



***LOWER MAINLAND BCH
HABITAT RESTORATION
2000-2001***

CHEAKAMUS RIVER

Conference Centre Marsh: "Moody's Channel Side Pond Complexes, Phase II"

Cheakamus River Off-Channel Rehabilitation 2000-2001

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Summary:

Location: Off-channel pond is located within the North Vancouver Outdoor School, south of the intersection of Conference Centre Road and the BCHydro transmission lines for Circuit 2L1 (towers 449-448).

BC Watershed Code: 900-097600-12900-...

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

UTM Co-ordinates Zone 10: 489500mE, 5522300mN (NAD83)

F&O Drawings: 11-54-15 (NVOS site drawing)

Cost Summary:	<i>Funding</i>	<i>Amount</i>
	Total Funds	\$59 959
	F&O HRSEP 1999-2000	\$9 960
	Fisheries Renewal BC 2000-2001	\$17 268
	BC Hydro 2000-2001	\$25 231
	North Vancouver Outdoor School	\$2 500
		(in kind)
	Fisheries & Oceans Canada	\$5 000
		(in kind)
Habitat Constructed:	<i>Feature</i>	<i>Area</i>
	total permanently wetted area	2735m ²
	total seasonally wetted marsh area	2256m ²
	Total Habitat	4991m²



Summary: 2

1 Introduction:..... 4

1.1 Background4

1.2 Need Statement.....4

1.3 Purpose.....4

1.4 Objectives.....5

2 Site Location:..... 5

3 Methods: 5

3.1 Equipment5

3.2 Construction5

4 Results:..... 6

4.1 Project Description6

4.2 Habitat Quantities and Estimated Production:.....6

5 Recommendations: 7

6 Acknowledgements:..... 7

7 References: 7

8 Figures:..... 8

9 Appendix: Financial Statement 14



1 Introduction:

1.1 Background

This project increases the area of coho rearing habitat as well as the food production capabilities of the system. The habitat works continue a program to restore off-channel habitats along the mainstem, anadromous reaches of the Cheakamus River.

Over the past 20 years, Fisheries and Oceans Canada has worked with various partners to restore off-channel habitats along the Cheakamus River. Since 1993, BC Hydro has co-funded some of the work. More habitats are available for rehabilitation and this program should be viewed as a long-term investment in population health for coho and chum salmon of the Cheakamus River.

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.

1.2 Need Statement

The Cheakamus River has been affected by diversion of a significant portion of its flow into the Squamish River. The diversion has decreased total and base flows as well as changed the hydrograph for the Cheakamus River. Low flow years when a high percentage of total flows are diverted into the Squamish River system are particularly susceptible to the changes in the base flow and its natural variation. During low inflow years the flows increase little, if at all, during the freshet. The lack of freshet flow variation leads to the rapid establishment of vegetation on river bars and subsequent trapping of fine sediment and organic soils, which further stabilises these bars. The dam also eliminated 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 further reduces mid-channel bar formation, which reduces channel braiding and side-channel creation and maintenance over time. The Daisy Lake dam intercepts the large wood moving down-river. Large wood is critical for forming lateral logjams, which armour and protect the upper ends of mid-channel gravel bars and side-channel entrances. The wood supply loss has resulted in less stable mid-channel bars and reduced stable 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.

Fish species such as 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 overwintering.

Also, other species of fish such as chum, chinook, and pink salmon use these waterbodies in high densities for spawning.

1.3 Purpose

The North Vancouver Outdoor School, Fisheries and Oceans, and BC Hydro built the Conference Centre Marsh Pond to further goals that:

- Provide quality habitat in a holistic, ecosystem based manner for not only salmonids, but associated aquatic invertebrates and amphibians by creating a wide variety of aquatic



zones, from warm shallow marshes, streamside wetlands and bogs to deep cool ponds and fast riffles

- Provide an opportunity to showcase the aquatic and wetland plant species used by the First Nations people of the Squamish area
- Provide educational opportunities for the thousands of students that attend programs at North Vancouver Outdoor School, in the natural history programs, Skw'unc-was First Nations Cultural Immersion, and Conference Centre programs

1.4 Objectives

We intend to accomplish the three project goals by providing a wide variety of habitats, and an ethnobotanical trail.

Widely varied habitats occur through thoughtful use of wood and log debris as well as careful construction of many different water body grades. Design features include both submerged and terrestrial "woody debris" placements; and a full variety of water depths, ranging from damp bogs, to cool deep groundwater-fed pools. The aquatic habitats, will be in sand, gravel and organic fills, providing special conditions for the widest possible variety of plant life. Such abundance and diversity will promote a broad range of aquatic life.

The ethnobotanical trail component will provide samples of all major food plants utilized by the Squamish First Nations people. This site will provide the requirements of bog, wetland, forest edge and arid climate plant types. This trail is to provide samples of these plants in a safe, easy to use form.

2 Site Location:

The North Vancouver Outdoor School has co-operated with Fisheries & Oceans and BCHydro since 1982 to construct fish habitat and use it to teach North Vancouver School District students about BC aquatic life and their importance to our ecosystem.

The Moody's Conference Centre Marsh builds upon the aquatic habitat legacy and increases it to include freshwater marsh. The off-channel pond and marsh is located within the North Vancouver Outdoor School on its southern properties within a BCHydro right of way south of the intersection of Conference Centre Road and the BCHydro transmission lines.

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 Marsh Pond is approximately 489500 metres East, 5522300 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 Excavator or Finning Caterpillar 325B Tracked Excavator
- Finning Caterpillar 966C Rubber-Tire Front End Loader, as required
- Kenworth Dump trucks, as required

3.2 Construction



During the previous year's (1999-2000) construction, we moved the existing BC Hydro Transmission Line Access Road so that it gave us the most working area, and would remain undisturbed for BC Hydro use. We also removed organic overburden, constructed and complexed a reach of channel, and constructed a berm as site preparation.

We divided (2000-2001) construction into two phases: excavation and landscaping. During excavation, the bulk of the gravel was removed and stockpiled for use in the Bowen Island stream rehabilitation project. North Vancouver Outdoor School determined the use or disposal of mixed soil from the excavation. During sculpting, the excavator operator carefully graded the ponds and banks and strategically placed large pieces of tree trunk, tree root wads and stone cobbles in the marsh, deeper refuge pits, and channel connections.

The last elements constructed were the connections to existing water bodies. We have allowed the site to naturally seed and revegetate.

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 August 30, 1999, and October 30, 1999, included:

- relocate roadway access to BCH right of way from centre to east side,
- remove organic overburden and prepare site,
- construct channel and complex one reach, and
- construct berm.

The scope of work constructed between July 30, 2000, and October 30, 2000, included:

- excavation of deep pond backbone,
- excavation of deeper pockets along deep backbone,
- excavation of shallow pond edges,
- placing large woody debris,
- grading constructed bog and marsh,
- grading new BCH access road, and
- site cleanup

4.2 Habitat Quantities and Estimated Production:

<i>Feature</i>	<i>Habitat</i>		<i>Smolts (primarily coho)</i>	
	<i>Type</i>	<i>Area</i>	<i>Factor</i>	<i>Total</i>
• refuge ponds (depth > 1m)	permanently wet	554m ²		
• deeper water (0.5m < depth < 1m)	permanently wet	1365m ²		
• shallow water (depth <= 0.5m)	permanently wet	816m ²		
• total pond area (permanently wetted habitats)		2735m ²	0.5 coho smolts/m ²	1,368 smolts
• constructed marsh	seasonally wetted	2256m ²		
• Total	all	4991m ²		



5 Recommendations:

The project is built and complete. Resource Restoration would like to recommend further opportunities for the North Vancouver Outdoor School (project proponent):

- explore possible co-operation with BC Hydro Vegetation Management to encourage low-growing riparian native species of plant around the habitat
- monitor procession of shallow marsh pond to fully mature marsh
- 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.

North Vancouver Outdoor School for permitting fish habitat construction on their lands and supporting its continued maintenance and use in research and development.

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

John Hunter Co. Ltd. for the supply of stone cobble and large woody debris.

7 References:

Resource Restoration Unit, Fisheries and Oceans Canada. "Cheakamus River: Conference Centre Marsh: Moody's Channel Side Pond Complexes". Fisheries and Oceans Construction Reports. Delta: 2000.

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

Carl Halvorson, North Vancouver Outdoor School. "Squamish Lillooet Watershed Group Phase 2 Proposal: NVOS Side Channel Pond Habitat. Fisheries Renewal Proposal Document. Brackendale, 2000.



8 Figures:

Figure 1. Sketch of the site. (Carl Halvorson, NVOS)

The transmission line roadway enters the site in the northeast corner of the sketch along the top of bank and is shown surrounding the tower.





Figure 2.
*Beginning of
construction at the
very north end of
the site.*



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Figure 3. *Early in
construction just
north of the
transmission line
tower.*



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Figure 4. *The site
around the base of
the transmission
tower early in
construction.*



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Figure 5. A view southward from the transmission line tower early in construction.



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Figures 6 to 12 show conditions after construction.

Figure 6. The southern-middle quarter of the site, showing the footbridge and the transmission tower.



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Figure 7. The northern portion of the site.



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Figure 8. The outlet to the marsh of the inlet stream at the north end of the site.



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Figure 9. A look into the waters of the habitat to see a few young coho.



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Figure 10. The habitat just north of the transmission line tower.



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Figure 11. The channel and trail connecting the north section with the south alongside the base of the transmission line tower.



11

Figure 12. The southern outlet of the habitat connecting it to a portion of Emerald Forest Creek that crosses the transmission line right of way.



12



9 Appendix: Financial Statement

Notes:

- * Construction Funded by Previous Years
- ** Fisheries Renewal British Columbia

<i>Item</i>	<i>Description</i>	<i>Income</i>	<i>Expense</i>	<i>Totals</i>
1	<i>Funding</i>			
1.1	F&O HRSEP Lower Mainland Small Streams*	9960		
1.2	BCHydro-F&O MOU Fund 2000-2001	25231		
1.3	Fisheries Renewal BC 2000-2001 (FsRBC**)	17268		
	Subtotal Funding			52459
2	<i>In-kind Support</i>			
2.1	Fisheries & Oceans Canada (Professional Support)	5000		
2.2	North Vancouver Outdoor School (Technical Site Support)	2500		
	Subtotal In-kind Support			7500
3	<i>Expenditures</i>			
3.1	Equipment		45908	
3.2	Materials (footbridges, trail surfaces)		1214	
3.4	Technical Site Supervision		5337	
3.5	Technical Site Support		2500	
3.6	Professional Support		5000	
	Subtotal Expenditures			59959