

## **Background Information: The Mamquam River Floodplain Restoration Project**

The Mamquam River Floodplain Restoration project is being undertaken in partnership with the Squamish River Watershed Society, Fisheries and Oceans Canada, District of Squamish, and Squamish Nation. Funding support has been received from the Pacific Salmon Commission, B.C. Ministry of Transportation, Pacific Salmon Foundation, Canadian Hydro Development Corporation. The Squamish River Watershed Society and the local community are working closely to provide future working plans for conservation of these important floodplain lands.

*The Mamquam River is important coho and Chinook salmon habitat.*

2005

The Mamquam River is an important coho, pink, chum and Chinook salmon producing tributary within the Squamish River watershed. The Squamish River estuary, lying at the head of Howe Sound, was formed at the confluences of the Mamquam and Squamish Rivers and historically supported a large complex wetland with interconnected tidally influenced sloughs and channels. These diverse habitats provided exceptional quality habitat for many salmonid species particularly coho, pink, chum and Chinook salmon.

Dyking in the early twentieth century confined the Mamquam River and Squamish Rivers to relatively narrow corridors isolated from most of their historic floodplain lands. Internal drainages remain in some of the undeveloped portions of these isolated floodplain areas but suffer from reduced flows and poor connections to viable salmon populations in adjacent habitats. One such drainage is Loggers Lane Creek. Loggers Lane Creek was originally a river channel of the Mamquam River but was isolated following a giant storm in 1921 after which the dyke was built.

*The building of dykes on the Mamquam & Squamish Rivers controlled flooding but negatively impacted salmon habitat.*

The Mamquam Reunion is a multi-year effort that aims to increase the amount of critical over wintering habitat available to Mamquam River coho salmon through the creation of additional wetland, pond, and channel habitat adjacent to the Mamquam River. The amount of over wintering habitat along the Mamquam River is thought to be the critical limiting factor influencing coho salmon populations in this watershed. The first phase of this floodplain restoration project also provides rearing habitat for coho and Chinook salmon along with spawning habitat for coho, Chinook, pink, and chum salmon and steelhead trout.

The project is located at the margin of the present floodplain of the Mamquam River immediately adjacent to the 200 year flood dyke. The work completed in 2005 included:

2005:

1) Installation of an Intake Structure

Install a river intake and flood control gate from the Mamquam River to provide a reliable water supply to Loggers Lane Creek.

2) Creation of Channel network

The second phase involved the construction of a channel network that provides over wintering ponding and spawning channels.

2005:

*Build river intake;*

*Create new channel habitat*

2006:

Work completed in 2006 included:

- 1) Install a new pipeline and flood control gate from the Mamquam River Intake across the dyke to connect the Mamquam River to Loggers Lane Creek

This work involved the diversion of a controlled amount of water flow through the 200 year flood dyke to re-connect the Mamquam River with the previously isolated floodplain channels and sloughs within the Loggers Lane Creek and the Mamquam Blind Channel. This then allowed fish passage between these two fish habitats. Loggers Lane Creek and Mamquam Blind Channel collectively have more than 50,000 square meters of channel and wetland habitat and are now restored to a high level of productivity with a consistent water flow from the Mamquam River.

2006:

*Install pipeline across dyke;*

*Open river intake to allow flows into new channels*

2007:

1) Brennan Park

There is a new channel on Brennan Park lands that will redirect some of the flows across the Brennan Park Recreational Grounds along former waterways (which are now ditches between the ball fields). This will become a tremendous asset to the District once the spawning fish begin to migrate and attract the wintering Bald Eagles. The new channel follows the current ditch alignment and connects up to the north south connector channel of Loggers Lane Creek currently flowing past the RCMP building.

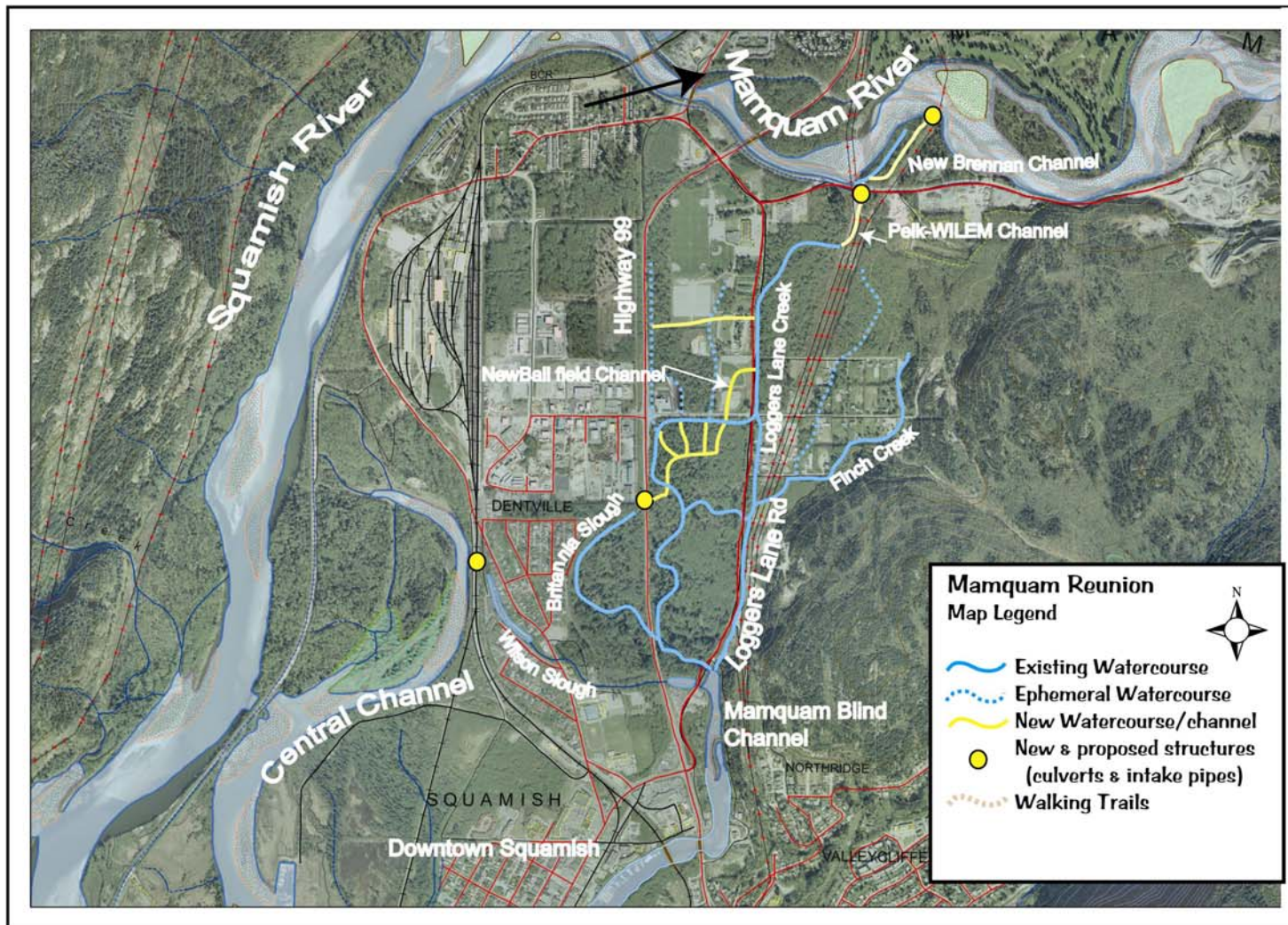
2) Mamquam River Dyke

The large storm on March 5, 2007 eroded the bank of Mamquam River just upstream of the new intake. This put the flood dike put in jeopardy as well as the newly created channels. An access road was created from the dyke to put rip rap rocks in place along the river bank, thus protecting the dyke and channels. This bank stabilization work was done between April and August 2007 achieving the aim of being done before the pink salmon run began in mid-August. We have seen in September of this year, thousands of pinks are making their way in the side channel. Still to be done in the fall of 2007 are riparian habitat plantings to complete the restoration.

2007:

*New channel at Brennan Park;*

*Mamquam River bank stabilization*



## Squamish Estuary Restoration Background Information



The purpose of this backgrounder is to provide some background information on the restoration work that has been done at the estuary to teachers and volunteers with the Squamish Estuary School Program.

In 1971 BC Rail dredged out a significant portion of the estuary and constructed a training dyke along the Squamish River in order to contain it along the western bank. The intention, at the time, was that BC Rail planned to construct a deep sea port for the storage of coal. The majority of the remaining dredgeate material (that did not go into the dike production) was placed within the estuary filling an area approximately 250 m<sup>2</sup>.

In 1972, the Department of Fisheries and Oceans put a stop to BC Rails efforts. However, the legacy of the dike construction and the stockpiling of the dredgeate material remained until the mid-1980's. At that time, Fisheries and Oceans Canada made an effort to place 2 culverts, which would connect the inner estuary to the Squamish River, which effectively had been restricted through the training dyke construction. In recent years, Fisheries and Oceans has installed several more culverts, up to 7 at present, and made an effort to reestablish channels and salmon spawning habitat within the inner estuary. As well, Fisheries and Oceans made efforts to remove the vast majority of the dredge spoils and reestablish the estuary to a productive state.

With the assistance of funding from the Habitat Restoration and Stewardship Program, the former Fisheries Renewal BC, and other internal DFO funding, and with the assistance and direction of the Squamish River Watershed Society, these projects were implemented over the years in a phased process. In the year 2000 the majority of the work was completed but there were several outstanding areas that needed attending to – including:

- removal of 90% of the original stock piled dredged material,
- the reconnection of the main channel that was constructed in the western estuary in the late 1990's and
- the final connection of some channels in the inner estuary by the WestBarr Log Sort.

Without these efforts the fisheries potential of this location would be all but lost, the area would be inhospitable to visit and would not be a welcome location for the locals to utilize as a nature viewing area, and the estuary would in no way provide the productive habitat that it had once provided. The year 2005's work included the final removal of all the remaining dredge material, the final grading of the estuary and the reconnection of two side channels at the dredge spoil site. A new channel was constructed in the South Loop Trail area reconnecting isolated tidal channels and allowing fish access and passage.

The restoration works 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:

- increase Chinook and other fish species populations
- enhance trail usage and maintenance,
- establish important native vegetation and bird habitat; and
- provide 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.

In 2006 restoration work included:

- establishing over 2,000 linear metres of new channels,
- opening up and re-vegetating 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.

In 2007, students from Mamquam, Brackendale, and Stawamus Elementary schools participated in estuary restoration activities, transplanting sedges into the Chelem Site. This work will continue in 2008.

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 undertaken at the estuary.

Information in this backgrounder is from the Estuary Restoration Project Final Report 2004/05 and 2006/07 by the Squamish River Watershed Society. Special thanks to Edith Tobe, Project Coordinator for providing this information.

## **Background Information: Powerhouse/Branch 100 and Swift Creek Restoration Projects**

The two projects are located north of Brackendale and are intended to improve spawning and rearing habitat of salmon species in the Squamish River system. While students participating in the Rivers and Estuary Field Days (2009) were not able to visit these projects due to their location, the type of habitat restoration that was seen in the Golf Course channel we visited provided similar habitat restoration characteristics.

Salmon populations can be increased through the improvement or creation of habitat for spawning or rearing of young. Creation or improvement of habitat such as side channels, groundwater fed channels and over-wintering ponds are all useful options. These types of habitats are used by young salmon for rearing and overwintering, while adult chum like side channels and groundwater-fed channels for spawning. Side channels are connected to the main river channel at their upstream and downstream ends with flow depending on the flow of the main channel. Groundwater-fed channels are linked to the main channel at the downstream end only. Overwintering ponds provide areas of refuge and stable habitat to prevent stranding and loss of young salmon during low flow situations.

Powerhouse Channel/Branch 100 Creek addresses the issue of the new point of discharge from Daisy Lake into the Squamish River. Since 1957, spawning salmon have been attracted to the water discharge from the Cheakamus Hydro station – spawning in limited amounts of poor quality gravel. This project expands the amount of spawning and off channels habitat by increasing the amount of high quality spawning habitat in the channel and expanding the existing Branch 100 creek for winter refuge habitat for young salmon. This project was completed in 2009.

The Swift Creek Restoration project is located on Swift Creek – a small stream that flows into a side channel of the Cheakamus River about 3 km before the river enters the Squamish River in Paradise Valley. This project is intended to provide a consistent flow in the channel by placing a river intake and pipeline from the Cheakamus River into the channel. The purpose of the project is to expand the amount of spawning and rearing habitat. To provide habitat to young salmon that enter Swift Creek for rearing and overwintering during high water.

Additional benefits for both projects include more food sources for birds such as the Bald Eagle, Great Blue Heron, and Belted Kingfisher. As well, additional nutrients will be provided to the upper watershed from salmon carcasses after spawning.

Both projects have been supported with funding from the Bridge Coastal Restoration Program (BC Hydro) and are being done in cooperation with the Squamish Streamkeepers, Squamish River Watershed Society and Fisheries and Oceans Canada. They are also the direct result of increased community awareness of the importance of high quality habitat for salmon by community groups such as the Squamish Streamkeepers and local land owners nearby.

Cheakamus Powerhouse Channel Restoration project



# Cheakamus Swift Creek Restoration Project

SWIFT CREEK RESTORATION PROJECT  
SITE LOCATION MAP

