

Clowhom Project Water Use Plan

Monitoring Programs

Annual Report: 2023

Implementation Period: May 2022 to April 2023

- **COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations**
- **COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity**
- **COMMON-3 Validation of the Effective Littoral Zone Performance Measure**
- **COMMON-4 Archaeological Sites Monitoring**

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

May 31, 2023

BC Hydro Clowhom Project Water Use Plan Monitoring Programs Annual Report: 2023

1 Introduction

This document represents a summary of the status and the results of the Clowhom Project Water Use Plan (WUP) monitoring programs to April 30, 2023, as per the Clowhom Order under the *Water Act*, dated April 20, 2005. There are four monitoring programs.

2 Status

The following table outlines the dates that Terms of Reference (TOR) for the Clowhom Project WUP monitoring programs were submitted to and approved by the Comptroller of Water Rights (CWR).

Table: 2-1: Dates of Clowhom Project WUP TOR Submissions and Approvals by the Comptroller of Water Rights

Monitoring Program TORs	Order Clause	Original ToR Submission		Most Recent ToR Resubmission	
		Date Submitted	Date Approved	Date Submitted	Date Approved
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Schedule A.1.a	September 23, 2005	October 28, 2005	February 28, 2019	March 27, 2019
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity	Schedule A.1.b	September 23, 2005	October 28, 2005	April 13, 2021	May 6, 2021
COMMON-3 Validation of the Effective Littoral Zone Performance Measure	Schedule A.1.c	September 23, 2005	October 28, 2005	December 24, 2019	May 12, 2020
COMMON-4 Archaeological Sites Monitoring	Schedule A.2	September 23, 2005	October 28, 2005		

3 Schedule

The following table outlines the current schedule for the monitoring programs being delivered for the Clowhom Project WUP.

Table 3-1: Monitoring Programs Schedule as of April 30, 2023

Monitoring Program	Study	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10	WLR YR11	WLR YR12	WLR YR13	WLR YR14	WLR YR15	WLR YR16	WLR YR17	WLR YR18	WLR YR19	WLR YR20
COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations	Wildlife Census	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	X	■	■
	Air Photography	✓				✓	✓				X ¹	✓			✓						■
COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productive Capacity	Fish Survey	✓		✓	✓	✓	✓				X ¹	✓				X ¹	X	X	■		■
	Juvenile Habitat Use Survey		X	✓	X	✓	✓					✓F									
COMMON-3 Validation of the Effective Littoral Zone Performance Measure		✓	✓	✓	✓	✓	✓				X ¹	✓	✓			✓F					
COMMON-4 Archaeological Sites Monitoring			X	✓	✓F																

- Legend:
- = Project to be undertaken in identified year
 - ✓ = Project is completed for the year
 - x = Encountered operational or hydrological delays (including COVID-19 impact)
 - X¹ = Work delayed due to program review
 - ✓F = All field work for this project is complete. No further field work is planned.

4 Monitoring Programs Terms of Reference

The monitoring programs being implemented under the Clowhom Project WUP are described in Terms of Reference (TOR). These TOR and the reports for work completed to date can be found here:

https://www.bchydro.com/toolbar/about/sustainability/environmental_responsibility/water-use-plans/lower-mainland/clowhom.html

5 Status of Monitoring Programs

5.1 COMMON-1 Monitor of Aquatic Wildlife in Wetlands Affected by Dam Operations

The objective of this project is to determine to what extent the ecology (e.g., species diversity and abundance) in the wetland at upper end of Clowhom Falls Reservoir is linked to the operation of the reservoir.

The wildlife census component of this monitoring program was initiated in 2006 and was broad in scope, including monitoring forest transects for a large spectrum of wildlife outside the reservoir inundation footprint on an annual schedule. The 2019 TOR revision refined the sampling to focus on birds and amphibians breeding/nesting within the reservoir inundation footprint at times when interactions between reservoir operations and wildlife are most likely.

The 2021 field work was completed in June and July 2021 after delays due to the COVID-19 pandemic. The 2021 field work focused on amphibians and ground-nesting birds in the upper drawdown zone of the reservoir. The wildlife census field work scheduled for late 2022 and spring 2023 was not implemented due to vendor availability and vendor capacity issues. Three field surveys are planned in 2024 at favorable times to sample amphibians and nesting birds, subject to vendor capacity issues being resolved. We are currently seeking other vendor options to complete this work.

The Year 15 (2020) report is currently in draft and will be submitted with the Year 16 (2021) report in the 2024 annual report. There will be no reports for 2022 or 2023 due to the scheduling challenges noted above.

5.2 COMMON-2 Role of Littoral Zone in Governing Clowhom Reservoir Productivity Capacity

The objective of this 20-year monitoring program is to track changes in fish productivity through sampling of rearing populations. This program was developed and implemented in 2006 to measure if fish productivity has decreased.

Fish surveys were scheduled in alternate years from 2006 to 2010 and then approximately at five-year intervals with the last completed survey in 2016. Our review of the program in 2021 determined that the limited field schedule of fish sampling, the limited number of samples, and the small capture of fish obtained in each sampling year is not enough to answer the management questions. In May 2021 the CWR approved our resubmission of the TOR for an enhanced field survey.

This enhanced survey was planned for 2022 but was delayed due to equipment procurement and supply chain issues related to the COVID-19 pandemic. The equipment procurement and subsequent field preparations are underway with juvenile salmon (fry) surveys to occur in the reservoir and tributaries in August 2023 followed by the identification of fish spawning areas. If spawning areas are identified, the monitoring of spawning activity and fish condition, focusing on Black Kokanee will occur from September 2023 through January 2024. The exact timing and intensity of spawning activity monitoring will depend on how many spawning sites are found.

The Year seven (2023 report) will be submitted in the 2024 annual report.

5.3 COMMON-3 Validation of the Effective Littoral Zone Performance Measure

The objective of this program is to detect changes in the reservoir littoral zone (e.g., the part of the reservoir close to shore) and compare these changes to model predictions validating performance measures for the different reservoir operational alternatives.

This monitoring program was initiated in 2006 with data collection occurring every year until 2010. The sampling period was successful and provided enough data to facilitate the evaluation the Effective Littoral Zone (ELZ) Model. However, by 2015 BC Hydro began to re-evaluate the validity of the Effective Littoral Zone Model (ELZ) for Clowhom due to results on other BC Hydro reservoirs. Review and analysis of results on Clowhom Reservoir in comparison to other reservoirs was completed in 2018 and concluded that littoral production had little effect on fish condition, in this case rainbow and cutthroat trout. Modelling was completed in 2018 and compiled in a 10-year summary report.

As per the May 12, 2020 letter, the CWR approved relief from the remaining years of study implementation for COMMON-3 Validation of the Effective Littoral Zone Performance Measure. This project is complete.

5.4 COMMON-4 Archaeological Sites Monitoring

This monitoring program was initiated in 2008, was carried out over two years. The objective of this program was to collect additional information about condition and location of sites in the drawdown zone and to monitor site specific impacts due to reservoir operations.

Leave to commence was not received for the COMMON-4 Archaeological Sites Monitoring TOR. As per the October 28, 2005 letter, this work proceeded under the *Heritage Conservation Act*.

This project is complete.

6 Monitoring Programs Costs

The following table summarizes the Clowhom Project WUP monitoring programs costs approved by the CWR and the Actual Costs to April 30, 2023

Table 6-1: Clowhom Project WUP Monitoring Program Costs

Monitoring Programs	Costs approved by CWR	Life to Date Actuals (LTD)	Estimated to Complete (Forecast)	Total Forecast (LTD and Forecast)	Variance Total to Approved	Explanation	Corrective Action
Clowhom WUP Annual Report	\$43,186	\$16,228	\$7,018	\$23,247	\$19,939		
COMM01A Mon Aquatic Wildlife	\$364,673	\$239,489	\$112,251	\$351,739	\$12,934		
COMM01A Mon Aquatic Wildlife - ONR DM	\$174,773	\$82,275	\$37,049	\$119,323	\$55,450		
COMM01A Mon Aquatic Wildlife - ONR Imp	\$189,900	\$157,214	\$75,202	\$232,416	(\$42,516)		
COMM02A Role Littoral Zone	\$296,900	\$143,503	\$151,059	\$294,562	\$2,338		
COMM02A Role Littoral Zone - ONR DM	\$85,324	\$49,418	\$27,314	\$76,732	\$8,592		
COMM02A Role Littoral Zone - ONR Imp	\$211,576	\$94,085	\$123,745	\$217,830	(\$6,254)		
COMM03A Valid Littoral Zone	\$155,909	\$125,651		\$125,651	\$30,258	Project Complete	
COMM03A Valid Littoral Zone - ONR DM	\$57,909	\$19,432		\$19,432	\$38,477		
COMM03A Valid Littoral Zone - ONR Imp	\$98,000	\$106,219		\$106,219	(\$8,219)		
COMM04A Archaeological Sites	\$0	\$7,350		\$7,350	(\$7,350)	Project Complete	
COMM04A Archaeological Sites - ONR DM	\$0	\$6,681		\$6,681	(\$6,681)		
COMM04A Archaeological Sites - ONR Imp	\$0	\$669		\$669	(\$669)		

OR - Ordered Remissible
ONR - Ordered Non-Remissible

* Red values in parentheses denote overage.