Clowhom Project Water Use Plan

Monitoring Programs Annual Report: 2009

- **Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations**
- **Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity**
- **Validation of the Effective Littoral Zone Performance Measure**
- **Archaeological Sites Monitoring**

For Water Licences 120562, 120565, and Conditional Water Licence 119822

30 May 2009

BC Hydro Clowhom Project Water Use Plan Monitoring Programs Annual Report: 2009

1 Introduction

This document is a summary of the status and results of the Clowhom Project Water Use Plan (WUP) monitoring programs to April 2009, as per the Clowhom Order, dated 20 April 2005, under the *Water Act*. There are four monitoring programs including:

a) Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations

b) Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity

c) Validation of the Effective Littoral Zone Performance Measure

d) Archaeological Sites Monitoring

The terms of reference (TOR) for the monitoring programs a, b and c listed above, were accepted by the provincial Comptroller of Water Rights (Comptroller) on 28 October 2005.

Leave to commence was not received for the Archaeological Sites Monitoring TOR. As per the 28 October 2005 letter, this work will proceed under the *Heritage Conservation Act*.

2 Background

The water use planning process for BC Hydro's Clowhom project was initiated in May 2002 and completed in May 2003. The conditions proposed in the WUP for the operation of the project reflect the March 2003 recommendations of the WUP Consultative Committee.

In April 2005, the Clowhom WUP was submitted to the Comptroller.

On 20 April 2005, BC Hydro was ordered to implement the conditions proposed in the Clowhom WUP and prepare the monitoring programs TOR.

On 23 September 2005, the Clowhom WUP monitoring programs TOR were submitted to the Comptroller for review and approval.

On 28 October 2005, the Comptroller accepted the TOR for 3 monitoring programs.

As stated in the Clowhom WUP (2003) a comprehensive evaluation report of the monitoring programs will be issued after 10 years. The Clowhom WUP will be reviewed 20 years from the date (7 April 2005) of approval of the Plan by the Comptroller.

The Clowhom Monitoring Review Committee consisting of representatives from Fisheries and Oceans Canada, Ministry of Environment, Sechelt Indian Band and the Sunshine Coast Regional District was formed in the fall of 2007. The first meeting to review the Year 1 monitoring program reports took place in November 2007. The Year 2 reports were sent out for review in the spring of 2008. The second committee meeting was scheduled for the fall of 2008 but the agencies declined the offer indicating they did not have the resources available to participate in the committee any longer. BC Hydro will continue our attempts to engage the agencies.

3 Status

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

Table 3-1: Status of Clowhom WUP Monitoring Programs Implementation

Monitoring Program	Study	2006 WLR YR1	2007 WLR YR2	2008 WLR YR3	2009 WLR YR4	2010 WLR YR5	2011 WLR YR6	2012 WLR YR7	2013 WLR YR8	2014 WLR YR9	2015 WLR YR10	2016 WLR YR11	2017 WLR YR12	2018 WLR YR13	2019 WLR YR14	2020 WLR YR15	2021 WLR YR16	2022 WLR YR17	2023 WLR YR18	2024 WLR YR17	2025 WLR YR20
Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Wildlife Census	✓	✓	✓	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Air Photography	✓				■					■					■					■
Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity	Fish Creel Census Analysis		X	X	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Fish Survey	✓		✓		■					■					■					■
	Juvenile Habitat Survey		X	✓	■																
Validation of the Effective Littoral Zone Performance Measure		✓	✓	✓	■	■					■					■					■
Archaeological Sites Monitoring			X	✓	✓	■															

Legend: □ = Project timing subject to change according to maintenance schedule

■ = Project to be undertaken/initiated in identified year

U/W = Project is underway

✓ = Project is complete for the year

X = Encountered operational or hydrological delays

4 Summary of Clowhom WUP Monitoring Programs

This section outlines the status of the Clowhom WUP monitoring programs as per the Order under the *Water Act* dated 20 April 2005.

4.1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations

4.1.1 Overview

The objective of this program is to measure wildlife and vegetation community diversity and abundance in the wetlands affected by dam operations.

A performance measure to track the effects of operating alternatives on aquatic wildlife in Clowhom valley could not be completed within the timeline of the water use planning process due to the complex channel hydraulics and hydrology of the upper Clowhom Lake Reservoir watershed. Rather than pursue the development of such a performance measure, the Consultative Committee recommended that monitoring be carried out to track wildlife impacts following implementation of the WUP in an adaptive management framework. Knowledge gained during the monitoring period will be used to develop an alternative operation in the future for a second treatment effect.

Monitoring Indicators (a): Index of wildlife diversity and abundance

(b): Index of vegetation community diversity and abundance

The program is comprised of annual field reconnaissance surveys and aerial photography.

4.1.2 Status

This monitoring program was initiated in June 2006 and will be carried out over 20 years. The Year 2 and 3 program reports are attached.

4.1.3 Interpretation of Data

Wildlife surveys were carried out in August, September and December where wildlife use data were collected. All survey data were collected using the transect lines established in the first year (2006/2007) of survey. No analysis was done as there were too little data to draw meaningful conclusions (i.e., only 8 months on an entire yearly cycle have been sampled). Diversity and abundance indices cannot be calculated until at least one full season (or yearly cycle) of data has been collected. All wildlife use observations were linked to a vegetation community type using the Ministry of Forests vegetation typing procedure.

The ortho-rectified air photos of the wetland complex collected in July 2006 and the resulting vegetation polygon analyses were ground truthed and adjusted accordingly. A reference data base of vegetation communities in the area has now been completed. Vegetation polygons were identified using the Ministry of Forests vegetation typing procedure. An index of vegetation community diversity and abundance however, was not calculated at the time of the report.

4.2 Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity

4.2.1 Overview

The objective of this program is to test the validity of the premise that a decrease in reservoir fish productivity is the result of an operations-related loss of littoral habitat, by tracking changes in relative fish abundance and simple health metrics through time.

During the Clowhom Project water use planning process, a decrease in reservoir fish productivity was noted since the impoundment of Clowhom Lake Reservoir for power generation (Bruce, 2003)[1]. For the purposes of the WUP, it was assumed that the loss was the result of an operations-related loss of littoral habitat and that restoring the littoral zone would lead to improved fish productivity. Evidence supporting this assumption however is weak. In addition, there is a competing hypothesis that suggests a loss of marine derived nutrients brought in by a historic run of sockeye salmon may be the dominant causal factor. The Consultative Committee recommended that a monitoring program be carried out to test the littoral zone hypothesis as part of a larger study to asses the role of each hypothesis.

Monitoring Indicators (a): Relative abundance of salmonid species

(b): Size at age

(c): Fish condition

The program is comprised of three parts:

a) An annual Creel census of all Clowhom Lodge guests and others who regularly visit or fish the Clowhom Lake Reservoir to track fishing effort and success.

b) A bi-annual fish survey for the first five years that uses the same methodology as the Fish Studies (Bruce, 2003c)[2] to quantify relative changes in fish condition, abundance, and diversity.

c) A juvenile habitat use survey of Clowhom Lake Reservoir and Clowhom River habitats to determine where juvenile salmonids rear in the system, and hence assess impacts of operations.

4.2.2 Status

This program was initiated in June 2006 and will be carried out over 20 years. The Creel census was not completed last year because Clowhom Lodge has been sold and is no longer operational. The Creel census portion of the monitor will be cancelled as a result. The Creel census data is useful but not critical to the overall success of the monitor.

The Year 2 program report is attached.

[1] Bruce, J.A. 2003. Habitat use characteristics of obligate and facultative aquatic wildlife in the Campbell River project area. Technical Note to Campbell River WUP Wildlife Technical Committee. 8 February, 2002, BC Hydro, Water Use Plans, Burnaby, BC [File No. WUP-JHT-TN-W03].

[2] Bruce, J.A. 2003c. Results of Fish Studies. Technical Prepared for Clowhom WUP Fish Technical Committee. B.C. Hydro Report No. COM-TN-002. 17 pp.

4.2.3 Interpretation of Data

A juvenile habitat use survey was completed this year, where a total of 5.5×10^5 m^2 of accessible habitat was measured, of which 51% was considered suitable spawning habitat. No fish capture work was done in the river to determine presence of salmonid juveniles. This should be completed next year.

A second year of fish sampling was carried out on the reservoir where a total of 24 salmonids were captured. Of these, the majority were rainbow trout (14) ranging in age between 1 and three years. This was followed by cutthroat trout (7) that ranged 1 to 4 years in age. Only two kokanee were captured. Total catch is similar to that observed in 2006, but smaller than that in 2004 (done during the WUP). It is recommended that additional sampling effort be spent on trying to improve capture success of kokanee to determine whether their low numbers is the result of sampling technique (gear selectivity) or is truly a reflection of poor numbers in the system.

4.3 Validation of the Effective Littoral Zone Performance Measure

4.3.1 Overview

The objective of this program is to track changes in littoral zone productivity through time, and compare them to Effective Littoral Zone model predictions as a method to validate the performance measures.

An effective littoral zone model was developed to predict changes in potential littoral productivity around the shoreline of Clowhom Lake Reservoir for a given reservoir-operating alternative. The model is conceptually new and has not been validated, but was one of the key performance measures used to evaluate the benefits of various operating alternatives.

Monitoring Indicator (a): Depth-integrated periphyton productivity

The program is comprised of field sampling of periphyton from three sites in the reservoir, laboratory work to estimate productivity and annual program reporting and a final report at the conclusion of the monitor.

4.3.2 Status

This program was initiated in June 2006 and will be carried out over five years. The Year 2 and 3 program reports are attached.

4.3.3 Interpretation of Data

A new apparatus configuration has substantially improved sampling success, allowing for the first year of complete sampling. Periphyton accrual data were obtained from all samples, but no analysis was done; this will be carried out at the conclusion of sampling in Year 4. Despite sampling success in Year-3, additional refinements to the apparatus are recommended to further improve sampling success and overall reliability.

4.4 Archaeological Site Monitoring

4.4.1 Overview

The objective of this program is to:

- Test the broad assumptions made in developing the performance measures used in the assessment of trade-offs during the Clowhom water use planning process. For archaeology sites these assumptions include a hypothesis that Clowhom Lake Reservoir fluctuations damaged archaeological sites and that it is preferable for archaeological sites to remain inundated to protect them from erosion and theft. A total of 12 archaeological sites have been documented for the study area.

- Provide a more accurate assessment of the impacts of BC Hydro operations on known and potential sites.

- Assess the relative importance of potentially impacted sites.

- Assist in the development of proposals to mitigate impacts.

The monitoring study will be implemented in three phases; erosion monitoring system installation and archaeological site significance determination, erosion monitoring and reporting, and mitigation options assessment.

4.4.2 Status

Fieldwork for Phase 2 commenced in April 2008 during a scheduled draw-down for maintenance at the dam site. This program was initially scheduled for March of 2007 but heavy precipitation precluded the scheduled draw down at that time. A proposed reschedule to August 2007 would have required a maintenance draw down at a time that conflicted with fish windows and was not undertaken. Erosion monitoring stations were established at two archaeological site locations within the draw down zone in April 2008. The interim program report for the 2008 fieldwork has been received.

In April 2009 these erosion monitoring stations were revisited for the purpose of collecting direct measurements of eroded or accreted sediment at each site. A final report for this study is expected in December 2009.

This study is being conducted in accordance with a heritage inspection permit under Section 14 of the Heritage Conservation Act (*HCA)*.

4.4.3 Interpretation of Results

At this time there is no data to interpret for this monitoring program.

5 Clowhom WUP Monitoring Programs Costs

The following table summarizes the Clowhom WUP monitoring programs costs approved by the Comptroller on 28 October 2005 and the actual costs to 30 April 2009.

Table 5-1: Clowhom WUP Monitoring Programs Costs

Monitoring Programs	Activity	Costs approved by CWR	Total Forecast (Actuals + Forecast) Life to Date Apr 30, 09	Variance Total to Approved ($)	Explanation	Corrective Action
COMWLR ANNUAL REPORT		$113,523	$43,342	$70,180	Original estimate overestimated and process streamlined.	Resubmit to CWR
COMMON#1 MONITOR OF AQUATIC WILDLIFE IN WETLANDS AFFECTED BY DAM OPERATIONS		**$364,673**	**$330,000**	**$34,673**		
COMMON#1 Direct Management 001	Direct Management	$174,773	$140,100	$34,673	Variance is the result of Project Management efficiencies implemented over the life of the project.	Resubmit to CWR
COMMON#1 Implementation 002	Implementation	$189,900	$189,900	-		
COMMON#2 ROLE OF LITTORAL ZONE IN GOVERNING CLOWHOM RESERVOIR PRODUCTIVE CAPACITY		**$188,424**	**$168,964**	**$19,460**		
COMMON#2 Direct Management 001	Direct Management	$85,324	$76,024	$9,300	Variance is the result of Project Management efficiencies implemented over the life of the project.	Resubmit to CWR
COMMON#2 Implementation 002	Implementation	$103,100	$92,940	$10,160	Opportunistic Creel Survey cancelled.	Resubmit to CWR
COMMON#3 VALIDATION OF THE EFFECTIVE LITTORAL ZONE PERFORMANCE MEASURE		**$155,909**	**$146,263**	**$9,646**		
COMMON#3 Direct Management 001	Direct Management	$57,909	$45,312	$12,597	Variance is the result of Project Management efficiencies implemented over the life of the project.	Resubmit to CWR
COMMON#3 Implementation 002	Implementation	$98,000	$100,951	($2,951)	Equipment malfunction.	Resubmit to CWR