ppm)	14
Surveyors initials	NN, GG		T (°C)	0.4
Location	McQuarrie Creek d/s of Hwy16		pH	7.6
Type of pool (culvert, nonculvert)	culvert pool		Waypoint	

Site Measurements

Comments

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	8.8	Surface area
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	pool	
Wetted Width (m)	6.8	
Max. Depth (at deepest point) (cm) <i>(estimate if necessary)</i>	87	
Depth at trap cluster location (cm) <i>(estimate if necessary)</i>	87	
Depth of riffle crest (at pool outlet) <i>(if applicable)</i>	25	
Area of site (m²)	59.84	
Cover (Low, Moderate or High)	Low	
Cover % breakdown (add to 100%)		
Small Woody Debris (<10cm diam)	2%	
Large Woody Debris (>10cm diam)	0%	
Instream Vegetation (type, % of area)	0%	
Overhanging Vegetation	20%	
Undercut Banks	N/A	
total length of undercut area	n/a	
average distance undercut from edge	n/a	
Deep pools		
Cobble	39%	
Boulder	39%	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	0%	
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	30%	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>	65%	
% boulder (> 256 mm) <i>bigger than a basketball</i>	5%	
% bedrock	0	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Recent, large beaver dam ~0.8m high and >25m wide
Coho spawners observed above and below dam
~25m up from bridge

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Oct 28/09	Photos:	DO (ppm)	13.6
Surveyors initials	NN, GG		T (°C)	0.7
Location	Byman Creek d/s of Hwy16	Waypoint	pH	7.5
Type of pool (culvert, nonculvert)	culvert pool			

Site Measurements

Comments:

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	15.2	Surface area
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	pool	
Wetted Width (m)	14.7	
Max. Depth (at deepest point) (cm) <i>(estimate if necessary)</i>	>130	
Depth at trap cluster location (cm) <i>(estimate if necessary)</i>	121	
Depth of riffle crest (at pool outlet) <i>(if applicable)</i>	10	
Area of site (m2)	223.44	
Cover (Low, Moderate or High)	Moderate	
Cover % breakdown (adds to 100%)		
Small Woody Debris (<10cm diam)	50	
Large Woody Debris (>10cm diam)	20	
Instream Vegetation (type, % of area)	0	
Canopy cover (0% - 100%)	20	
Undercut Banks (present, absent)	absent	
total length of undercut area	N/A	
average distance undercut from edge	N/A	
Deep pool		
Cobbles	5	
Boulders	5	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	~20	could not see bottom so substrates are an estimate from what we could see
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	~20	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>	~50	
% boulder (> 256 mm) <i>bigger than a basketball</i>	~10	
% bedrock		

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Rip rap present along right bank

2009/2010 Overwintering Monitoring - Habitat Description Data

Date	Oct 28/09	Photos:	DO (ppm)	13.6
Surveyors initials	NN, GG		T (°C)	n/a
Location	Richfield creek ~20m u/s of CNR bridge		pH	6.95
Type of pool (culvert, nonculvert)	nonculvert		Waypoint	n/a

Site Measurements

Comments

Length of habitat unit (m) <i>e.g. riffle crest-crest, dam-dam, etc.</i>	5.7	Surface area
Habitat Unit Type <i>(i.e. pool, riffle or glide)</i>	pool	set traps near left bank
Wetted Width (m)	9.4	
Max. Depth (at deepest point) (cm) (estimate if necessary)	>130	
Depth at trap cluster location (cm) (estimate if necessary)	>130	
Depth of riffle crest (at pool outlet) (if applicable)	16.8	
Area of site (m²)	53.58	
Cover (Low, Moderate or High)	Moderate	
Cover % breakdown (add to 100%)		
Small Woody Debris (<10cm diam)	95%	
Large Woody Debris (>10cm diam)	0%	
Instream Vegetation (type,% of area)	0%	
Overhanging Vegetation	0%	
Undercut Banks	absent -0	
total length of undercut area	n/a	
average distance undercut from edge	n/a	
Deep pools	2%	
Cobble	1.5%	
Boulder	1.5%	
Bed Material (adds to 100%)		
% fines (< 2 mm) <i>grain of sand and smaller</i>	10%	
% gravel (2-64 mm) <i>btwn grain of sand and tennisball</i>	80%	
% cobble (64-256 mm) <i>btwn tennisball and basketball</i>	5%	
% boulder (> 256 mm) <i>bigger than a basketball</i>	5%	Rip rap from left bank
% bedrock	N/A	

Description of other habitat features, impacts or restoration opportunities

(i.e. beaver dams present, rap-rap present, needs LWD added, banks unstable, etc.)

Rip rap present on left bank. Bank unstable