BC HYDRO

FISH AND WILDLIFE

BRIDGE COASTAL RESTORATION PROGRAM

2001-2002

CHEAKAMUS RIVER

Cheakamus Off-River Channel Development: "Dave's Pond Extension"

Cheakamus River Off-Channel Rehabilitation 2001-2002

BCH 01.LM.17

North Vancouver Outdoor School
School District #44

Victor Elderton
North Vancouver Outdoor School
School District 44, British Columbia
October, 2001

Summary:

Location: Off-channel pond is located north of the North Vancouver Outdoor School, northeast of the Paradise Valley road bridge and east of the BCHydro transmission lines for Circuit 2L1 (seven towers north of tower 449).

BC Watershed Code: 900-097600-12900-…

Map References NRC NTS Map 92G/11
BCGS TRIM Map 92G.085

UTM Co-ordinates Zone 10: 489129mE, 5519540mN (NAD83)

F&O Drawings: 11-163-1

Cost Summary:

Funding	*Amount*
Total Funds Expended—All Sources	**$ 43 934.70**
BCHydro Bridge Coastal Restoration Program Allocation Total (BCRP)	$ 45 200.00
BCHydro BCRP Allocation—Used Portion	$ 30 739.79
BCHydro BCRP Allocation—Unused Portion Remaining	$ 14 460.21
John Hunter Company	$ 500.00 (in kind)
North Vancouver Outdoor School	$ 7 695.00 (in kind)
Fisheries & Oceans Canada	$ 5 000.00 (in kind)

Habitat Constructed:

Feature	*Area*
new pond bays	3250m²
new shallow pond	200m²
total protected by access restrictions	10550m²
Total New Habitat	**3450m²**

1 Introduction:

1.1 Background

Over the past 20 years, Fisheries and Oceans Canada (F&O) has worked with various partners to restore off-channel habitats along the Cheakamus River. The North Vancouver Outdoor School (NVOS) has worked with F&O since 1980 developing a number of off-channel projects on school property.

To address limiting factors for coho salmon success, off-channel habitat creation rather than lateral logjam or river side-channel rehabilitation is the preferred technique. Extreme ranges of river flows typical of the watershed make the risk of damage to restoration work in the active floodplain too great. For the Cheakamus River, the productivity of coho salmon is limited primarily by the amount of critical off-channel habitat available.

Since 1993, BC Hydro (BCH) has co-funded some of the habitat restoration work. More habitats are available for rehabilitation and this program should be viewed as a long-term investment in population health for salmon stocks of the Cheakamus River.

1.2 Need Statement

The Daisy Lake Dam and Power House divert a significant portion of Cheakamus River flow into the Squamish River, which significantly affects the Cheakamus' behaviour.

The diversion has decreased total and base flows as well as changed the Cheakamus River hydrograph. The river is particularly susceptible to changes in the base flow and its natural variation in low-flow years, when a high percentage of total flows are diverted into the Squamish River system. During extreme low flow years the operations of the dam and power house can completely eliminate the freshet. Without surges in river flow, gravel bars stop shifting throughout the floodplain.

The lack of freshet flow variation also leads to rapid establishment of vegetation on river bars and subsequent trapping of fine sediment and organic soils, which further stabilises the bars. The dam also reduces gravel and wood debris transport from the Upper Cheakamus River to downstream anadromous reaches of the Cheakamus River. Reduction in sediment supply to the lower river reduces mid-channel bar formation, which reduces channel braiding and side-channel creation and maintenance over time. Large wood is critical for forming lateral logjams, which armour and protect the upper ends of mid-channel gravel bars and side-channel entrances, providing mid-channel bars, side-channels and lateral logjams.

The net result of these effects is the simplification of the Cheakamus River floodplain into a single channel form that may be causing a lowering of floodplain water tables, harming groundwater-fed off-channel habitats.

Coho salmon are critically dependent on woody debris lateral logjams, stable side-channels with wood debris and groundwater-fed off-channels for providing summer and winter habitat. All these habitats are heavily used by coho salmon for spawning,

rearing and over-wintering. Other species of fish such as pink, chum, chinook, and steelhead also use these areas for spawning and rearing.

1.3 Purpose

This project increases the area of coho over-wintering habitat as well as the food production and juvenile rearing capabilities of the Cheakamus River system. The project consists of habitat development in the form of extensions to an existing pond and riffle network. The habitat works continue a program to restore off-channel habitats along the anadromous reaches of the Cheakamus River.

1.4 Objectives

The primary objective of the project is to restore off-channel habitat that dykes protecting electrical transmission structures cut off from the main channel of the Cheakamus. The project also addresses critical habitat needs that the footprint effects of the Daisy Lake Dam and water extraction negatively impacted. Expanding an existing habitat restoration project is the solution used to tackle the habitat objective; it adds both deep-water refuge and shallow food production/rearing areas.

The interpretative trail and signage component of the project will provide a valuable location for the general public to learn the importance of these habitats in the ecosystem. The Dave's Pond area is also used extensively by the *Skw'une-was* Coast Salish Cultural Immersion Program at the North Vancouver Outdoor School. The ponds and trails provide the valuable teaching tools needed to develop an understanding of First Nations land use as well as both plant and animal food gathering practices. Other such projects in the area are on the grounds of the NVOS are not as freely accessible to the general public.

2 Site Location:

The Dave's Pond expansion is located on Crown land on the Northeast side of the Cheakamus River, on the opposite bank from the NVOS grounds.

The Cheakamus River is catalogued in the BC watershed atlas as 900-097600-12900. The reach of river this project feeds is shown on Natural Resources Canada National Topographic System map 92G/11 and Geodata British Columbia TRIM map 92G.085. The position of the Dave's Pond is approximately 489129 metres East, 5519540 metres North, using Universal Transverse Mercator co-ordinates for Zone 10U with the 1983 North American Datum.

3 Methods:

3.1 Equipment

To complete the work, the contractor--John Hunter Company Limited of Squamish--provided

- Finning Caterpillar 225B LC Tracked Heavy Hydraulic Excavator, and alternatively, Finning Caterpillar 325B Tracked Heavy Hydraulic Excavator
- Finning Caterpillar 966C Rubber-Tire Front End Loader, as required
- Kenworth Dump trucks, as required

3.2 Construction

During construction operations between May 29 and June 31, 2001, the contractor's machine operators dug new branches for the pond network and connected old borrow pits to the pond network.

The equipment operators excavated habitat isolated from existing habitat by leaving the connecting excavations while completing new pond grading and sloping for the expansions. In the few instances where expansion occurred in the existing pond, the pond system was isolated from the Cheakamus River system.

The last elements constructed were the connections to existing water bodies and the access control measures (gate and barriers). We have allowed the site to naturally seed and re-vegetate.

4 Results:

Since this is a habitat restoration construction project, the results are the physical works as well as the quantities of productive habitat and expected production yield.

4.1 Project Description

Works constructed between May 29 and June 31, 2001, included:

- excavating existing roads, expanding the pond and shallow swamps;
- connecting old borrow and test pits;
- raising some of the existing river access trails with the spoil from the pond excavation;
- installing a gate on the F&O road for BCR Spawning Channel (on this site);
- placing large woody debris in the main pond;
- placing vehicle barriers at remaining access points;
- constructing approximately 200 metres of public access trails; and
- assembling and installing a 9 metre long handicap-accessible bridge over a main pond arm.

4.2 Habitat Quantities and Estimated Production:

Feature	***Habitat***		***Smolts (primarily coho)***	
	Type	***Area***	***Factor***	***Total***
• deep refuge water	permanently wet	3250m²		
• shallow shelf	permanently wet	200m²		
• Total New Habitat	permanently wet	3450m²	0.5 coho smolts/m²	1,725 smolts
• existing habitat protected by new barriers	permanently wet	6460m²		
• Total Site Habitat	permanently wet	9910m²		

4.3 Monitoring and Evaluation

Gee's minnow trapping by F&O staff in January of 2002 found similar numbers of coho pre-smolts over-wintering in the new section of Dave's Pond as in the previously constructed area (51 pre-smolts/trap new area vs. 50 pre-smolts/trap old). These high catches per trap indicate the entire habitat was fully seeded.

A complete downstream fence enumeration of smolts emigrating from the Dave's Pond area in the spring of 2001 (prior to expansion) produced a count of 5,744 coho smolts or 0.9 smolts/ m^2. (Resource Restoration Group, 2001) Assuming the expanded habitat produces at a similar rate at full seeding (nearly double the bio-standard), an additional 3,105 coho smolts could be produced annually.

5 Recommendations:

The project is built and complete. Resource Restoration has recommended further opportunities for the North Vancouver Outdoor School (project proponent):

- monitor fish use of pond and marsh as well as relative use and productivity of each
- monitor regeneration of plants and plan alder and cottonwood population management
- monitor water flows and requirements

6 Acknowledgements:

Bridge Coastal Fish and Wildlife Restoration Program, BC Hydro, for funding the project.

Fisheries and Oceans Canada for technical and professional assistance of fish habitat construction.

BC Hydro for facilitating this type of development in the transmission corridor.

John Hunter Co. Ltd. for the supplying trail gravel, large cobble, and large woody debris.

North Vancouver Outdoor School Alumni Society for their assistance completing the trail and footbridge.

Provincial ministerial representatives from Ministry of Forests and British Columbia Assets and Lands Corporation for their help in ensuring the trail could be built.

Paradise Valley Campground for assisting in spoil disposal and daily maintenance.

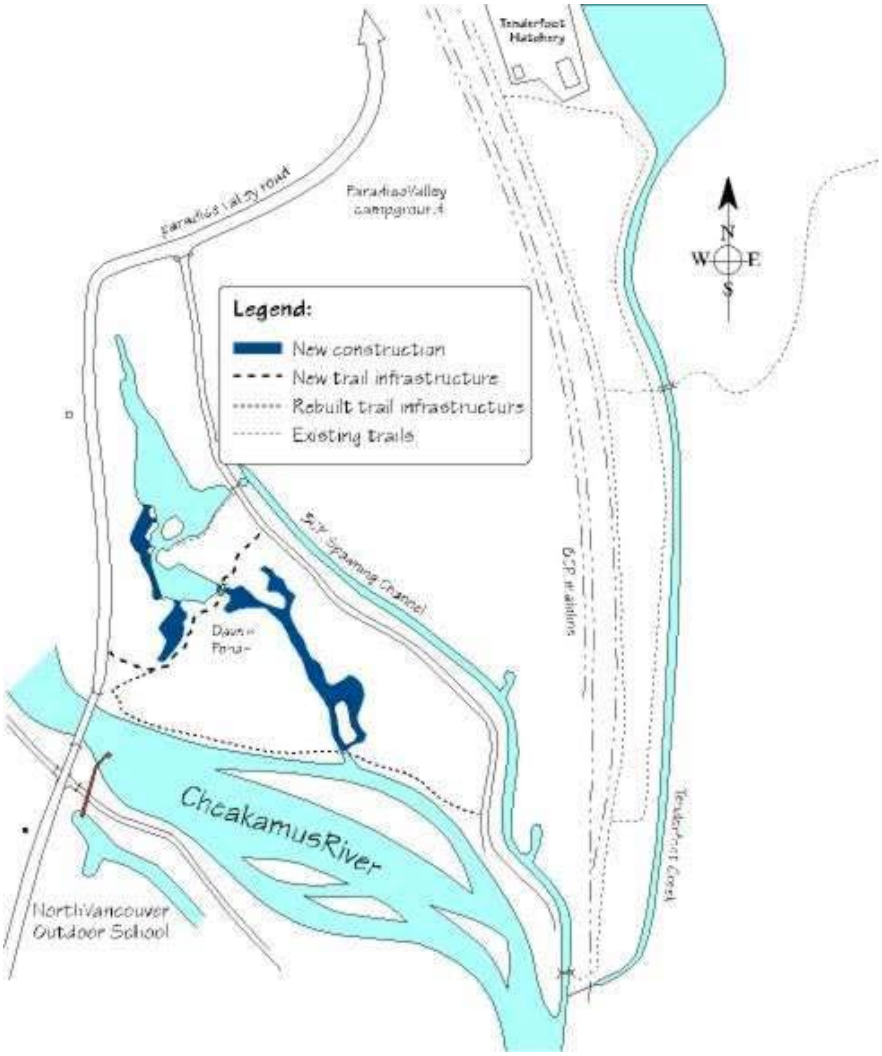
7 References:

Resource Restoration Unit, Fisheries and Oceans Canada. "Bridge River Coastal 2000/2001 Projects". Proposal Document. Delta: 2000.

Resource Restoration Group, Fisheries and Oceans Canada. "Coho Salmon Production From Constructed Off-Channel Habitat". Bridge Coastal Restoration Project Report 99.LM.08. Delta: 2001.

8 Figures:

***Figure** 1. Site plan*



1

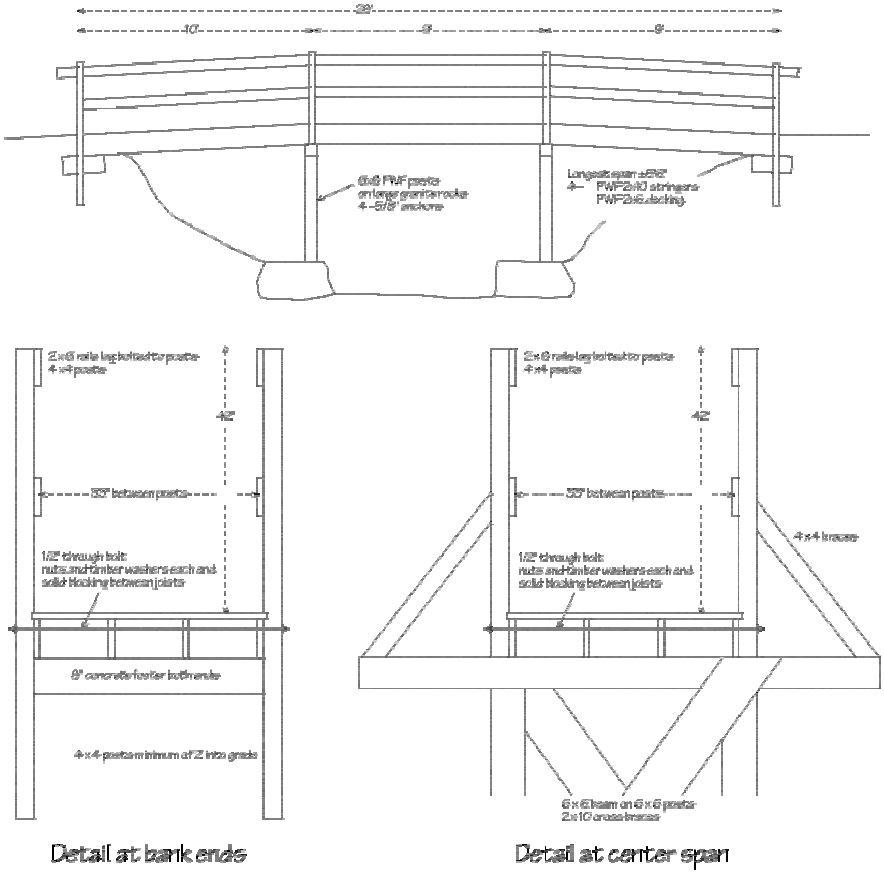
***Figure 2.** Moving an isolation barrier between new work (foreground) and existing habitat; and changing from earthworks to sandbags*

2

Figure 3. *Recently completed habitat*

3

Figure 4.
Bridge details



4

Figure 5.
Bridge close-up

5

Figure 6. *Bridge in service*

6

9 Appendix 1: Financial Statement

Item	*Description*	*Income*	*Expense*	*Totals*
1	***Funding***			
1.1	BCHydro Bridge Coastal Restoration Program	30739.79		
1.2	BCHydro BCRP Unused Allocation		14460.21	
	Subtotal Funding			**45200**
2	***In-kind Support***			
2.1	Fisheries & Oceans Canada (Professional Support)	5000		
2.2	North Vancouver Outdoor School (Technical Site Support and Planning)	1800		
2.3	North Vancouver Outdoor School (Special Permits & Contracts)	300		
2.4	North Vancouver Outdoor School Alumni Society (Trail Construction)	3000		
2.5	North Vancouver Outdoor School (Bridge Construction)	2000		
2.6	North Vancouver Outdoor School (Rotary Drill Rental)	45		
2.7	John Hunter Company Ltd. (Trail Gavel, 2 truckloads)	500		
2.8	North Vancouver Outdoor School (Site Photography)	50		
2.9	North Vancouver Outdoor School (Drawings & Maps)	500		
	Subtotal In-kind Support			**13195**
3	***Expenditures***			
3.1	Equipment (John Hunter Company # 232)		26435	
3.2	Materials: Footbridge (Mountain Building Centre # S18014, S34842, S34952, 70317)		850.79	
3.4	Supply & Install: Gate (John Hunter Company # 324)		3454	
	Subtotal Expenditures			**30739.79**

10 Appendix 2: Location Key Map