

Alouette Water Use Plan

Monitoring Programs Summary Report: 2009

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For Water Licences 124724, 124725, 124726

BC Hydro Alouette Water Use Plan Monitoring Programs Summary Report: 2009

1.0 INTRODUCTION

This document represents a summary of the Alouette Water Use Plan (WUP) monitoring programs to September 2009, as per the Comptroller of Water Rights (CWR) cover letter communication included with the 21 April 2009 Substitution Water Licences and Order for the Alouette Water Use Plan. The CWR cover letter requested along with submission of Ordered monitoring program terms of reference (TOR) that, given BCH initiation of WUP recommended monitoring programs in 2008 prior to receipt of leave to commence, a summary status of Alouette WUP monitoring work completed to date also be submitted.

2.0 BACKGROUND

The water use planning process for BC Hydro's Alouette storage/hydroelectric project was initiated in May 2005 and completed in May 2006. The conditions proposed in the WUP for the operation of the project reflect the August 2006 recommendations of the WUP Consultative Committee (CC).

In April 2006, as a component of the Alouette Water Use Plan, the draft TOR for the fisheries component of the Alouette WUP monitoring program was confirmed by the WUP fish technical committee (FTC) including Fisheries and Oceans Canada (DFO), Ministry of Environment (MOE), Katzie First Nation, City of Maple Ridge, BC Corrections (Alco Hatchery) and Alouette River Management Society.

On 20 November 2007 the Alouette WUP Monitor Committee including DFO, Ministry of Environment, Alouette River Management Committee, Katzie First Nation, City of Maple Ridge, and BC Corrections (Alco Hatchery) and local stewards met to confirm the draft TOR for the fisheries component of the Alouette WUP monitoring program with full endorsement provided based on minor revisions to the Sockeye Adult Enumeration and Smolt Enumeration TOR.

In January 2008 BC Hydro committed to the Alouette Monitoring Committee (AMC) that all recommended WUP monitoring programs including the Archaeology monitoring would be implemented in 2008 to ensure continued progress of the Alouette Sockeye Restoration Program which is contingent on three of the recommended WUP monitoring programs as well as to stay within the originally committed seven year review period through 2014.

In an attempt to facilitate the CWR TOR review process, on 22 January 2008 BCH forwarded the draft TOR for the fisheries components of the Alouette WUP monitoring program to the CWR for consideration given impending Order issue and communicated CWR work load issues. BCH acknowledged that no TOR approval would be provided from the CWR until the Alouette Order has been issued.

The TOR for the WUP recommended Archaeology Monitoring was accepted by Katzie FN in January 2009 and the BC Archaeology Branch in November 2008.

In April 2009, BCH submitted a revised Alouette WUP was submitted to the CWR.

On 21 April 2009, BC Hydro was ordered to implement the conditions proposed in the Alouette WUP and submit monitoring programs TOR as well as provide a summary of WUP monitoring work done to date.

Based on initial AMC TOR endorsement in November 2007, a further seven minor revisions to the fisheries component TOR including both budget increases and methodology changes were accepted by the AMC between September 2008 and September 2009.

A summary of all revisions to the fisheries component TOR since initial drafting by the WUP FTC in April 2006 is included as Table 1.

On 19 October 2009 the Alouette WUP monitoring programs TOR were submitted to the CWR for review and approval.

The Order will be implemented until 2014, when BC Hydro will assess the results of the monitoring programs and merge the Stave and Alouette into a single Water Use Plan that better reflects the integrated nature of the Alouette, Stave Falls, and Ruskin hydroelectric power developments.

Table 1. Alouette Monitoring Committee accepted Monitoring Program TOR addendums since initial draft by WUP FTC in April 2006.

Monitoring Program	Date	Terms of Reference Addendum Summary
Smolt Enumeration	Nov. 2007	<ol style="list-style-type: none"> 1. Based on significant channel changes and Fraser backwater the previous 216th rotary screw trap site be moved upstream to the 224th incline plane trap site. 2. Based on assessment of trap efficiency during the fry and smolt outmigration periods a 1.5m rotary screw trap drum be utilized until April 15 and the 1.8m drum afterwards through to early June.
Kokanee Out-migration	<p>April 2009</p> <p>Sept. 2009</p>	<ol style="list-style-type: none"> 1. Based on a rotary screw tarp condition assessment the \$1.5K available annually for maintenance was increased to \$15K to allow for complete trap replacement. 2. Based on discussion with the lead study contractor, a total program budget increase of \$55.2K from \$285.9K to \$341K over the remaining 5 implementation years (2010 – 2014) required to ensure both sufficient labour and expense funds are available to support spring trap operations.
Sockeye Adult Enumeration	<p>Nov. 2007</p> <p>April 2009</p>	<ol style="list-style-type: none"> 1. Clarification to confirm the Alouette Sockeye Restoration Committee technical working group including DFO, MOE, Katzie FN, Alouette River Management Society, and Alco Hatchery to deal with transport of adult sockeye returns. 2. Confirmation of 2009 and 2010 Alco Hatchery fish fence operation for April through December period instead of year round to provide for upstream steelhead migration and fence maintenance. The

		2009 and 2010 annual study budget will not change based on reallocation of the ~\$6K available annually for the three month fence operation to increase corrections staff support in the peak summer migration period
Water Temperature	Nov. 2008	1. Increase from two to four temperature logger download sessions per year to ensure data integrity with a resulting total budget increase over the 7-year monitoring period of \$8,400.
Kokanee Age-Structured Population Analysis	Sept. 2008 July 2009	<ol style="list-style-type: none"> 1. Additional funds between \$20 - \$15K provided for year one (2008) and two following by every other year thereafter through the end of the WUP review in 2014/15. The budget increase provides for the addition of mid water gill netting to allow apportionment of hydro-acoustic estimates to provide high precision kokanee abundance and age class structure estimates. 2. Clarification of recommended Stables and Perrin 2007 fish sampling methodology with confirmation that four surface gill nets are to be placed in >10 m water depth to ensure greater representation in each age class and to ensure meeting recommended sample size of ~ 50 fish per age class. 3. Total study budget increase of \$8.1K based on required increase of data analysis time from two to three days as well as additional expenses required for gill netting and a truck capable of towing. 4. The data analysis proposed for addressing the three study hypothesis was modified to a more statistically robust approach.
All monitoring studies	April 2009	1. All the monitoring program terms of reference budgets revised with removal of the annual contractor presentation. This ranges from a one day annual labour cost of \$300 - \$500 through the seven year monitoring period. This revision is to align Alouette TORs with other BC Hydro programs where presentation costs are covered separately from the approved TORs.

3.0 STATUS

The following table outlines the status and schedule for the Alouette WUP monitoring programs.

Table 4.1-1: Status of Alouette WUP Monitoring Programs Implementation.

Monitoring Program	2008	2009	2010	2011	2012	2013	2014
	WLR Yr1 ¹	WLR Yr2 ¹	WLR Yr3	WLR Yr4	WLR Yr5	WLR Yr6	WLR Yr7
Smolt Enumeration	✓	U/W	■	■	■	■	■
Kokanee Outmigration	✓	U/W	■	■	■	■	■
Substrate Quality	✓	U/W	■	■	■	■	■
Sockeye Adult Enumeration	✓	U/W	■	■	■	■	■
Water Temperature	✓	U/W	■	■	■	■	■
Kokanee Age Class Structure Analysis	U/W ²	U/W	■	■	■	■	■
Archaeological Monitoring	DEL ³	U/W					

Legend: ■ = Project to be undertaken/initiated in identified year
 U/W = Project is underway
 DEL = Project is delayed for this year
 ✓ = Project is complete for the year

Footnotes:

1. Programs initiated prior to receipt of monitoring program leave to commence from CWR.
2. BC Ministry of Environment program commitment to provide yearly reporting of fall field data by December of following year (e.g. 2008 reporting due in December 2009).
3. Archaeological Monitoring delay until 2009 based on delayed TOR approval by Katzie First Nation and BC Archaeological Branch

4.0 SUMMARY OF ALOUETTE WUP MONITORING PROGRAMS

This section provides a summary of the Alouette WUP monitoring programs as per the Order under the *Water Act* dated 20 April 2009. The following table summarizes the monitoring programs results according to the key monitoring indicators for each program.

Table 4.1-2: Summary of Alouette WUP Fisheries Monitoring Program Results

Monitoring Program	Monitoring Indicator	Bio-standard	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
			WLR ⁰	WLR ¹	WLR ⁰	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ¹	WLR ² Yr1	WLR ² Yr2	WLR ² Yr3	WLR ² Yr4	WLR ² Yr5	WLR ² Yr6
Smolt Enumeration	(a) Coho Smolt Density (Production)	1,400 smolts/km ³	Not Studied	Not Studied	Not Studied	1,473 (16,200)	931 (10,238)	1,818 (20,003)	1,253 (13,789)	1,100 (12,102)	1,759 (19,358)	1,534 (16,880)	1,183 (13,020)	1,359 (14,951)	276 (3,040)	592 (6,508)							
	(b) Steelhead Smolt Density (Production)	418 smolts/km ⁴	Not Studied	Not Studied	Not Studied	Low Capture	164 (1,803)	308 (3,392)	208 (2,286)	343 (3,768)	215 (2,364)	305 (3,355)	227 (2,493)	Low Capture	Low Capture	564 (6,204)							
	(c) Chum Fry Production	15M ⁶	Not Studied	Not Studied	Not Studied	8.3M	13.4M	6.8M	6.4M	14.7M	24.1M	12.8M	16.6M	30.3M	4.3M	15.6M							
	(d) Pink Fry Production	1M ⁶	Not Studied	Not Studied	Not Studied	55K	N/A	190K	N/A	143.3K	N/A	1.25M	N/A	175.6K	N/A	279.2K							
Kokanee Outmigration	Number of Outmigrating Kokanee Smolts	N/A	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	7,900	5,064	62,923	8,257							
Substrate Quality	Substrate Quality (areal fraction of fine sand < 2mm)	20% ⁷	31	16	13	12	17	Not Studied	Not Studied	Not Studied	20	10	9	Not Studied	Not Studied	12							
Sockeye Adult Enumeration	Number of Returning Adult Sockeye	N/A	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	28	54							
Water Temperature	(a) Number of days with temperatures > 25 (Degrees Celcius) ⁸	N/A	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	0	0	0	0	0	0	0	0							
	(a) Number of days with daily average temperatures > 16 (Degrees Celcius) ⁹	N/A	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	28	61	Not Studied	92	71	67	89	41							
Kokanee Age Class Structure Analysis	Kokanee Fry Production ¹⁰	N/A	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Not Studied	Study not complete							

1. Monitoring as per 1996 Alouette Water Use Plan recommendations.
 2. Monitoring as per 2006 Alouette Water Use Plan recommendations.
 3. Bradford et al (1997) undertook a review of 86 coho streams in Western North America which related estimates of coho smolt abundance to habitat features.
 4. BC Ministry of Environment (2007) estimated Alouette River steelhead smolt carrying capacity.
 5. Fisheries and Oceans Canada (2007) estimated maximum chum fry production.
 6. Fisheries and Oceans Canada (2007) estimated maximum pink fry production based on historic escapement records. Note odd year pink salmon spawning cycle.
 7. Fine sediment threshold above which documented reduction in egg and embryo survival occurs. Technical Report on Quantitative Linkages Between sediment Supply, Streambed Fine Sediment, and Benthic Macroinvertebrates in Streams of the Klamath National Forest. University of California, 2006
 8. Upper lethal temperature threshold for stream dwelling juvenile salmonids.
 9. Average upper sustained temperature threshold for stream dwelling juvenile salmonids.
 10. Monitoring indicator to be confirmed based on submission of year 1 (2008) reporting in December 2009.

4.1 Smolt Enumeration

4.1.1 Overview

The objective of this monitoring program is to confirm the average base-flow release of $2.6 \text{ m}^3\text{s}^{-1}$ from the Alouette Dam (obtained by fully opening the low level outlet) is adequate to sustain or improve current levels of salmonid smolt production downstream in Alouette River. The species of interest include chum, pink, chinook, and coho salmon as well as steelhead and cutthroat trout. Supporting objectives include: 1) confirmation that following their migration out of Alouette Reservoir that kokanee smolts immediately continue migration out of the Alouette River and 2) using adult chum salmon counts as an indicator of run strength, is there evidence of a persistent, declining trend in egg to smolt survival that would suggest a degrading condition in spawning substrate quality.

Monitoring Indicator (a): smolt production (coho, steelhead, pink, chum, chinook)

Monitoring Indicator (b): Kokanee smolt migration timing (Mud Creek trap downstream to 224th trap locations)

Monitoring Indicator (c): Chum egg to smolt survival

This monitoring program is comprised of several study components involving:

- Instream trapping of fry and smolt outmigrating from the Alouette River; and
- Observations of salmon adults returning to spawn

4.1.2 Status

This program commenced in 1998 as a component of the initial 1996 Alouette WUP commitments. As a result, it is in its twelfth year of full implementation. The 2007/2008 study program report¹, which is a summary of studies between 1998 - 2008, was submitted in January 2009. The 2008/2009 study program report is due for submission in January 2010.

4.1.3 Interpretation of Data

The 2008 chum fry out-migrant estimate was 15.59 million fish. The current emigrating chum fry estimate represents an increase of 22% for this cycle year and a 2.3 fold increase in fry production for the cycle-year since monitoring began in 1998.

The 2008 pink salmon fry out-migration estimate was 279,167 fish. The 2008 pink fry production was the second highest ranking since 1998. It appears that further growth of the pink salmon run is likely limited by the very large chum salmon escapements that out-compete and/or overwhelm the much smaller pink salmon run).

¹ Cope, Scott. 2009. Alouette River Salmonid Smolt Migration Enumeration: 2008 Data Report. Prepared for BC Hydro, Burnaby, BC.

Chinook salmon have re-colonized the South Alouette River and a small but stable trend of successful spawning, incubation and out-migration of smolts has been documented.

The 2008 coho smolt out-migration estimate was 6,508. This was less than half the 10 year annual average of 15,000 smolts that was expected. The declining trend in coho smolt production estimates over the last 6 years (2003-2008) is cause for concern. However, another year in the time series data is required to establish the accuracy of the last two years data.

The 2008 steelhead smolt out-migration estimate was 6,204. This was approximately double expectations and was the highest reported for the 11 years of study. The 1999 to 2005 average annual estimate was 2,780 steelhead smolts (note that 1998, 2006, 2007 estimates were not possible due to low capture success).

Nine hundred ninety-nine (999) sockeye smolts were captured in the 224th St. rotary screw trap between 20 April and 19 May. Captures in the lower watershed at the 224th Street location closely tracked the captures immediately below the dam at the Mud Creek site. It is clear from the time difference of only a day or two in out-migration peaks or pulses between the Mud Creek trap and 224th St trap that sockeye smolts, following their release from Alouette Lake, continue their migration out of the Alouette system without delay.

Data analysis indicated a strong positive correlation between fence counts of chum salmon spawners and the number of fry in the following spring. The strong linear relationship indicates that the fence counts are a good indicator of run size in the river as a whole and that egg-to-fry survival appears to be constant year to year; at least for the years of available data (2005-2008). This suggests the Alouette River has not hit the point of significant density-dependent mortality.

4.2 Kokanee Outmigration

4.2.1 Overview

The objective of this monitoring program is to confirm whether a surface release of at least $3 \text{ m}^3\text{s}^{-1}$ from the Alouette Dam between April 15 and June 15 (obtained through the spillway gate) is adequate to promote the downstream migration of kokanee smolts out of the Alouette Reservoir. A supporting objective relates to whether a post-surface release flush of $6-9 \text{ m}^3\text{s}^{-1}$, lasting 7 days following the tail end of the out migration period, encourage more smolts to leave the system.

Monitoring Indicator (a): Number of outmigrating kokanee smolts.

This monitoring program involves instream trapping of smolts outmigrating from the system.

4.2.2 Status

Supporting program data was collected from 2005 through 2007 by the BC Hydro Bridge Coastal Restoration Program as a component of a Alouette sockeye restoration initiative to assess salmonid smolt passage response with spill releases

in the order of $3 \text{ m}^3\text{s}^{-1}$ over the Alouette Dam. In 2006 the kokanee outmigration monitoring program was confirmed as a component of the Alouette WUP Consultative Committee recommended monitoring program. As a result, it is in its fifth year of implementation. The 2008 study program (WUP monitor year 1) report², which is a summary of studies between 2005 -2008, was submitted in January 2009. The 2009 study program report is due for submission in January 2010.

4.2.3 Interpretation of Data

In 2005, spillway releases at the Alouette Dam occurred from 3 May to 3 June to evaluate the migration success of marked coho salmon smolts from the reservoir. In 2006, spillway releases at the Alouette Dam again occurred from 11 to 31 May to evaluate the migration success of marked steelhead from the reservoir. In both years coincidental kokanee smolts emigrations from the reservoir were also monitored and an estimated 7,900 and 5,064 kokanee smolts migrated based on mark recapture experiments. In 2007, kokanee smolts again migrated from the reservoir during spillway releases and 7,787 were captured during the monitored period of 16 April to 6 June. The total mark-recapture estimate of kokanee smolts emigration from the Alouette reservoir in 2007 was 62,923.

In this 2008 study, a total of 3,224 kokanee smolts were captured in the Mud Creek rotary screw trap (RST) as they migrated from the reservoir during 15 April to 26 May. A mark-recapture estimate of 8,257 for the period of 21 April to 8 May was determined to have migrated from the Alouette reservoir in 2008.

4.3 Substrate Quality

4.3.1 Overview

The objective of this program is to assess Alouette River substrate quality considering underlying management questions to evaluate the general composition of bed material and to confirm the threshold of fine sediments less than 2 mm diameter to maintain productive salmonid habitat. Program findings will be evaluated to confirm the need for an Alouette Dam flushing flow.

Monitoring Indicator (a): Substrate Quality (areal fraction of fine sand)

This program will involve direct instream observations of substrate quality at index sites in the Alouette River.

4.3.2 Status

This program commenced in 1998 as a component of the initial 1996 Alouette WUP commitments. In 2006 the monitoring program was confirmed as a component of the Alouette WUP Consultative Committee recommended monitoring program. As a result, it is in its seventh year of full implementation. The

² Mathews, M., Bocking, B. 2009. Evaluation of the Migration Success of *O. nerka* (Kokanee/Sockeye) from the Alouette Reservoir, 2008. Prepared for BC Hydro, Burnaby, BC.

2008 study program report³, which is a summary of studies between 1998 -2008, was submitted in January 2009. The 2009 study program report is due for submission in January 2010.

4.3.3 Interpretation of Data

Substrate analyses for all Alouette River monitoring sites for the period 1995 to 2008 indicate that a substantial high water event in November 1995 resulted in a significant decrease of fine sediments < 2 mm from most sites, with some deposition occurring in the lower river at certain low velocity sites. The overall percentage of fine sediments has remained relatively stable since that time. One fluctuation of note occurred between 2003 and 2004, when the overall percentages of fines dropped by 10%. This is likely due to the significant high water event of October 2003. Overall the percentages of fine sediments within the 20% range considered appropriate for productive fish habitat.

The sampling exercises that have taken place since the 1996 WUP have shown that the levels of fine sediments tend to fluctuate across the sites and/or river sections from year to year, but there has not been any evidence of steadily increasing sedimentation or substrate compaction.

2008 program findings indicate that a directed flush flow could benefit upriver lower velocity sites by removing accumulated fines from certain sections of the lower velocity side habitats. However, these did not appear to be having a negative effect on area salmonids and / or their food sources. In addition, negative sedimentation impacts such as compaction at a level that would hinder or prevent spawning were not encountered at any site. Other assessments that were made during the study, such as examining the abundance and variety of macro invertebrates, strongly suggest that sedimentation is not a limiting factor on salmonid habitat at this time.

4.4 Sockeye Adult Enumeration

4.4.1 Overview

The objective of this program is to confirm that Alouette Lake kokanee smolts passed over the Alouette dam during the spring surface release flow are successfully adapting to an anadromous existence by returning from the ocean environment to spawn in Alouette Lake as adult sockeye. Supporting objectives include: 1) confirmation that the adult sockeye returns are members of the 'Alouette stock' and not strays from other nearby coastal systems, 2) confirmation of the adult sockeye return run timing to allow streamlining of enumeration efforts, and 3) confirmation that ocean survival rates of returning re-anadromised kokanee comparable to that of sockeye stocks found elsewhere.

Monitoring Indicator (a): Number of returning adult sockeye

This program will involve enumeration of adult sockeye captures at the Alco Hatchery fish collection facility.

³ Davies, R., 2009. South Alouette River Substrate Monitoring 2008 Data Report. Prepared for BC Hydro, Burnaby, BC.

4.4.2 Status

This program was supported in 2007 by the BC Hydro Bridge Coastal Restoration Program as a sockeye restoration initiative. The monitoring program was further confirmed as a component of the Alouette WUP Consultative Committee recommended monitoring program in 2006. As a result, it is in its third year of implementation with the 2008 first year WUP recommended study program report⁴ submitted in January 2009. The 2009 study program report is due for submission in January 2010.

4.4.3 Interpretation of Data

In total, 54 adult sockeye returned to the Alouette Watershed in 2008 of which 53 were released live upstream in the Alouette Reservoir via a BC Hydro Bridge Coastal Restoration program sockeye trap and truck program. The 2008 returns were nearly double the 28 adult sockeye returns observed in 2007.

Genetic sampling from the Pacific Biological Station showed non-significant variation between the Alouette kokanee smolt samples taken during outmigration and the 2008 sockeye adult returns. In addition, the 2008 adult sockeye run included no stray sockeye from other systems and there was a significant variation between Alouette sockeye adults and sockeye from Coquitlam, Cultus, Harrison, and Weaver systems indicating that the Alouette stock is distinct from other Lower Fraser River systems.

The 2008 adult sockeye ocean survival rates will be addressed in January 2010 with age-class data from scale samples provided by the Pacific Salmon Commission.

Based on the first year of monitoring, the adult sockeye return appears to be a summer run, arriving to the Alouette Watershed in July and August, however, both the 2009 and 2010 monitoring years will be used to further confirm run timing given continuous trapping from April through December.

4.5 Water Temperature

4.5.1 Overview

The objective of this monitoring program is assess if high summer water temperatures in Alouette River downstream of Alouette Dam approach incipient lethal limits of rearing salmonids that would impact survival and growth during the summer critical rearing period. A supporting objective includes whether a general increase in stream temperatures shifts fish community structure from a cold-water, primarily salmonid system to a warm-water primarily cyprinid system.

Monitoring Indicators (a): Number of days with temperatures > 25 (Degrees Celsius)

⁴ Balcke, A., 2009. Alouette Adult Sockeye Enumeration 2009. Prepared for BC Hydro, Burnaby, BC.

Monitoring Indicators (b): Number of days with daily average temperatures > 16
(Degrees Celsius)

The monitoring program is comprised of continuous temperatures loggers situated in the Alouette Dam forebay as well as four Alouette River downstream locations.

4.5.2 Status

This program commenced in 2001 as a component of the initial 1996 Alouette WUP commitments. The year 1 2006 WUP recommended program report⁵ submitted in June 2009 summarizes the temperature data collected since the beginning of the monitoring program (October 2008) and also summarizes the available data collected earlier through 2001. The report does not address the reservoir temperature since only a few months of data are currently available and will be expanded to address all of the management questions as the program proceeds and more data is collected. The 2009 study program report is due for submission in June 2010.

4.5.3 Interpretation of Results

The highest water temperatures are observed in late August in the Alouette River. Of the salmonid species present, these temperatures potentially impact summer rearing coho and steelhead as well as resident trout species. Other salmonid species will emigrate from the system prior to August.

The literature review has confirmed that the upper lethal temperature for rearing salmonids is near 25°C, however, there have been no observations of temperature over 23°C to date. The highest temperatures occurred near the end of August with temperatures over 20°C observed only in some years. For example, for year 2000 through 2008 at the plunge pool site water temperatures exceed 20°C on 5 of the 9 years and only for one day in one of those years (2002). Water temperatures have been slightly cooler in the downstream sites compared to the Plunge Pool site over most years.

4.6 Kokanee Age Class Structure Analysis

4.6.1 Overview

The objective of this monitoring program is to determine if there is any correlation between the extent of Alouette Reservoir fluctuation during the spawning and incubation period and age structure of the kokanee population.

Monitoring Indicator (a): Total kokanee fry production.

This monitoring program is comprised of several study components involving both hydro acoustic assessments and gill netting in Alouette Reservoir:

⁵ Greenbank, J., Townsend, M. 2009. Alouette Water Temperature. Prepared for BC Hydro, Burnaby, BC.

4.6.2 Status

This program was initiated in fall 2008 as part of the 2006 Alouette WUP recommendations. Year 1 field components are complete, however, based on a program delivery partnership with the BC Ministry of Environment and associated reporting requirements a study program report will not be available until December 2009. The 2009 field components are due for completion in fall 2009 with a study program report due in December 2010.

4.6.3 Interpretation of Data

No data is yet available for this monitor.

4.7 Archeological Assessment

4.7.1 Overview

The objective of this monitoring program is to address a knowledge gap regarding the number, location, elevation, condition, susceptibility to erosion and relative importance of archaeological sites within the Alouette reservoir and Alouette River study area.

Monitoring Indicator (a): N/A

This monitoring program is comprised of several study components involving field survey of the Alouette Reservoir drawdown zone and Alouette River as well as an archival literature review.

4.7.2 Status

This one year program was initiated in April 2009 as part of the 2006 Alouette WUP recommendations. The 2009 field components are well underway with the Alouette Reservoir drawdown and Alouette River surveys complete. The program study report is due for submission in February 2010.

4.7.3 Interpretation of Data

No data is yet available for this monitor.

