

Puntledge River Project Water Use Plan

Monitoring Programs and Physical Work Annual Report: 2008

- **Assessment of Adult Fish Passage During Pulse Flow Releases**
- **Puntledge River Steelhead Production**
- **Evaluating Effects of Ramping Rates on Fish Stranding in Puntledge River Reach C**
- **Puntledge River Kayak Pulse Flow Cost-Benefit Analysis**

For Conditional Water Licences 120300, 120301, 120302

BC Hydro Puntledge River Project Water Use Plan Monitoring Programs and Physical Work Annual Report: 2008

1 Introduction

This document represents a summary of the status and the results of the Puntledge River Water Use Plan (WUP) monitoring programs and physical work to 31 May 2007, as per the Puntledge River Order under the *Water Act*, dated 19 January 2005. There are five monitoring programs and one physical work:

- a) Assessment of Adult Fish Passage During Pulse Flow Releases
- b) Assessment of Egg Incubation Success in Puntledge River Reach C
- c) Steelhead Production
- d) Evaluating Effects of Ramping Rates on Fish Stranding in Puntledge River Reach C
- e) Kayak Pulse Flow Cost – Benefit Assessment
- f) Gravel Placement in the Puntledge River

2 Background

The water use planning process for BC Hydro's Puntledge River project was initiated in June 2001 and completed in June 2003. The conditions proposed in the WUP for the operation of the project reflect the December 2003 recommendations of the Puntledge River WUP Consultative Committee.

In November 2003, the Puntledge River WUP was submitted to the Comptroller.

On 19 January 2005, BC Hydro was ordered to implement the conditions proposed in the Puntledge River WUP and prepare the monitoring programs and physical works terms of reference (TOR).

On 11 August 2005, the Puntledge River WUP monitoring programs TOR were submitted to the Comptroller for review and approval. On 6 September 2005, the TOR for all monitoring programs except the Kayak Pulse Flow Cost-Benefit Assessment were accepted by the Comptroller. Revisions were made to this TOR and re-submitted to the Comptroller on 3 January 2006. On 7 March 2006, the revised TOR was accepted by the Comptroller.

On 11 April 2006, BC Hydro requested a delay of submission of the TOR for the placement and periodic maintenance of approximately 2000 square meters of spawning gravel in the Puntledge River. On 11 May 2006, the Comptroller accepted the proposal to defer the gravel placement portion of the Puntledge WUP, and directed BC Hydro to submit an update on the status of the gravel placement TOR to the Comptroller's office by 31 March 2008.

On 4 May 2007, BC Hydro re-submitted the TOR for the Assessment of Adult Fish Passage during Pulse Flow Releases due to a revision of methodology and increased implementation cost. On 28 May 2007, this revised TOR was accepted by the Comptroller.

On 26 June 2007, BC Hydro submitted a letter to the Comptroller to inform of a schedule change to the monitoring program for Evaluating the Effects of Ramping Rates on Fish Stranding in the Puntledge River (Reach C).

As outlined in the Puntledge River WUP, a review is recommended after ten years, if not triggered earlier. Five years after the implementation of this WUP, BC Hydro will review the results of the monitoring programs and assess the need to review the Puntledge River WUP. A review could be triggered sooner if significant risks are identified that could result in a recommendation to change operations.

3 Status

The following table outlines the status and schedule for the Puntledge River WUP monitoring programs and physical work.

Table 3-1: Status of Puntledge River WUP Monitoring Programs and Physical Work Implementation

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Monitoring Programs	WLR YR1	WLR YR2	WLR YR3	WLR YR4	WLR YR5 Interim Review	WLR YR6	WLR YR7	WLR YR8	WLR YR9	WLR YR10 Final Review
Assessment of Adult Fish Passage During Pulse Flow Releases		u/w	u/w		■					
Assessment of Egg Incubation Success in Puntledge River Reach C	✓	■	u/w							
Steelhead Production	✓	u/w	u/w	■	■					
Evaluating Effects of Ramping Rates on Fish Stranding in Puntledge River Reach C	u/w	■	●							
Kayak Pulse Flow Cost - Benefit Assessment	✓	u/w	u/w	■	■					
Physical Works										
Gravel Placement in the Puntledge River			■							

- Legend:
- = Program to be undertaken/initiated in identified year
 - u/w = Project is underway
 - ✓ = Program completed for the year
 - × = Program started, but encountered operational or hydrological delays
 - = Program completed

4 Puntledge River WUP Monitoring Programs

This section outlines the status of the Puntledge River WUP monitoring programs as per the Order under the *Water Act*, dated 19 January 2005.

4.1 Assessment of Adult Fish Passage During Pulse Flow Releases

4.1.1 Overview

The objective of this monitoring program is to assess the benefits of the pulse flow releases to the upstream migration of adult summer run Chinook salmon and

steelhead trout in Reach C of the Puntledge River. The geographic scope of the monitoring will also include limited areas upstream and downstream of Reach C.

The Puntledge River WUP Consultative Committee expressed concern that flow conditions in Reach C of the Puntledge River may impede the upstream passage of adult salmon and steelhead. The benefits of pulse flows were uncertain and the Consultative Committee recommended that fish passage be monitored.

Monitoring Indicator: (a) Distance Chinook salmon travel before/after a pulse flow event.

This monitoring program will involve using radio telemetry to assess the migration of summer run Chinook salmon. Telemetry work will be supplemented with snorkel counts at locations with difficult passage.

4.1.2 Status

This program was initiated in June 2007 and is currently underway. The study will be carried out during 2008 and 2010 for a total of three years of monitoring. The first program report was completed in February 2008.

4.1.3 Interpretation of Data

As noted in the Terms of Reference, interpretation of data will occur after the conclusion of data collection.

4.2 Assessment of Egg Incubation Success in Puntledge River Reach C

4.2.1 Overview

The objective of this monitoring program is to assess the incubation success believed to occur with the minimum flow requirements proposed in the Puntledge River WUP. A secondary objective of the monitoring program is to develop a predictive model linking measures of flow with incubation success.

The Puntledge River WUP Consultative Committee recommended several operations in the Puntledge River towards improving flow conditions for spawning, rearing and access for key indicator fish species. In particular, minimum flows were changed slightly and several "pulse-flow" operations were recommended to provide the opportunity for fish migration. The most significant change to minimum flow requirements in the Puntledge River occurred in 1997 when the flows for fish were increased from 2.8 m³/s to 5.7 m³/s. Although the Consultative Committee recommended this flow in the WUP, there was no information available to suggest that the flow changes have resulted in increased fish production. To inform future water use planning processes, the Consultative Committee recommended a two-year study to assess the salmon and steelhead egg incubation success in Reach C.

Monitoring Indicator: (a) Chinook salmon egg incubation success.

This monitoring program will include four components: information review and synthesis; egg incubator and environmental monitoring installations; field spot measurements and incubation assessments; and data summary, analysis and reporting.

4.2.2 Status

This program was initiated in August 2006 and will be carried out over two years. The first program report was received in June 2007. The final report is expected in September 2008.

4.2.3 Interpretation of Data

As outlined in the Terms of Reference, Year 1 focused on compilation of background information, and presentation of methods and results for year 1. Interpretation of data, including development of the model linking incubation success, physical incubation parameters, and flow is to be performed after year 2 results are complete. At the time of writing, data for Year 1 and Year 2 have been collected, and interpretation and reporting are currently ongoing.

4.3 Steelhead Production

4.3.1 Overview

The primary objective of the monitoring program is to assess the impacts of the minimum flow release and the pulse flow releases on steelhead production in Reach C of the Puntledge River. The second objective is to examine the effects of kayak pulse flows on juvenile steelhead.

The Puntledge River WUP Consultative Committee expressed concern that flow conditions in Reach C of the Puntledge River may affect the production of endangered summer and winter run steelhead populations. The benefit to steelhead production of the minimum and pulse flows was uncertain when it was incorporated into the WUP. As a result, the Consultative Committee recommended that steelhead production be monitored.

Monitoring Indicators: (a) Number of steelhead adults returning to Reach C.
 (b) Number of steelhead juveniles in Reach C.
 (c) Number of steelhead fry in Reach C.

This monitoring program will include three components: adult escapement, juvenile abundance and parr stranding following kayak pulse flows.

4.3.2 Status

This program was initiated in January 2006, and will be carried out over five years. The first program report was delivered in May 2007, while the second program report was delivered April 2008

4.3.3 Interpretation of Data

Data for all three components was collected in Years 1 and 2. As noted in the Terms of Reference, interpretation of data will occur after the conclusion of data collection in Year 5.

4.4 Evaluating Effects of Ramping Rates on Fish Stranding in Puntledge River Reach C

4.4.1 Overview

The objective of this monitoring program is to assess the risk of stranding associated with the pulse-flow operations planned under the Puntledge River WUP. Secondly, the aerial extents of stranding and the mitigation options available will also be assessed.

The Puntledge River WUP Consultative Committee recommended several operations in the Puntledge River towards improving flow conditions for spawning, rearing and access for key indicator species. In particular, minimum flows were increased and several “pulse-flow” operations were recommended to provide the opportunity for fish migration. The Consultative Committee acknowledged that these operations may result in detrimental impacts to rearing juvenile salmonids, and recommended further monitoring.

Monitoring Indicator: (a) Stranding risk (fish stranded per area).

This program is comprised of four components: site reconnaissance and design revisions (additional sites); stranding enumeration and mapping; data report, site summary and mapping; and summary and recommendations.

4.4.2 Status

This program was initiated in July 2006, and was to be carried out for one year. However, as per BC Hydro’s letter of 26 June 2007 to the CWR, the October data collection for this study was not conducted in 2006 and will be conducted in 2007. The program report for both years of data collection was delivered in March 2008.

4.4.3 Interpretation of Results

As detailed in the final study report, monitoring during the July 2006 and October 2007 pulses found no indication of stranding or mortality to any juvenile salmon or trout in the diversion reach sites, and found only a minor impact at a site in the reach downstream of the powerhouse. The report includes recommendations on: i) the maximum magnitude of the pulse, above which stranding may occur, and ii) management options to mitigate stranding at the site in the reach downstream of the powerhouse.

4.5 Kayak Pulse Flow Cost-Benefit Analysis

4.5.1 Overview

The objective of this program is to assess the performance of the WUP decision to release planned kayak pulse flows during mid May to mid June. The WUP Consultative Committee recommended a monitoring program that would allow future assessment of how well utilized the kayak pulse flow is (number of kayak participants), the economic and social benefits to the community and recreationalists respectively, and the associated cost of lost power revenue.

Puntledge River is one of the most popular sites for “play feature” kayaking on Vancouver Island. Local paddlers indicate that at ideal water levels, the quality of

paddling is excellent for paddlers at various experience levels. However, ideal water conditions occur on an unpredictable basis through the fall and winter storm season, when the reservoir is full and BC Hydro actively pre-spills before or spills during a storm event. A number of factors outside of BC Hydro control affect water levels throughout the year, including tributary inflows (Browns and Tsolum Rivers), tide cycles in Courtenay, actual rainfall and freezing level. Because of the unpredictability of most of these factors, kayakers have historically had difficulty in obtaining both current and forecast river flow information.

The Puntledge River WUP Consultative Committee agreed to provisions for the following activities related to kayaking on the Puntledge River:

- Five-day forecast reservoir discharges on posted external website.
- Two eight-hour pulse flow releases between mid-May and mid-June, for a planned kayak event.
- Monitoring of cost-benefit of pulse flow release.

The economic and social benefits of the flow release will be evaluated in this monitoring program, over a five-event timeline.

Monitoring Indicator: (a) Net cost of kayak flow release.

This monitoring program has two components, assuming there is one event per year: survey design and implementation during events one through five; and event five post-analysis (assuming that it takes five years for event success).

4.5.2 Status

This program was initiated in June 2006, during the kayak event, and will be carried out over five years. The first survey occurred during the 2006 kayak event and the first report was delivered in September 2006. The second survey occurred during the May 2007 kayak event and the second report was delivered in August 2007. The third survey occurred during the May 31, 2008 and June 1, 2008 kayak event. The third report is expected September 2008.

4.5.3 Interpretation of Results

Eighty five of the 127 registered participants were surveyed during the June 2006 event. One hundred and twenty of the 181 registered participants were surveyed during the June 2007 event. As outlined in the Terms of Reference, this data will be used as part of a comprehensive assessment of the effectiveness of the pulse flow following the completion of data collection in Year 5.

5 Puntledge River WUP Physical Work

This section outlines the status of the Puntledge WUP physical works as per the Order under the *Water Act*, dated 19 January 2005.

5.1 Gravel Placement in the Puntledge River

5.1.1 Overview

In the summer of 2005, Fisheries and Oceans Canada (DFO), in partnership with the BC Hydro Bridge Coastal Restoration Program, undertook a gravel placement program in the Puntledge River headpond reach. The purpose of the program was to

provide spawning habitat for summer Chinook. Based on current projections, DFO believes that the capacity of the new spawning habitat exceeds the expected returns for the next several years. Both DFO and the Ministry of Environment (MOE) have therefore recommended that the BC Hydro ordered gravel placement program be deferred, until the existing platform is fully assessed and/or spawning utilization by Chinook increases above 400 spawners. BC Hydro supports this recommendation.

5.1.2 Status

On 11 April 2006, BC Hydro requested a delay of submission for the placement and periodic maintenance of approximately 2000 square meters of spawning gravel in the Puntledge River TOR. On 11 May 2006, the Comptroller accepted the proposal to defer the gravel placement portion of the Puntledge WUP, and directed BC Hydro to submit an update on the status of the gravel placement TOR to the Comptroller's office by 31 March 2008. On January 2008 BC Hydro requested a further delay in the gravel placement project for two years with the submission of the terms of reference by March 31 2010. Approval for this delay was received from the CWR office on March 3 2008.

6 Puntledge River WUP Monitoring Programs and Physical Work Costs

The following table summarizes the Puntledge River WUP monitoring programs and physical work costs approved by the Comptroller on 6 September 2005 and the actual costs to 30 June 2008.

Table 6-1: Puntledge River WUP Monitoring Programs and Physical Work Costs

Description		Costs Approved by Comptroller of Water Rights	Actual Costs to 30 June 2008
Monitoring Programs			
Assessment of Adult Fish Passage During Pulse Flow Releases	Direct Management	\$58,961	\$25,804
	Implementation	\$296,470	\$92,270
Assessment of Egg Incubation Success in Puntledge River Reach C	Direct Management	\$20,862	\$10,799
	Implementation	\$80,100	\$75,579
Steelhead Production	Direct Management	\$70,228	\$31,818
	Implementation	\$276,700	\$106,998
Evaluating Effects of Ramping Rates on Fish Stranding in Puntledge River Reach C	Direct Management	\$7,472	\$6,235
	Implementation	\$8,369	\$8,204
Kayak Pulse Flow Cost -Benefit Assessment	Direct Management	\$27,894	\$12,785
	Implementation	\$36,200	\$11,846
Physical Work			
Gravel Placement in the Puntledge River	Deferred		