



# **East Squamish / Wilson Slough Estuary Restoration Project 2006/2007 Final Report**

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## ***EXECUTIVE SUMMARY***

Since 1998 the Squamish River Watershed Society has partnered with Fisheries and Oceans Canada to secure funding to reestablish tidal channels and fish habitat within the Squamish Estuary. The primary focus of these works were to provide important Chinook fry rearing areas that have been lost due to urbanization, industrialization, and diking of the Squamish and Cheakamus Rivers. In 2001, the Watershed Society was successful in obtaining important funding through the newly formed Bridge Coastal Fish and Wildlife Restoration Program established by BC Hydro. The works undertaken in the estuary for the health of the Chinook (and other salmonids) populations are directly linked to the footprint impacts of the Daisy Reservoir and its effect on the Cheakamus River flows and natural operations. Loss of nutrients and a decrease in spring and summer water temperatures due to the effects of the Daisy Lake Reservoir have 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 River and the estuary channels for several months prior to their migration into Howe Sound.

The works that BCRP has helped to fund within the estuary have not only shown a marked increase in Chinook populations (along with other fisheries species including coho, steelhead, pink salmon, char, and trout) but has also been a cornerstone for establishing important partnerships and links to other functions and organizations within the Squamish corridor. Primarily, the restoration works have helped to enhance trail usage and maintenance, establishing important native vegetation and bird habitat, and providing important habitat for such yellow listed species as Henderson's Checkermallow, Vancouver Island Beggartick, Marsh Pea, and numerous wildlife populations including bird, amphibian and mammal populations.

This years works were no different in establishing over 2,000 linear metres of new channels, opening up and revegetating with native grass cover over 3.7 hectares to tidal exchange, planting over 500 shrubs, native herbs (including Henderson's Checkermallow), and constructing two pedestrian foot bridges. The increased public awareness to these restoration works cannot be overstated, as became apparent following the unfortunate incident on August 4, 2006 that resulted in Bunker C oil spreading throughout the southern portion of the Estuary. The public awareness of the importance of the estuary was in no small part due to the recognition that has been given over the years to the important restoration works that have been funded by BCRP. The assistance that was rendered through this years BCRP funding in allowing for important analysis to proceed while the various government, First Nations, and shipping company parties were in discussion will prove invaluable.

It has been an important and exciting year in Squamish and as we are losing valuable habitat with each passing month these restoration projects become that much more valuable.



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## 1. Introduction

This year's project was undertaken in two parts – the first being the completion of the channel works in the area known as the South Loop Trail within Site "A" and the second being the initiation of the connection of the tidal channels across the WestBarr Logsort Road.

The first stage works were completed by December 2006 and included the removal of the former sewage outfall culvert and removal of over 40 loads of contaminated soils (in partnership with the District of Squamish who waived the landfill tipping fees). The channel works undertaken in 2003/2004 and 2005/2006 were reconnected once again through an open channel. A pedestrian bridge was constructed to cross the new channel and the day the channel was opened fry could be seen within the new channels. This was an important connection as it enabled three previous stages of restoration tidal channels to be reconnected (as noted in Figure 1).

The second project works were no less important and involved, once again, an important partnership with Squamish Nation in meeting their mandate to reestablish as much Chinook habitat as possible within Site "A". This project initiated with the installation of a 36" CSP across the WestBarr Logsort Road. A connection was then established at a gradient that would ensure tidal exchange yet would restrict the drainage of the upland slough into the Central Estuary channel. The latter works involved reconnecting to the formerly isolated slough that has been cut off since the 1950's with the construction of both the WestBarr Logsort Road and the BCRail Spur Line. This slough is one of several that have been isolated and care was taken to permit several of the other sloughs to remain in isolation in order to provide diversity for habitat (i.e. of species that prefer the fresh low pH waters that pooled in these sites such as certain species of amphibian).

The upstream site of the culvert was discovered to be the former dumping grounds for hogfuel from the early 1960's and 70's. As much material as possible was removed from this site and once again taken to the Municipal Landfill site with the fees waived by the District. Over 30 loads of material were transported away. The new connector channel, over 6m in width and with a depth of approximately 3m have now opened an extensive amount of habitat at the upper end.

A pedestrian bridge was constructed at the lower end across a much used trail system in partnership with the Squamish Trail Society (as constructed once again by Mr. Carl Halvorson).



## 2. Goals and Objectives

The primary goals were to:

- Produce upwards of 3,500 square metres of tidal channel rearing habitat;
- Replant marsh and riparian vegetation in the newly constructed habitat sites;
- Install pedestrian access bridges;
- Take soil samples at key locations to analyze for any heavy metals or contaminants
- Hire professional biologists to undertake a survey of plants and bird populations and provide recommendations for restoration opportunities to improve the habitat usage.

The primary objective was to provide Chinook rearing habitat as well as important habitat for other salmonids and recreational fisheries, wildlife, and native vegetation. A secondary objective was to increase public awareness to the importance of estuaries and develop stronger partnerships with likeminded groups within Squamish.



Henderson's Checkermallow Vancouver Island Beggartick Red Columbine Chocolate Lily (inset)

## 3. Study Area

The site is in the East Delta of the Squamish River approximately 12km 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 5505270N/488150W (1983 North America Datum, UTM Zone 10U). The area is composed of historic channels of the Squamish River that are both active and inactive. All of these areas are within tidal influence and salinity ranges from freshwater to 18/1000 salinity over the course of the year dependant upon the Squamish River discharges. The estuary vegetative



community ranges from salt water tolerant marine algae such as rock weed to shrubs and trees common to brackish estuaries such as Sitka spruce and twinberry. Much of the area is covered with dense colonies of Lyngby's sedge with lesser amounts of rare species including Henderson's Checkermallow and Vancouver Island Beggars Tick. Many of the tidal channels have inverts near the zero metre geodetic and bank elevations around 1.3 metres geodetic. The larger tides reach elevations of 1.5 metres regularly and up to 2.0 metres periodically. Tidal channels provide an accessible path for fishes to penetrate deep into the upper estuary marshes, shrub meadows and forests as well as providing low tide refuge area where both fish and their various prey may survive during low water periods.

#### 4. Methods

In early May the site adjacent to the former sewage outfall culvert was cleared in order to construct a pedestrian bridge crossing. The excess material (much of which contained contaminated soils that had leached from the former sewage outfall line) was transported to the Municipal landfill. The former sewage outfall sewer was also removed. The bridge was constructed off site and hauled on-site where it was installed a-top of two lock blocks on each side.



First Nation Youth Corp on new bridge (July 2006)



The second part of the project involved clearing the site adjacent to the WestBarr Logsort Road to the east and west in preparation of the channel construction. Where hogfuel and other undesirable materials were encountered these sites were cleared and the material was taken to the local Municipal landfill. Several squatters had been located over the years in the vicinity and there was much garbage and sewage that had been left on-site.



Garbage seen on site just prior to construction and once site has been grubbed (garbage removed)

Once the site was cleared and grubbed a channel was constructed on the downstream side to connect into the Central Estuary channel. Armour was lined along the banks to prevent any erosion and a drainage channel was constructed along the invert to provide continuous channel flow. A small rock weir was installed beneath the site where the pedestrian bridge was to be located to ensure proper gradation that would allow the upstream slough to remain permanently wetted. Care was taken at all times to limit impacts on mature trees and no conifers were harmed during the construction operations. Several alders were removed from site as there were no options to avoid these stands.

Four 36" CSP culverts were installed across the WestBarr Logsort Road in for a total length of 40'.



Installing the culvert



Half way.



The bridge was once again constructed off site (by Mr. Halvorson) and brought onsite at the end and placed on two concrete lock blocks. Crush was brought in to regrade the pedestrian trail and the area was grass seeded and revegetated with a mix of native shrubs and grass seed. Signage was placed onsite during the construction to notify of trail closures but there appeared to be very nominal trail use at this time.



## 5. Results

With the construction of 500m linear length of channel at the WestBarr Logsort site and through installing a new connector channel across the South Loop Trail, well over 3,500 square metres of new rearing habitat has been established and opened up for Chinook salmon and other species. An important section of the estuary has been reestablished as tidal and over two hectares of land base has been revegetated with native seed mix and over 500 native shrubs.

Two pedestrian bridges were constructed thereby ensuring trail access along much used trails. Through an unusual turn of events, sediment and chemical testing was able to proceed following the estuary oil spill of August 4, 2006. Ongoing mercury testing was undertaken in partnership with Ralph Turner and his testing within the estuary.



The final bridge installation adjacent to the WestBarr Logsort Road



In recognition of concerns by Squamish Nation, a summary report was prepared by Fisheries and Oceans Canada titled: “Squamish River Estuary Tidal Channel Restoration Plan 2007 – Ecosystem Impact Assessment” (Matt Foy, March 2007). A copy of this report may be found in the appendices. The main issues addressed in this report were the original objectives of the estuary restoration works that have been undertaken over the years by DFO through various partnerships, such as the one developed with the Squamish River Watershed Society. The intention was to provide confidence in the successful establishment of Chinook rearing habitat, reestablishing estuarine habitat, and reconnecting tidal channels.

## 6. Discussion

The two stages of this project have helped to reduce one of the limiting factors associated with the estuary in its current state, primarily the loss of accessible channels that are open to tidal influence. The decrease of viable Chinook rearing habitat in the Cheakamus River is a factor in limiting fry growth rate due to reduced water temperatures that result from flow diversion at Daisy Lake and the Cheakamus River. Through the increased access to habitat in a stable environment, such as within the estuary, the Chinook fry growth rate may proceed at a healthy rate during the rearing stage. With the existing culvert crossings within the Training Dike that allow access from the Squamish River into the central estuary and with the installation of several more the outcomes to improved Chinook rearing habitat will assist in reestablishing this important sports and native fishery stock. The estuary is a nutrient rich environment that provides much refugia and sheltered habitat that permits the development of healthy smolts as they emerge into their ocean phase of growth into Howe Sound the Pacific Ocean.

The assurance of trail access and maintenance has also been an additional contribution made by the two stages of this project as a value added component. Other partners are working to provide fish access across highway and rail corridor and improve water quality and tidal flushing in the Mamquam Blind channel portion of the Squamish River estuary. Pedestrian access along these sites has also been recognized as an important linkage to ensure public support and awareness of the importance of the estuary and the habitat within.

Historically, the channels that are being restored were not just important habitat for juvenile Chinook and other salmonid species but were also an integral waterway for the original inhabitants of the region. The works have been undertaken with this in mind and the bridges are designed to provide access to watercraft such as kayaks and canoes as per the desires and recognition by Squamish Nation.

Monitoring, both photopoint, vegetation plant growth counts, and fish counts have been undertaken and are included in the appendices.



## 7. 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 this 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.

## 8. 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:

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- John Hunter Company Limited for their superb work, once again, for their care and effort while working within such sensitive areas.

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