SRWS

Final Report

05 CH 02
May 25th, 2006

PART I - IDENTIFICATION

A. Proponent/Contractor Name Squamish River Watershed Society

B. Proponent/Contractor Address

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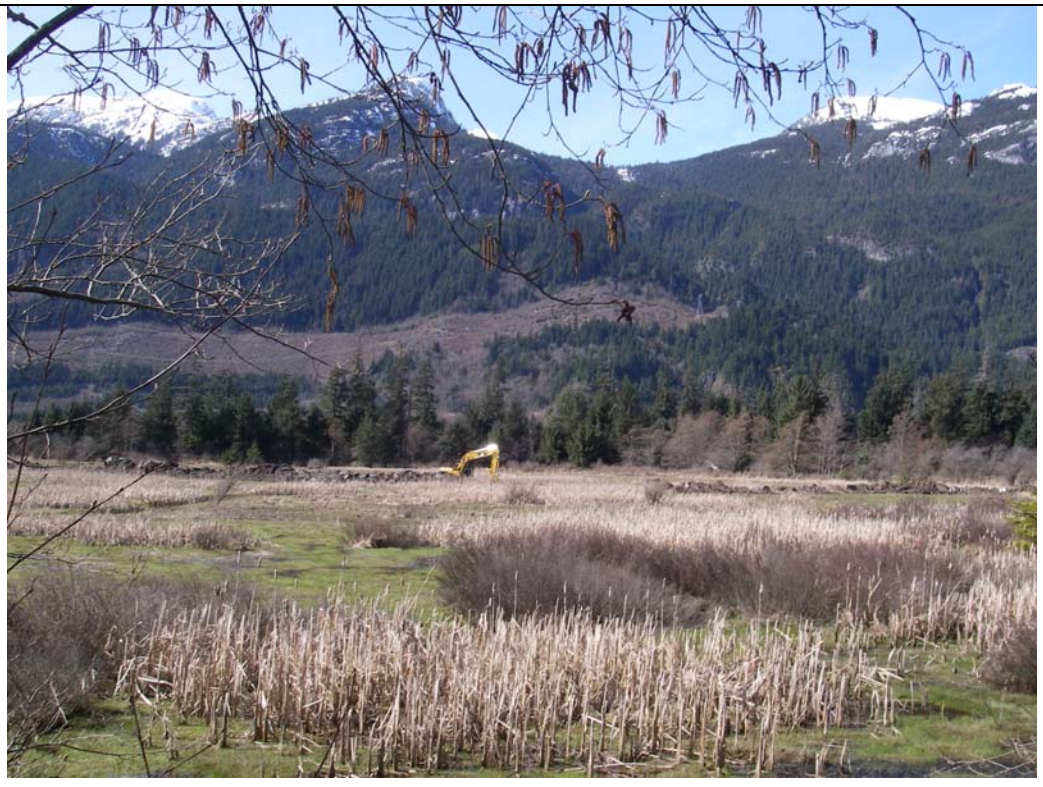
PART II - PROJECT DESCRIPTION

A. Project Number and Name 05-CH-02 Central Channel Estuary Restoration

B. Project Life May 1, 2005 *(Start Date* to May 30, 2006 *End Date)*

C. Project Funding $77,630

D. Final Report Prepared by Edith B. Tobe, May 25th, 2006



Executive Summary

Since the early 1970's, former chinook fry rearing areas have been lost, primarily due to simplification of the Cheakamus River in Reach 4 and 3 due to dyke and bridge construction, diversion of flows out of the basin and loss of wood and gravel recruitment due to the effects of Daisy Lake. All these impacts are related to the footprint effects of the Cheakamus River power project. These footprint impacts such as altered fluvial processes, caused by reduced downstream flows, and reduced sediment budget have resulted in less downstream diversity such as side channels to the main river.

Loss of nutrients and decrease in spring and summer water temperatures due to the effects of the Daisy Lake reservoir has presumably reduced the potential growth rates and productivity of chinook fry residing in the Cheakamus River. A large component of the chinook salmon fry produced from spawning grounds on the Cheakamus River leave the river soon after emergence and rear and feed in the mainstem Squamish and its estuary channels for some months prior to their migration into Howe Sound.

The freshwater rearing corridor for Cheakamus River chinook juveniles begins in the Cheakamus River canyon and extends downstream along the Cheakamus-Squamish River corridor and ends in the Squamish River estuary where Cheakamus River chinook reside prior to their entry to Howe Sound.

By improving Cheakamus River chinook fry and smolt access to and use of the warm, nutrient rich waters of the Squamish River estuary their overall productivity and survival would be expected to increase. The development of estuary habitat would compensate for some of the chinook productivity losses in the Cheakamus River such loss of critical rearing habitat and decreased water quality that result from footprint impacts from the hydro development.

Rearing side channels lost on the Cheakamus River would be restored lower down in the watershed at the estuary where water temperatures and nutrient levels are higher. Cheakamus River chinook fry would not only have more critical rearing habitat available to them but they would enjoy higher quality rearing conditions and higher growth rates. To mitigate the entire footprint impacts on chinook salmon within the Cheakamus River itself will not be practical. Restoration of the estuary can provide immediate benefits to the Cheakamus River chinook salmon.

Added value benefits include the informational signs placed in estuary for interested members of the public. The Squamish Environmental Conservation Society has developed a brochure on trails and ecological and historic values within the Squamish River estuary. This project will complement those initiatives. The general public has access to this area for nature viewing. Promotion of Eco-tourism opportunities is being pursued within the business community of Squamish as a key economic strategy for the community and these works complement and add to the value of the estuary to provide those opportunities.

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Introduction

The estuary channel restoration project involved restoring access to high marsh areas of the Cheakamus-Squamish River estuary that were no longer accessible to salmonid smolts and other fishes. Connecting tidal channels were excavated to develop new estuary habitat and to provide access to formerly isolated estuary channels. This work will provide benefits to salmonid smolts and other fishes, which rely on this critical and limiting habitat.

The habitat development project consists of reconnecting inactive portions of the Squamish Estuary to regular tidal flows. Tidal channels were constructed that now allow juvenile salmonids access to areas of the estuary that were historically accessible but no longer provide good habitat due to past land development of the estuary. Under the terms of the signed "Squamish Estuary Plan" much of the central portion of the Squamish River estuary has been set aside for conservation purposes in perpetuity. Part of the allowable activities in the conservation area includes restoring damaged estuary habitats.

Levy and Levings (1978) found that while all species of salmonids from the Squamish River watershed (including the Cheakamus River) used the estuary to varying degrees it was chinook salmon juveniles which relied the most on estuary habitat for extended periods of time. Chinook salmon residing in the Cheakamus River are listed as high risk in the BCH Strategic Plan. The Squamish River Watershed Society has worked with Fisheries and Oceans over the past number of years to restore critical estuary habitats. Fisheries and Oceans Canada has offered to continue working with the Society during the design and development of the proposed estuary habitat project. Aside from expected benefits to salmonids, many other estuary and near shore fishes such as herring, may also benefit from the proposed works. Monitoring will now be undertaken to obtain results.

Goals and Objectives

- Produces upwards of 2,000 square metres of tidal channel rearing habitat
- Replanted marsh and riparian vegetation in the newly constructed habitat areas
- Installed informational signs that will enhance awareness of the ecological value of estuaries
- Over the course of the project obtaining soil samples at key locations to analyze for any heavy metals or contaminants
- Hiring a professional biologists to undertake a comprehensive survey of plant species in the site area and establish permanent monitoring plots to track changes in plant communities as well as a wildlife biologist to assist in maximizing avian habitat for migratory birds.
- Construct and upgrade access bridges along the walking trails.

Study Area

The site is in the East Delta of the Squamish River approximately 8.0 km. downstream of the Squamish-Cheakamus confluence. The property is designated District Lot 486, Group 1, in the New Westminster Land District. Maps covering the site are Natural Resources Canada National Topographic System 92G/11 and Geo Data British Columbia Terrain Resource Information Management 92G.065 near UTM coordinates of 5505270m N by 488150m E (1983 North American Datum, UTM Zone 10U) or BC Albers coordinates 1204580m, 524500m.

Methods

This project site is located within the Squamish Wildlife Management Area as well as Squamish Nation's Site "A". Early in September permission to undertake these restoration projects was obtained respectively from the Squamish Estuary Review Committee and from Squamish Nation. In August of 2005 there was an on-site walkabout with the Squamish Estuary Management Committee to outline the 2005/2006 years project proposals and to showcase the former years channel works.

In early February the first phase of the channel construction proceeded as an extension to the channel works completed in the 2004/2005 project year. This channel now reconnects all the previous channel works over the past three years to provide maximum habitat and tidal channel availability to migratory fish. As the second phase of the project began, with the final stretch of channel construction in Site "A", the first phase was planted up with a special order estuary seed mix. In the fall and late winter professional biologists went in and assessed both sites to provide recommendations on vegetation strategies and improvements that could be undertaken to maximize the site for wildlife, such as migratory birds. These recommendations (see appendix) were implemented by planting native yellow listed flowering plants (Henderson's checker mallow, marsh pea, Beggartick, etc) and by planting native shrubs (nootka rose, hawthorn, and crabapple). This treatment was repeated after the second phase was completed. A trail separates the two phases of the project and as the second phase neared completion an upgraded bridge was constructed to ensure safe pedestrian access along the trails.


Henderson's checker-mallow


Common Beggartick


Red Columbine Chocolate Lily (inset)

Most of the channel work was side cast but towards the South Loop Trail access permission was given by the District of Squamish to endhaul the material to the local landfill site. This was a preferred option as the physical area became limited and confined between the pedestrian trail, natural vegetation, and new channels. Approximately eight loads of material were removed in this fashion. Access to and from the site was along the railway spur line access road.

Results

Over 2,000 linear metres or approximately 6,000 m^2 of new habitat was constructed to provide habitat for migratory and resident fish including Chinook and coho salmon that would have spawned in the upper Squamish watershed including the Cheakamus River. Signage was placed at key locations to identify the project and alert the public for any temporary disruptions to trail access. A new bridge was constructed along what is called the North Loop Trail.

The contractor took special care to minimize any disturbance to the area and was able to construct the channels in a manner that the side cast material was less than a metre in elevation above grade. The side cast material was immediately seeded and planted up with native vegetation and shrubs to prevent any invasive species from growing. Care will be taken over the next few years to weed out any invasive species and maintain the estuarine meadow habitat. In order to minimize impacts, the contractor, John Hunter and Company, moved the excavator along a conveyor of logs that supported the weight of the unit and were moved along with the excavator. Although a somewhat slow and cumbersome technique the result is extremely limited impact on the estuary and any flattened vegetation inevitably returned to normal growth once the machinery was removed.

In order to prevent any disturbance to potential nesting birds (redwinged black birds, Canada geese, etc) care was taken prior to the initiation of work to ensure no nests were present on the site and to remove any potential nesting habitat (cattails) along the path of the new channel. This work began in February/March so by the time the nesting birds began to settle into the estuary in mid-April most of the site had already been prepared. Interestingly enough, during the duration

of the initial phase of the project a nesting goose set up just adjacent to the backhoe. Care was taken to avoid disturbing this nesting site and it appeared that until the excavator moved on to the next phase that the geese were quite undisturbed (incidentally, once the excavator was removed to the next phase a pair of coyotes was seen prowling mid-day in the site so it is unknown if the nesting goose and the eggs survived).

In the fall of 2005 seeds from native yellow listed species were gathered in the adjacent estuary sites. As well, as an experimental project, the DFO biologist home grew over thirty Henderson's Checkermallow (a yellow listed species). The seeds and seedlings were planted in April with care and will be monitored over the course of the summer and fall through visual checks and photopoint monitoring.

Discussion

The project was delayed due to very mild winter conditions and unusual rain. The ground was a lot softer than was anticipated and made for slightly more challenging conditions to construct on. However, through the experience and expertise of the contractor, the work, once initiated, proceeded very smoothly.

This project has become increasingly important to Squamish Nation and their management planning to re-establish as much former fish habitat as possible as well as providing opportunities for water access as part of a water transportation corridor.

As this project is phased, the next stage will be to put a secondary bridge across the former sewage outfall trail and remove a portion of the sewage pipe that has been decommissioned.

photo of last years (2004) project clearly showing culvert which will be removed. (facing east towards railway spur line along restoration channel)

As the channels were constructed salmonids, herring, and other species of fish were seen immediately within the tidal channels. There is evidence of otter activity as the southern end of the first phase channel throughout the project. As noted in the consultants report by Gebauer and Associates, over twenty species of birds were seen using this site.

The Squamish Environmental Conservation Society undertakes bird surveys once a month and their data will be collected over the next few years to see if there is an increase in species and abundance usage of migratory and resident species.

Recommendations

The recommendations are to continue to reconnect the isolated channels within this portion of the estuary and to establish permanent interpretive signage. Squamish Nation has begun a pilot project to place educational signage at specific fishing sites. The hope is to incorporate these style of signs in the estuary. Furthermore, the estuary is becoming an increasingly important destination for pedestrian traffic and residents and visitors and looking for nature hikes and peaceful sites to visit. The tidal salmon channels help to provide such a destination and are being well received by the community as a whole.

Acknowledgements

This phase of the project was undertaken in direct partnership with Squamish Nation for the section within the land parcel known as “Site A” (land areas located to the north of the “North Loop Trail” on the attached map). Squamish Nation has been an active participant in the previous alignment and construction of the initial channels on the adjacent “South Loop Trail” portion of the Wildlife Management Area. The Watershed Society and Fisheries and Oceans have met on-site with Randall Lewis of Squamish Nation and will be bringing the proposed plans and alignment to the attention of Squamish Nation Council for their final input and approval. Historically, the channels that are being restored were not just important habitat for juvenile chinook and other salmonid species but were also an integral water way for the original inhabitants of these region and the channel construction and placement is being undertaken to allow accessible navigatable waters in this area.

We would like to thank BC Hydro Bridge Coastal Fish and Wildlife Restoration Program for all of their help and assistance is funding and supporting the tidal channel and marsh restoration project.

We would also like to take this time to thank:

- Randall Lewis, Squamish Nation,
- Matt Foy, Harold Beardmore, Fisheries and Oceans Canada, for all of their hard work, and finally
- John Hunter Company Limited for their superb work, once again, for their care and effort while working within such sensitive areas.

References

- Goodman, D., and P.R. Vroom. 1972. "Investigations into fish utilization of the inner estuary of the Squamish River." *Technical Report 1972-12*, Environment Canada, Fisheries Service, Vancouver, BC.
- Levy, D.A. and C.D. Levings. 1978. "A description of the fish community of the Squamish River Estuary, British Columbia: relative abundance, seasonal changes, and feeding habits of salmonids." Department of Fisheries and the Environment, Fisheries and Marine Service Resource Services Branch. *Fisheries and Marine Service Manuscript Report No. 1475*
- Gebauer and Associates. 2006. “Impacts of Channel Restoration on Birds within the Squamish Estuary.
- Raincoast Applied Ecology. 2004. “Effects of Fish Habitat Restoration Activities on Plant Communities in the Squamish River Estuary.”

Figures
Phase I



Initial clearing to connect with existing tidal channel



Low tide after Phase I complete


Sidecast pile before being flattened


And after

Facing south towards above shots

reaching completion

Signage

upper end (north) of phase I

lower end (south)

Phase II – Site "A"

Getting started (north end of Site "A")

Later that week

Site "A" Signage

Trail entrance off rail spur line

old bridge

new bridge (with newly connected channel)

Downstream of new bridge – note how channel now connects with phase I

Upstream of new bridge

Facing east

New channel facing west

Wide angle view of Phase II channel

New tributary feeding into main


Notice piping (submerged channels) that allow seepage (right photo is close up)

Future Works:

Current isolated channel (as seen from North Loop trail) which will be connected up to this years channel works in the future to permit fish access.