

Final Report

Puntledge Hatchery Wetland Restoration and Enhancement

Seed Funding 2013

FWCP Project Number: 13.W.PUN.01

Prepared for:

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November 6, 2013

Prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, and Fisheries and Oceans Canada

Executive Summary

FWCP seed funding was obtained in 2013 to monitor the habitat conditions and amphibian use of the decommissioned BC Hydro Upper Puntledge River Hatchery near Courtenay, BC. The objective of the monitoring program was to develop a habitat restoration plan for 2014 and beyond. The Rearing and Spawning Channels retained water throughout the amphibian breeding season in 2013, and at least three species were confirmed to utilize the site for breeding and larval development. The Blue listed Red-legged Frog (*Rana aurora*) bred in both the Upper Spawning and Rearing Channels. Pacific Treefrogs (*Pseudacris regilla*), and Northwestern Salamanders (*Ambystoma gracile*) also bred at the site. Adult Rough-skinned Newts were also observed but breeding was not confirmed. Other incidental wildlife species observed at the site include dragonflies, American Dipper, garter snakes, and beaver or muskrat.

The following areas were identified as restoration options for the site for 2014 and beyond:

- Naturalize and increase habitat complexity within the old Spawning and Rearing Channels,
- Create riparian habitat for amphibians and other wildlife species between the two Channels by naturalizing the old gravel road,
- Re-contour and naturalize the rearing pond area (create upland habitat for wildlife species and native vegetation),
- Enhance the area for other wildlife species by increasing opportunities for nesting, foraging, resting, and perching, and
- Utilize the project as an educational and training opportunity for students, professionals, and First Nations.

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1.0 Introduction

1.1 Background

The BC Hydro Upper Puntledge River Fish Hatchery was scheduled for decommissioning in late summer 2012. A site visit was conducted on June 28, 2012 with Eva Wichmann and Todd Ewing from BC Hydro, Krysia Tuttle from LGL in Sidney, BC, and myself (E. Wind Consulting) with the objective of discussing possible wetland restoration and enhancement opportunities at the hatchery.

Summary of Site Visit Decommissioning Plan

- The site consisted of approximately four buildings, three main channels (Spawning – upper and lower, and Rearing), tanks, a head pond, pump stations, gravel roads, asphalt roads, fishways, and a rearing pond.
- The decommissioning plan included the removal of some buildings and the boarding up of others, removal of concrete diffusers in the channels, and removal of the rearing pond (asphalt pulled up and concrete walls removed and laid within the pond area; Fig. 1).
- The pumps feeding water from the Puntledge River into the Spawning and Rearing channels were turned off in early June 2012.
 - It was believed that water could not be naturally retained within the Channels without pumping water into the site (water levels had dropped about 1.5 m by the end of June).
- A major priority for BC Hydro in terms of the decommissioning, final layout, and design of the proposed restoration is public safety.
 - The area will remain fenced with no public access.
 - The Department of Fisheries and Oceans (DFO) will retain an access road and fishways.
- The gravel roads between and along the two Channels, and two asphalt roads will remain in place.
- The Upper Spawning Channel will remain as is (banks will remain natural).

As part of the decommissioning work, an amphibian salvage was conducted and overseen by E. Wind in late Aug. and early Sept. 2012. From that effort, 15 adult amphibians and 14 larvae were recovered and moved into suitable habitat off site—13 adult / subadult Blue listed Red-legged Frogs (*Rana aurora*), and 2 adult and 14 larval Rough-skinned Newts (*Taricha granulosa*).

1.2 Goals and Objectives for 2013

After the 2012 site visit and salvage operation for the decommissioning, it was recommended that the restoration follow a staged approach: 1) monitor the site as is; 2) work on those areas that appear to need improvement; 3) monitor species use / success; and 4) adapt as needed. As such, it was decided that seed funding would be sought from BC Hydro FWCP for 2013 to provide an opportunity to observe the site, collect some basic data / information, and develop a more detailed restoration plan for 2014.

The goals and benefits of this project are to increase the amount of available wetland and riparian habitat for amphibian populations, especially for species at risk such as the Red-legged Frog, as a means of compensating for habitat lost during the damming of the Puntledge River. Work done for amphibians will benefit a variety of wetland-associated flora and fauna. The project utilizes an existing disturbed site, providing an opportunity for habitat restoration on multiple levels and for various species.

The objectives of this project for 2013 were to:

- Assess the site in its current state in terms of species use, especially for species at risk and non-native and invasive species.
- Monitor site conditions (e.g., hydroperiod, water levels) and identify areas for improvement.
- Identify and engage with potential partners for future restoration and enhancement work, and for long-term monitoring.

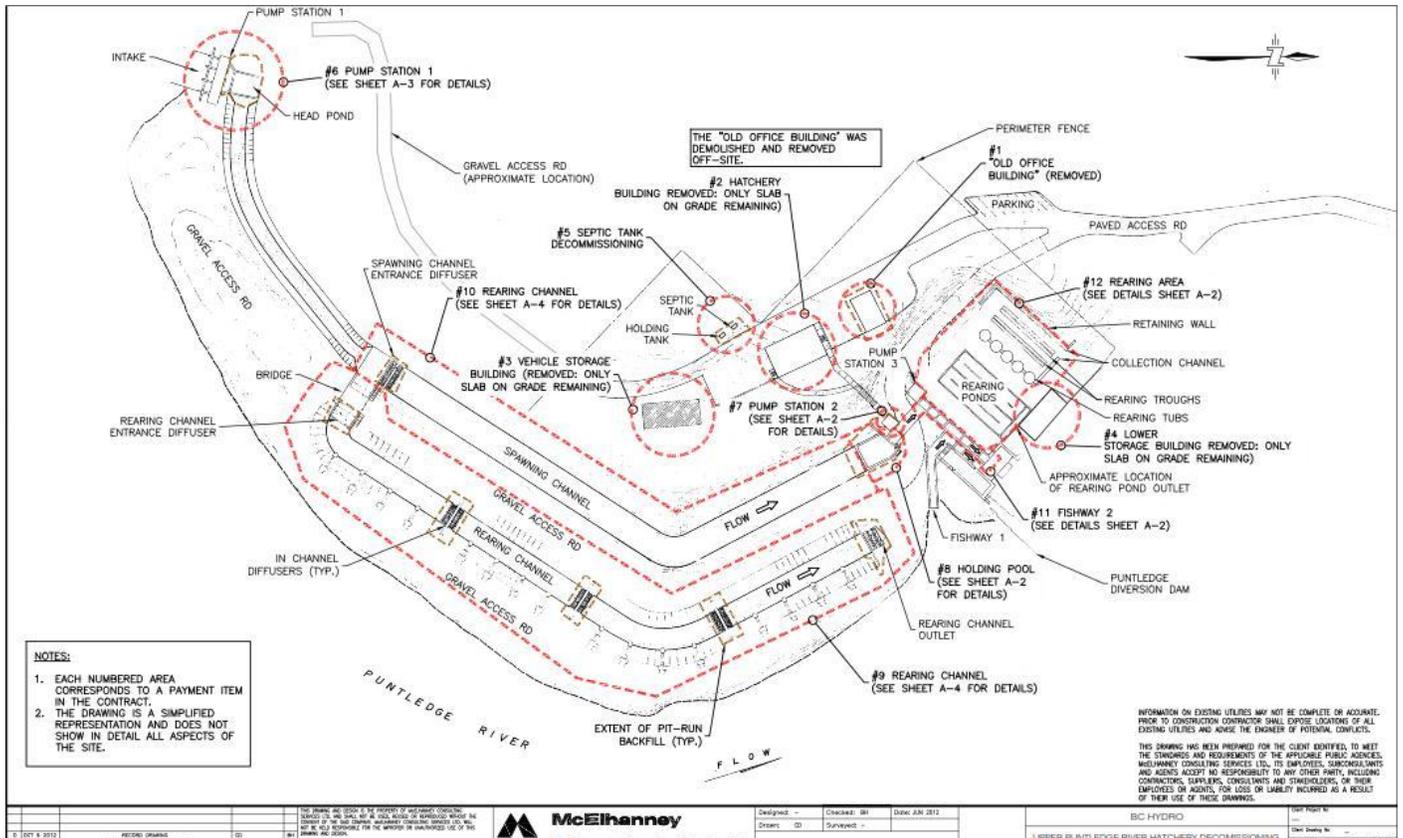


Figure 1. Layout and description of decommissioning work conducted at the Upper Puntledge River Hatchery in Aug. 2012.
(used with permission by McElhanney Environmental Consultants)

2.0 Methods

There were four main areas of information gathering completed to meet the objectives established for this project in 2013.

1) Monitoring the Spawning and Rearing Channels

Site visits were conducted each month between April and July 2013 to survey for aquatic-breeding amphibians in both the Spawning (upper and lower) and Rearing channels to determine use. Visual surveys and / or dipnetting were used during each site visit to detect all amphibian species and life stages. During these site visits, the quality of the aquatic habitat for amphibians was recorded (e.g., maximum / average water depth, water temperature, water clarity). Channel water levels were compared to water levels / spill rates within the Puntledge River.

During each site visit, use of the channels and riparian areas by other wildlife species was also recorded to identify habitat features and structures being used or potentially lacking (e.g., substrate, aquatic vegetation, downed wood, perching, resting, or basking sites, etc.)

2) Non-native Species Identification and Management

The focus of this work was mainly vegetation, but any non-native species detected when on site were recorded. A botanist (Michele Jones – Mimulus Biological Consultants, Courtenay) was brought to the site on two occasions to survey the area and discuss vegetation management options. She was asked to:

- Identify non-native and invasive vegetation that occur on the site
- Identify species of concern and potential eradication / control measures

3) Identify Areas for Enhancement / Restoration

Based on the 2013 observations of habitat conditions within the channels, riparian areas, and upland areas (e.g., by the old septic field), various restoration options were developed.

In addition, in order to: a) identify other potential options for restoration at the site, and b) determine whether there might be any potential issues associated with the proposed restoration work (e.g., limitations, conflicting objectives, etc.), numerous stakeholders were contacted – e.g., DFO (Darcy Miller), Comox Valley Regional Parks staff (Brian Allaert and Karin Albert), BC Hydro staff (Eva Wichman and others), K'omoks First Nation, an engineer familiar with the site and decommissioning work (C. Durupt, McElhaney Environmental, Courtenay), and two non-profit organizations that work in the area (Courtenay Fish and Game Association and Project Watershed).

4) Identify and Engage with Potential Partners for 2014 (and beyond)

Through conversations with various stakeholders, etc. various partners were identified and contacted that could be interested in being involved in the restoration project. Potential partners that were considered included those that might be interested in teaching or learning about habitat restoration.

3.0 Results and Discussion

1) Monitoring the Spawning and Rearing Channels

The water levels within the Spawning and Rearing Channels fluctuated to some degree throughout the spring and summer monitoring period in 2013, but neither channel had water levels recede as much as was observed in 2012 (some areas dried that year). The outflows of the Rearing Channel and Spawning Channels were both plugged during the decommissioning work which has likely increased the capacity of the channels to retain water (C. Durupt, pers. comm.). When water levels were low within the Rearing Channel four separate pools existed, disconnected by the mounds that were left from the decommissioning of the old diffusers (Pools A-D; see Fig. 2). When water levels were high, some or all of the Rearing Channel pools were connected (Table 1). Connectivity facilitates movement between pools and channels for aquatic species. Water levels within the Spawning and Rearing Channels appear to fluctuate in relation to BC Hydro spill rates into the Puntledge River (Fig. 3). Fluctuating water levels have the potential for negative impacts for amphibians if levels drop after eggs have been laid, which can increase their risk of exposure to cold temperatures and to desiccation.

At least three amphibian species were confirmed breeding in the Spawning and / or Rearing Channels in 2013, including the Blue listed Red-legged Frog (Table 2). Red-legged Frogs bred in the Lower Spawning Channel and all four Rearing Channel pools. In total, 11 egg masses were detected in late April. Differences in the development and hatching success of Red-legged Frog egg masses were observed between the four pools of the Rearing Channel. Five egg masses were laid in Pool C, all of which had some dead eggs (three of the five masses appeared mostly dead). Red-legged Frog egg masses in the other three pools appeared healthy and were hatching out. Water clarity / condition at the time of the spring survey was relatively poor (silty / cloudy with high algal growth). The dead Red-legged Frog egg masses observed in the Rearing Channel in April, may be the result of fluctuating water levels in spring in the Puntledge River (e.g., the eggs were laid in March and water levels had dropped by April). More intensive water level monitoring is needed to determine whether this is a contributing factor.

Of the remaining amphibian species, Pacific Treefrogs (*Pseudacris regilla*) laid eggs in the Upper Spawning channel, as well as all pools in the Rearing Channel. Northwestern Salamander (*Ambystoma gracile*) egg masses (n = 2) were detected in the Upper Spawning Channel, and one mass was detected in pool B of the Rearing Channel. Relatively small salamander larvae of either the Northwestern Salamander or Long-toed Salamander (*Ambystoma macrodactylum*) were detected in pool D of the Rearing Channel in May. Small larvae of these two species are difficult to tell apart. Numerous adult Rough-skinned Newts (*Taricha granulosa*) were detected in both the Spawning and Rearing Channel during various surveys, but breeding was not confirmed. This species lays single eggs that are almost impossible to detect. Breeding appears to be later in the season compared to other amphibian species so larvae may not be detectable until late summer (E. Wind, pers. obs.). Successful metamorphosis likely occurred for at least some larvae of all amphibian species detected in 2013 as no obvious threats to their development were identified during site visits, such as critically reduced water levels.

Stickleback were observed in both the Upper Spawning Channel and pools within the Rearing Channel. Fish prey on amphibian larvae, at least until they are large enough to escape the gape limit of the species present. Other wildlife observed at the site included numerous dragonfly

species, an American Dipper foraging along the Spawning Channel, garter snakes, and evidence of muskrat or beaver (chewed sticks) in the Upper Spawning Channel.

2) Non-native Species Identification and Management

The following vegetation was identified to occur on site during preliminary surveys conducted in 2013 by M. Jones, including at least 10 non-native / invasive species (see *):

	Common Name	Scientific Name
Tree species	bigleaf maple	<i>Acer macrophyllum</i>
	black cottonwood	<i>Populus balsamifera ssp. trichocarpa</i>
	coast Douglas-fir	<i>Pseudotsuga menziesii var. menziesii</i>
	red alder	<i>Alnus rubra</i>
	western redcedar	<i>Thuja plicata</i>
	willows	<i>Salix spp.</i>
Shrub species	black twinberry	<i>Lonicera involucrata</i>
	dull Oregon-grape	<i>Mahonia nervosa</i>
	Himalayan blackberry*	<i>Rubus armeniacus*</i>
	red-flowering currant	<i>Ribes sanguineum</i>
	red huckleberry	<i>Vaccinium parvifolium</i>
	red-osier dogwood	<i>Cornus stolonifera</i>
	salal	<i>Gaultheria shallon</i>
	saskatoon	<i>Amelanchier alnifolia</i>
	Scotch broom*	<i>Cytisus scoparius*</i>
	thimbleberry	<i>Rubus parviflorus</i>
	trailing blackberry	<i>Rubus ursinus</i>
Herbs	bladderwort	<i>Utricularia sp.</i>
	blunt-leaved pondweed	<i>Potamogeton obtusifolius</i>
	broad-leaved starflower	<i>Trientalis borealis ssp. latifolia</i>
	Canada thistle*	<i>Cirsium arvense*</i>
	clover*	<i>Trifolium spp.*</i>
	common cattail	<i>Typha latifolia</i>
	common horsetail	<i>Equisetum arvense</i>
	common timothy*	<i>Phleum pretense*</i>
	creeping buttercup*	<i>Ranunculus repens*</i>
	dock	<i>Rumex sp.</i>
	field mint	<i>Mentha arvensis</i>
	fireweed	<i>Epilobium angustifolium</i>
	grasses	<i>Poaceae</i>
	mannagrass	<i>Glyceria sp.</i>
	peavine*	<i>Lathyrus sp.*</i>
	pondweed	<i>Potamogeton sp.</i>
	purple-leaved willowherb	<i>Epilobium ciliatum</i>
	reed canarygrass*	<i>Phalaris arundinacea*</i>
	Robert's geranium*	<i>Geranium robertianum*</i>
	rushes	<i>Juncus spp.</i>
	sedges	<i>Carex spp.</i>
	small-flowered forget-me-not	<i>Myosotis laxa</i>
	smartweed*	<i>Persicaria sp.*</i>
	white water-buttercup	<i>Ranunculus aquatilis</i>
	wild strawberry	<i>Fragaria virginiana</i>
	Mosses	electrified cat's-tail moss
step moss		<i>Hylocomium splendens</i>

Some of the non-native / invasive plant species may have been introduced through site works (e.g., common timothy, creeping buttercup, and clover during hydroseeding) while others would have invaded naturally from the surrounding area (e.g., Scotch broom and Himalayan blackberry). Some of these species may be controllable during restoration work.

3) Identify Areas for Enhancement / Restoration

There were a number of factors identified within the site related to habitat complexity that could limit native species now or in the future. For example, 1) there is a lack of organic materials in the spawning channel that limits the growth of submerged vegetation, which is important as egg attachment sites and provides cover for developing larvae, 2) increased shading of the channels via planted coniferous trees along the roadways will eventually deter amphibian breeding, 3) fluctuating water levels in combination with steep banks could limit plant establishment and egg laying, and 4) lack of forest / vegetative cover along roadways, old building sites, and on the septic field could increase vulnerability for wildlife to extreme climatic conditions and predation.

The following areas were identified as restoration options for the site for 2014 and beyond:

- Naturalize and increase habitat complexity within the old Spawning and Rearing Channels,
- Create riparian habitat for amphibians and other wildlife species between the two Channels by naturalizing the old gravel road,
- Re-contour and naturalize the rearing pond area (create upland habitat for wildlife species and native vegetation; see Fig. 2),
- Enhance the area for other wildlife species by increasing opportunities for nesting, foraging, resting, and perching, and
- Utilize the project as an educational and training opportunity for students, professionals, and First Nations.

4) Identify and Engage with Potential Partners for 2014 (and beyond)

It was determined that this project provides a unique opportunity to educate and train students, professionals, and First Nations in techniques used for habitat restoration and enhancement, and monitoring. First Nations technicians could be utilized where possible for all data collection / monitoring and on-site restoration work. Staff and students from the University of Victoria's Habitat Restoration Program could adopt a part of the project (e.g., the upper septic field and old office building site) for course project work. Other potential opportunities for this site / project include using it as an example for the annual Wetlands Institute put on by the BC Wildlife Federation and / or a training site for their Wetland Keepers program. Other potential student projects could include providing practicum work for students in the GIS or Biology programs at Vancouver Island University.

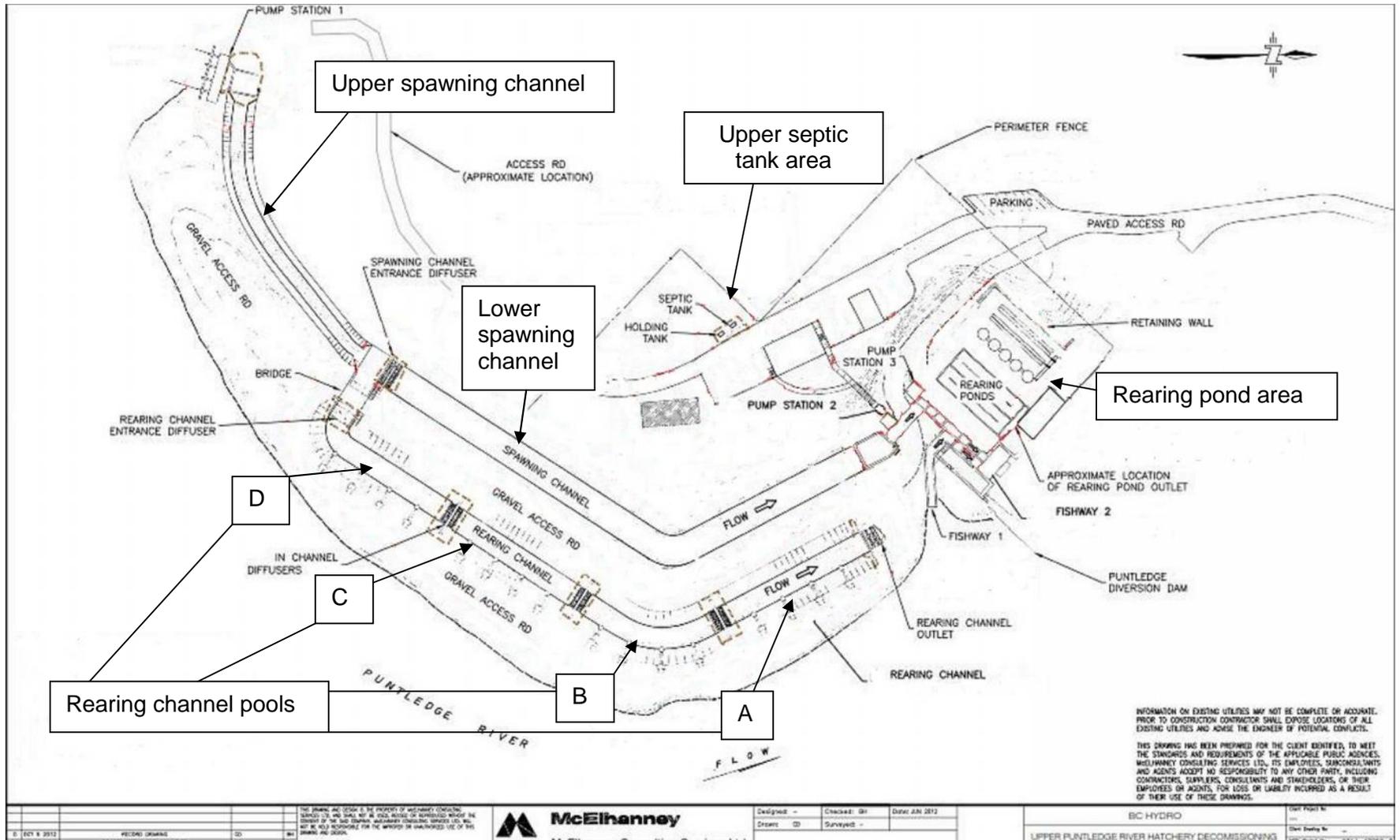


Figure 2. Species and life stages detected during amphibian surveys in 2013.

Table 1. Water levels recorded at the Spawning and Rearing Channels during the amphibian breeding season in 2013.

Location	Maximum Water Depth			
	19-Apr-13	17-May-13	10-Jun-13	16-Jul-13
Lower Spawning Channel - north end	46 cm			40 cm
Lower Spawning Channel - south end	27 cm			24 cm
Lower Spawning Channel	36.5 cm	46 cm	50 cm	32 cm
Upper Spawning Channel	1.5-2.0 m	> 1.5 m	> 1.5 m	> 1.5 m
Rearing Channel - Pool D	(aver=50 cm)	1.0+m	75 cm	55 cm
Rearing Channel - Pool C	(aver=80 cm)		90 cm	71 cm
Rearing Channel - Pool B	(aver=80 cm)		90 cm	77 cm
Rearing Channel - Pool A	(aver=85 cm)		90 cm	77 cm
Rearing Channel	(aver=73.8 cm)	1.0+m	86.3 cm	70 cm
<i>Comments:</i>	4 separate pools in Rearing Channel; Lower Spawning channel has 2 pools	Water levels high - Pools A & B are connected; Lower Spawning Channel one pool	4 separate pools in Rearing Channel	4 separate pools in Rearing Channel; Lower Spawning channel has 2 pools

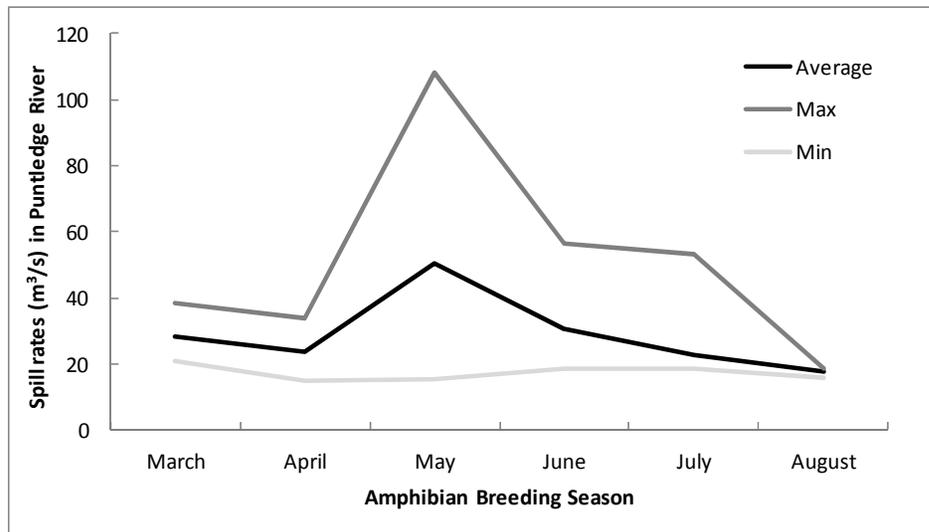


Figure 3. Spill rates (m³/sec) in the Puntledge River during the amphibian breeding season in 2013.

Table 2. Species and life stages detected during amphibian surveys in 2013.

Location*	Pool	Northwestern Salamander	<i>Ambystoma sp.</i> **	Rough-skinned Newt	Red-legged Frog	Pacific Treefrog
Upper Spawning Channel		Breeding (2 egg masses)		Adults		Breeding
Lower Spawning Channel				Adults	Breeding (1 egg mass)	
Rearing Channel	A			Adults	Breeding (3 egg masses)	Breeding
	B	Breeding (1 egg mass)			Breeding (1 egg mass)	Breeding
	C				Breeding (5 egg masses)	Breeding
	D		Breeding	Adults	Breeding (1 egg mass)	Breeding
<i>TOTAL</i>		<i>3 egg masses</i>			<i>11 egg masses</i>	

* See Fig. 2 for location.

** Larvae captured could have been a Northwestern Salamander (*Ambystoma gracile*) and Long-toed Salamander (*Ambystoma macrodactylum*). Small larvae from these two species are very difficult to tell apart.

4.0 Conclusions and Recommendations

Monitoring in 2013 revealed that the decommissioned Upper Puntledge River Hatchery provides a unique opportunity to implement restoration techniques to increase wetland and riparian habitat available for native flora and fauna. Amphibian and other wetland-associated species are utilizing the site now, but would benefit from habitat enhancement.

Suggested future restoration work includes:

- Reduce the linear, steep-sided shorelines within the Spawning and Rearing Channels
 - Create bays and islands (e.g., variety of shoreline aspects, varying water depths)
 - Lower the profile of the centre gravel road to reduce the steep banks
- Increase the amount of organic material available for vegetation to grow within the Lower Spawning Channel (e.g., add fish compost or soils)
- Naturalize riparian habitat and maintain sun exposure along shallow shoreline areas for amphibian breeding and rearing
 - Plant native, thin-stemmed graminoids that amphibians use as egg attachment sites in shallow shoreline areas of the Spawning Channel.
 - Thin and remove coniferous trees planted along the centre gravel road
 - Plant low stature shrubs and deciduous trees within the riparian area
 - Remove / control non-native, invasive vegetation species
- Naturalize upland areas back to returning them to riparian forest habitat (similar to natural riparian areas along the Puntledge River)
 - Add soils to the rearing pond area to re-create natural slopes and plant with native vegetation (cover remaining concrete areas)
 - Remove asphalt and concrete pads and plant areas to native vegetation (e.g., in the upper old office building and septic field area); the hillside should have drier plant species (i.e., snowberry, sword fern), as it is likely that this is a water-shedding site (M. Jones, pers. comm.).
- Utilize enhancement techniques for wildlife species – e.g., add downed wood to aquatic and riparian habitats, install nest boxes for birds, bat boxes, small perches in aquatic habitats, create snake basking areas (rock piles), etc.
- Monitor water quality and quantity within the Channels
 - E.g., evidence suggests that seepage from the upper septic field site may be flowing down into the southern end of the Upper Spawning Channel – are nutrients from the old septic site entering the channel and affecting vegetative growth and wetland water quality?)
 - Can water levels within the Puntledge River be maintained during the egg development stage (April) to avoid mortality?
- Invite students (e.g., UVic, VIU, local high schools), professionals, and First Nations to consider partnering on the project to utilize it as a training opportunity.

5.0 Acknowledgements

Thanks to Eva Wichman for helping in the field, facilitating access, and obtaining site information and contact names. Danny Loiselle helped in the field. Michele Jones collected data on vegetation. Chris Durupt provided information on site engineering. Financial support provided by the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, and Fisheries and Oceans Canada.

6.0 Appendices

I. Financial Statement (Statement of income and expenditures-form attached)

	BUDGET		ACTUAL	
	FWCP	Other	FWCP	Other
INCOME				
<i>Total Income by Source</i>	\$4,457.00	\$480.00	\$4,457.00	\$906.81
Grand Total Income (FWCP + other)	\$4,937.00		\$5,363.81	
EXPENSES	Note: Expenses must be entered as negative numbers (e.g. – 1000, etc.) in order for the formulas to calculate correctly.			
Project Personnel				
Wages	-\$0	-\$480	-\$	-\$275.00
Consultant Fees (List others as required)	-\$4,100.00		-\$4,100.00	-\$342.16
**GST/HST # 869701128 RTE0001				
Materials & Equipment				
Equipment Rental	-\$		-\$	
Materials Purchased	-\$		-\$	
Travel Expenses	-\$357.00	-\$	-\$357.00	-\$289.65
Permits (List others as required)				
Administration				
Office Supplies				
Photocopies & printing				
Postage				
General admin.	-\$	-\$		
Total Expenses	-\$4,457.00	-\$480.00	-\$4,457.00	-\$906.81
Grand Total Expenses (FWCP + other)	-\$4,937.00		-\$5,363.81	
BALANCE (Grand Total Income – Grand Total Expenses) Inclusive of GST/HST obligations	The budget balance should equal \$0 \$0		The actual balance might not equal \$0* \$0	

II. Performance Measures - Actual Outcomes

This seed funding did not result in restoration work at the site as of yet. An application has been submitted to the FWCP for restoration work to begin in 2014.

III. Confirmation of FWCP Recognition (newspaper clippings, press releases, newsletters, brochures, photographs of signs/plaques, etc.)

This seed funding has not resulted FWCP recognition in the form of press releases, etc. as of yet. An application has been submitted to the FWCP for restoration work to begin in 2014. During the process of obtaining partners for the project numerous discussions were held with various individuals (e.g., First Nations, UVic, consultants, etc.) which has raised awareness of the project.