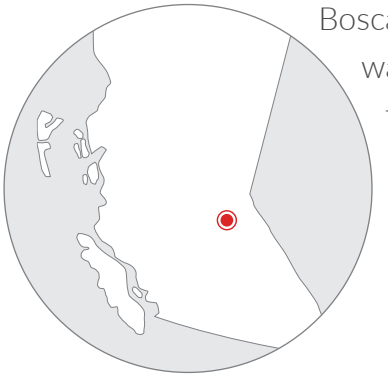
1 | Boscar Lake Creek
Culvert Removal



Boscar Lake Creek connects Bosk Lake and Cruiser Lake in the Horsefly River watershed, Cariboo Chilcotin Region, British Columbia. The creek is known to support a range of fish species including Kokanee, Coho Salmon, Largescale Sucker, Longnose Sucker, Mountain Whitefish, Northern Pikeminnow, Peamouth Chub, Rainbow Trout and Redside Shiner.

Why this project?

The Black Creek-Cruiser Lake Forest Service Road was constructed across a short section of Boscar Lake Creek. A narrow, closed-bottom culvert was installed under the road to facilitate the flow of the creek below. The culvert created a pinch point where the ~ 10 metre wide creek was forced to narrow and accelerate to pass through.

In-stream and riparian habitat at the crossing was flooded and lost, and at times the culvert was a barrier to fish movement. When the forestry road was no longer required, there was an opportunity to restore the stream bed and riparian habitat.

Photos: Civil North Engineering; Sarah Sra

Outcomes

In August 2022, the culvert was removed, and the stream channel was re-established to its full width. The riparian area was reconstructed and reseeded. The forest service road was deactivated for 200 metres on each side of the stream through mounding, reseeding and scattering of woody debris. Berms and road deactivation signage were erected at either end of the road work to deter recreational ATV traffic from trespassing once the project was completed.

> *"The Pacific Salmon Commission's Southern Fund Committee continues to support projects designed to benefit wild stocks of salmon by protecting or improving the quality or quantity of their habitat. The Boscar Lake Creek project, and the Canadian Wildlife Federation's (CWF) strategic decision to remove and deactivate the culvert crossing, instead of replacing it, showcases CWF's efficient resource management and dedication to restoring valuable salmon habitat. This project will have a positive impact on the restoration of salmon in the Horsefly River watershed."*
>
> Pacific Salmon Commission

TOTAL PROJECT COST:

$94,613

RESTORED ACCESS TO HABITAT:

DISTANCE:

6.8 km

AREA:

103,060 m²

SPECIES THAT BENEFIT:

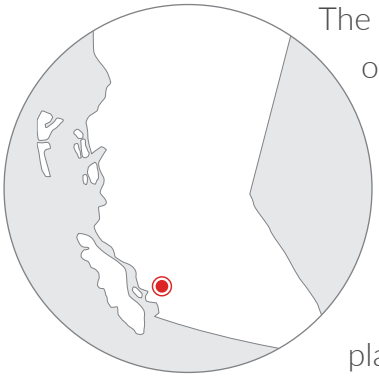
- KOKANEE
- COHO SALMON
- RAINBOW TROUT

ADDITIONAL SPECIES:

- LARGESCALE SUCKER
- LONGNOSE SUCKER
- MOUNTAIN WHITEFISH
- NORTHERN PIKEMINNOW
- PEAMOUTH CHUB
- REDSIDE SHINER

This project is primarily funded through the Pacific Salmon Commission Southern Endowment Fund and the Canada Nature Fund for Aquatic Species at Risk, with additional support from the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

2 | Branch 100 Creek
Restoration



The Branch 100 Creek overwintering pond and wetland are located north of Squamish on British Columbia Crown lands, partially on a BC Hydro transmission right-of-way, and along a provincially managed forest service road in the unceded homelands of the Sḵwx̱wú7mesh Úxwumixw (Squamish Nation). The creek is an important spawning tributary for Coho Salmon that rear in the pond, wetland and the BC Hydro Powerhouse Tailrace Channel that carries water away from the power plant. Juvenile salmon spend one to two years in these waterbodies, then migrate out to the Squamish River.

Why this project?

A build-up of gravel on one end of an undersized culvert alongside the forest service road blocked flows to a spawning channel downstream. Fish movement was also hampered where a collapsing berm and defunct beaver deterrent device allowed American Beaver to block a culvert used by juvenile salmon to exit overwintering habitat on their way to the Squamish River.

Outcomes

The undersized culvert and accumulated sediment were removed from along the forest service road. This restored flow and connectivity to spawning habitat in Branch 100 Creek, restoring spawning capacity. The berm was reconstructed to restore and increase the size of the wetland and overwintering pond. The beaver-deterrent structure was fixed, and beaver dams were removed to restore flow between overwintering and downstream habitat. Removing these barriers to fish movement increased the amount of critical overwintering and summer rearing habitat available to juvenile salmonids.

Photos: Murray Manson, MPO; B. Rebellato

"We've had the opportunity to improve culverts to allow fish connectivity, to do riparian restoration and restore slopes to stop erosion, and here in the estuary to restore tidal connectivity."

Edith Tobe
Squamish River Watershed Society

Acknowledgements

- Squamish River Watershed Society
- Squamish Nation
- BC Ministry of Forests, Lands and Natural Resource Operations
- BC Fish Passage Technical Working Group

TOTAL PROJECT COST:

$57,265

RESTORED ACCESS TO HABITAT:

DISTANCE:

0.1 km

AREA:

800 m²

SPECIES THAT BENEFIT:

COHO, PINK AND CHUM SALMON, WESTSLOPE CUTTHROAT TROUT AND STEELHEAD

AMPHIBIANS

AQUATIC INVERTEBRATES

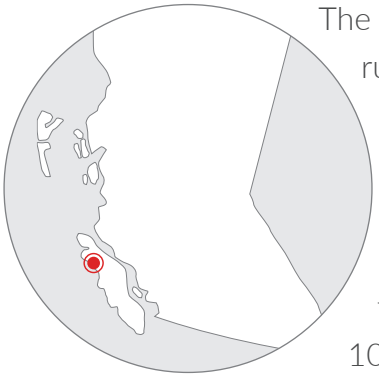
This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

CANADIAN WILDLIFE FEDERATION

Fisheries and Oceans Canada | Pêches et Océans Canada

BRITISH COLUMBIA

3 | Burman River
Side Channel Reconnection



The Burman River originates in Strathcona Park, West Vancouver Island, and runs through the unceded territory of the Mowachaht/Muchalaht First Nation into Nootka Sound about 18 kilometres southeast of the town of Gold River. The river once supported large numbers of Pink Salmon, along with Chinook, Coho and Chum. Salmon populations declined in the '70s and '80s. In particular, the number of Pink Salmon that returned to spawn each year decreased from an estimated 150,000 to less than 100 individuals by the mid '80s.

Why this project?

Several side channels connect to the main stem of the Burman River. These channels are important refuge for salmon during flooding events and provide access to food and shelter from overhanging vegetation. They are often the best places for spawning and are particularly important for juvenile Coho Salmon that spend the first year of their lives in fresh water before migrating to the ocean. Pink and Chum salmon also use these areas. Fish that have access to side channel habitats to overwinter have better survival rates than those that spend their winters in mainstem rivers.

Forestry and on-going natural processes like erosion and landslides have constantly re-shaped the Burman River drainage and river channels. In the early to mid-part of the 20th century, a series of Burman River side channels were buried or cut off by landslides. Using remote sensing, the project team identified three of these channels that were being fed by groundwater beneath the debris. These channels were historically important habitat for Chinook, Chum, Coho, Pink Salmon and steelhead. Reconnection and restoration of the channels was predicted to restore important habitat.

Outcomes

Three groundwater-fed channels were excavated from the slide debris and shaped into rearing, spawning and overwintering habitat features for salmon. These include rocky, fast-flowing shallows (riffles), deeper pools, and sections of relatively uniform flow and substrate (runs or

Photos: Betty Rebellato; MC Wright & Associates Ltd.

glides). Large pieces of wood were added to provide cover for salmonids of all life phases and to provide habitat for primary producers (like algae) and aquatic invertebrates. Clear-span bridges were built over two of the channels to allow forestry traffic to continue while restoring fish access to the site without disturbing it. A wetland was also created where an old pit had been dug. This wetland was connected to the channels.

Fish are now present throughout the restored areas. Juvenile Coho Salmon, steelhead, and Prickly Sculpin have been found in the channels, and Northwestern Salamanders have moved into the wetland. The presence of these species indicates that the project has been successful at connecting this newly restored habitat to the Burman River main stem, which will be beneficial for salmonid production in the watershed.

"The Burman River is wild west coast B.C. at its best. It supports a great diversity of species including Pink, Chinook, Coho, Chum Salmon and steelhead. Our partners saw that there was a lot of potential in this river, and when they put their shovels in the ground, the water was still there in the channel, buried under the landslide. Now that it's opened back up, it's full of Coho. It's great to see the fish community bounce back so quickly."

Betty Rebellato
National Fish Passage Improvement Coordinator | Canadian Wildlife Federation

Acknowledgements

- Mowachaht/Muchalaht First Nation
- BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development Land Based Investment Strategy
- BC Fish Passage Technical Working Group
- BC Timber Sales

TOTAL PROJECT COST:
$577,776

RESTORED ACCESS TO HABITAT:

DISTANCE:
0.88 km

AREA:
4,400 m²

SPECIES THAT BENEFIT:

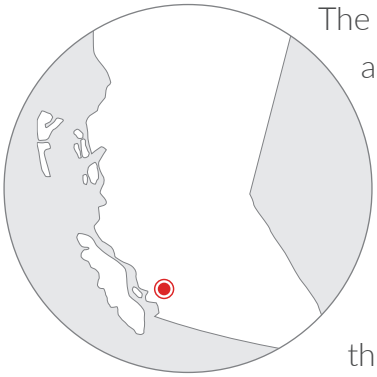
CHINOOK, COHO, CHUM AND PINK SALMON. STEELHEAD TROUT

NORTHWESTERN SALAMANDER

AQUATIC INVERTEBRATES

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

4 | Central Estuary
Culvert Replacement



The Squamish Central Estuary is located at the head of Howe Sound approximately 52 kilometres north from Vancouver, British Columbia, in the unceded homelands of the Sḵwx̱wú7mesh Úxwumixw (Squamish Nation). It is critical rearing habitat for declining populations of South Coastal Chinook Salmon. Rearing habitat for Chinook Salmon juveniles was compromised when a five-kilometre-long berm (locally known as "The Training Berm") was constructed parallel to the Squamish River through the estuary in the early 1970s to facilitate the development of a coal port in the estuary. Though the port was never built, the berm remained, limiting fish access and river flow from the Squamish River to the estuary.

Why this project?

Juvenile salmon undergo a transition period, known as smoltification, when moving from fresh water into the ocean. During this process, their bodies adapt to salt water and build up strength by feeding in rearing habitat like the estuary. The berm blocks migration to the estuary for many juveniles, flushing them down river and out into the ocean with limited opportunities to transition in the brackish waters of the Squamish estuary. Over the past three decades, several culverts were installed in the berm to promote fish passage and water exchange between the river and estuary. Many of the culverts have been inaccessible to salmonids due to their small diameter size, flow velocity, and poor positioning (inaccessible at low tide, too deep for fish to access at high tide). Through the Central Squamish Estuary Restoration Project, multiple partners have come together to replace culverts at key locations along the berm. This project involved several components including the replacement of two culverts and modification of the southern "Spit" portion of the Berm to reconnect the Squamish River to the Central Estuary. Funding from CWF/BCSRIF helped to support the work that was undertaken to replace Culvert #4, located mid-way down the berm at a critical connection from the river to the estuary.

Photos: B. Rebellato

Outcomes

In the summer and fall of 2020, the undersized culvert at site #4 was replaced with a 3 m x 3 m fish-friendly box culvert. The riparian zone around the culvert was replanted with native vegetation. The goal of this culvert replacement and others is to increase flushing of estuarine habitats with river water and to improve water quality for juvenile Chinook Salmon. It is also hoped there will be a re-watering and rehabilitation of marsh habitats.

"The Central Squamish Estuary Project has been an important project to help restore Chinook salmon populations as well as restore the biodiversity of the Squamish estuary. The Squamish estuary provides multiple functions including mitigations against climate change, a natural carbon sink that allows for carbon sequestration in the nutrient rich soils, and diverse habitat for numerous flora and fauna."

Edith Tobe
Squamish River Watershed Society

Acknowledgements

- Squamish River Watershed Society
- Squamish Nation
- BC Ministry of Forests, Lands and Natural Resource Operations
- BC Fish Passage Technical Working Group

TOTAL PROJECT COST:
$819,310

RESTORED ACCESS TO HABITAT:

DISTANCE:
3 km

AREA:
481,700 m²

SPECIES THAT BENEFIT:

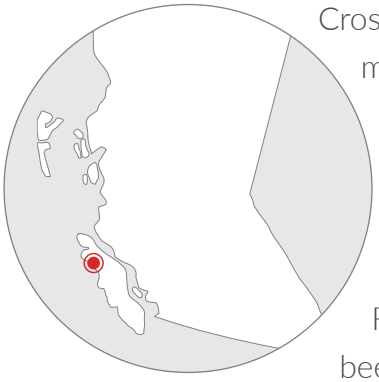
CHINOOK SALMON

ADDITIONAL FISH SPECIES:

- COHO SALMON
- CHUM SALMON
- PINK SALMON
- STEELHEAD
- ARCTIC CHAR
- PACIFIC HERRING

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

5 | Cross Creek
Culvert Replacement



Cross Creek is a tributary of Babine Lake in Lake Babine Nation territory, mid-west British Columbia. It runs through the center of Pendleton Bay Provincial Park and is one of the many tributaries of Babine Lake that have historically hosted large numbers of Sockeye Salmon. It is also habitat for Coho and Pink salmon, kokanee, Rainbow Trout, Prickly Sculpin and Longnose Dace.

For time immemorial, the Sockeye Salmon fishery of Babine Lake has been central to the subsistence of Lake Babine Nation. The number of wild Sockeye Salmon returning to the lake once numbered in the millions, but the population is declining primarily due to a mixed-stock commercial fishery that manages multiple stocks together, rather than accounting for the health and size of individual stocks such as those using Babine Lake tributaries.

Why this project?

Cross Creek is an important spawning stream for Sockeye Salmon and kokanee that originate in Babine Lake. When Babine Lake Road was built, two oval, closed-bottom culverts were installed below the road surface to allow the stream and fish to pass beneath it. Over time, the stream bed eroded away, leaving the culverts perched above the waterline during low flows. Coupled with constantly accumulating debris, the culverts became impassable to fish, especially at the time of year that they typically begin their migration to spawning grounds upstream. Additionally, the culverts were collapsing under weight and use of the road. Replacement of the culverts was necessary to ensure that Sockeye Salmon and kokanee have free and clear access to Cross Creek.

Photos: Avison Management Services Ltd.; Pathfinder UAV

Outcomes

In the summer of 2021, the collapsing culverts were replaced with a geotextile reinforced soil arch. The creek bed under the arch was reconstructed to allow for water, sediment and woody debris to flow freely under the road without blocking fish passage. Raised streambanks along the creek bed provide travel corridors under the road for other animals, including small mammals and amphibians.

Following the project, salmon numbers upstream of the road increased from 127 the year previous to 917. An environmental monitoring program in place during and after construction also identified the presence of many Columbia Spotted Frogs. The creek appears to be important rearing habitat for these frogs at all life stages and is likely near significant breeding habitat.

"Lake Babine Fisheries Department is ever so happy to see this project completed. We really want to rebuild these wild stocks and ensure that they are there for our children and grandchildren."

Bessie West
Lake Babine Nation Councillor, Fort Babine

"Many people rely on or like to take part in fishing, and sockeye is a fantastic and healthy food source that gets people into nature and connects them with the resource. In order to continue to enjoy that though, we need to meet that resource in the middle and protect it at the same time so that future generations can continue to enjoy its benefits."

Dustin Snyder
Spruce City Wildlife Association

Acknowledgements

- Lake Babine Nation
- Spruce City Wildlife Association
- BC Ministry of Transportation and Infrastructure
- BC Fish Passage Technical Working Group

TOTAL PROJECT COST:
$602,545

RESTORED ACCESS TO HABITAT:

DISTANCE:
1.1 km

AREA:
7910 m²

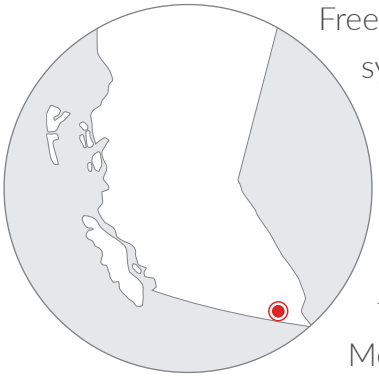
SPECIES THAT BENEFIT:

- SOCKEYE
- KOKANEE
- COHO
- PINK SALMON
- RAINBOW TROUT
- PRICKLY SCULPIN
- LONGNOSE DACE

COLUMBIA SPOTTED FROG

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

6 | Freeman Creek and Meadow Restoration



Freeman Creek and Freeman Meadow are part of a stream and wetland system that serve as a headwater of the Yahk River in the Southern Purcell Mountains, southeastern British Columbia. These waterbodies are important habitat for Westslope Cutthroat Trout, a federally-listed Species at Risk. Historically, Dolly Varden were also present in this system, though both fish species have declined because of habitat loss from railway building, forestry and cattle grazing. Freeman Creek and Meadow are in the traditional territory of the Ktunaxa Nation, and the area is identified as having high cultural value.

Why this project?

Fish passage was impeded by two undersized culverts located over a kilometre apart on Freeman Creek. The area downstream of and between the two culverts is a meadow that mostly dries up during low flows but supports abundant Westslope Cutthroat Trout adults in deeper pools. Upstream of the two culverts the creek flows year-round, providing critical spawning, rearing and overwintering habitats. The presence of the two culverts was impeding seasonal movement of Westslope Cutthroat Trout between the meadows and the faster-flowing upstream habitat.

Photos: Phil MacDonald, BC Timber Sales

Outcomes

The two culverts were removed over two consecutive summers and replaced with bridges. The streambed below each bridge was re-shaped, providing natural contours and features for fish to follow as they make their way upstream to abundant spawning gravels and pools for rearing and overwintering.

"Having clear fish passages are important to an area because they are tied closely to the health of the watershed. Their presence can greatly bolster habitat by both utilizing and contributing back to an area during times like spawning season which happens in early spring. The spawning area is already there and regaining access for fish is critical to bringing back populations. "

Norman Allard Jr.
Community Planner | Lower Kootenay Band

Acknowledgements

- BC Timber Sales
- Lower Kootenay Band (Yaqan Nu?Kiy) of the Ktunaxa Nation

TOTAL PROJECT COST:
$244,487

RESTORED ACCESS TO HABITAT:

DISTANCE:
3 km

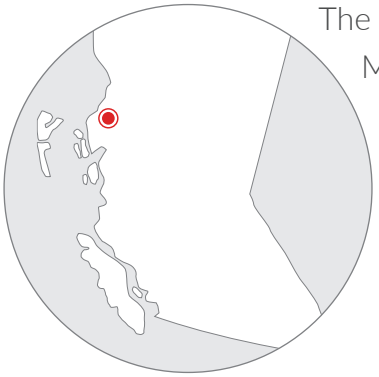
AREA:
29,320 m²

SPECIES THAT BENEFIT:

- WESTSLOPE CUTTHROAT TROUT
- DOLLY VARDEN

This project is made possible in part by funding provided by the Canada Nature Fund for Aquatic Species at Risk. Learn more at FishPassage.ca.

7 | Ginlulak Creek
Culvert Replacement



The Nass River, located in northwest British Columbia, flows from the Coast Mountains into Portland Inlet via Nass Bay. Ginlulak Creek is a side channel of the Nass River, one of a series fed by an upstream wetland that serves as important rearing and refuge habitat for juvenile salmon, particularly Coho and Chinook salmon. The pond may also be used opportunistically by other salmon species including Sockeye, Chum, and Pink salmon, Dolly Varden, Cutthroat Trout, and steelhead.

Why this project?

Juvenile salmon heading to the wetland had to pass through a small, collapsing, open-bottom wood culvert installed under a road that crosses Ginlulak Creek. The culvert was often plugged with debris or dammed by beavers, causing water to pool upstream of the road and sometimes stranding juvenile salmon in the forested areas outside the main channel. In addition, high tides would sometimes influence the site and cause the pooled water on the upstream side of the culvert to flow over the road. During these events, people reported seeing juvenile salmon swimming over the roadway. Replacement of the culvert was critical both for fish passage and vehicle safety.

Photos: Tyler Wood, B.C. Ministry of Forests

Outcomes

In February 2021, the existing 1 m x 3 m wooden culvert was replaced by an 18-m, concrete clear-span bridge. Debris and sediment that were piled up around the old culvert were removed from site, and the streambed restored. The new bridge is anticipated to better handle high flows, and to improve fish passage for salmonids.

"Climate change has resulted in increased frequency and magnitude of high water events. Even crossings that may have been passable to fish 30 years ago may not be today due to these changes to stream flows. Replacing the crossing on Ginlulak Creek will help to prevent flooding of the road and allow unimpeded movements of juvenile salmon into and out of this important off-channel habitat."

Betty Rebellato
National Fish Passage Improvement Coordinator | Canadian Wildlife Federation

Acknowledgements

- BC Ministry of Forests, Lands and Natural Resource Operations
- BC Fish Passage Technical Working Group

TOTAL PROJECT COST:
$423,424

RESTORED ACCESS TO HABITAT:

DISTANCE:
0.48 km

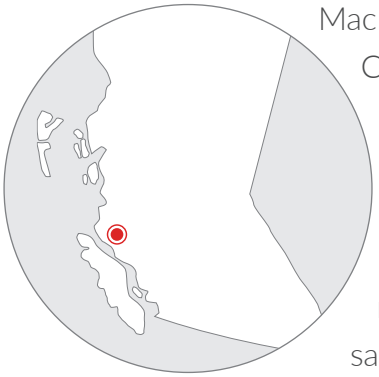
AREA:
5,056 m²

SPECIES THAT BENEFIT:

- COHO SALMON
- CHINOOK

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

8 | Mackenzie Lake
Log Jam Removal



Mackenzie Lake is nestled in the Coast Mountains, southwestern British Columbia, in the traditional territory of the Gwawaenuk Tribe. The lake provides valuable rearing habitat for Coho and Sockeye salmon that emerge from the lake's tributaries. Not to be confused with the mighty Mackenzie River that runs through the Northwest Territories, this Mackenzie River is a 1200-metre-long coastal river and the only migration corridor into Mackenzie Lake for spawning Sockeye and Coho salmon. These salmon hold in the lake until conditions are right before entering the tributaries to spawn. The river empties into Mackenzie Sound just north of Kingcome Inlet, and also provides spawning habitat for Pink and Chum salmon, and Coastal Cutthroat Trout that can be found throughout the Mackenzie system.

Why this project?

Historic forestry operations around Mackenzie Lake have resulted in a large stockpile of abandoned logs in the lake. Though forestry operators in the area installed a boom to contain logs at the outlet of the lake and prevent them from entering Mackenzie River, some logs skirted the boom and formed a substantial pile-up of large, interlocking logs that covered roughly 55 metres of the creek near the outlet of Mackenzie Lake. This log jam was thought to impair passage of spawning salmonids from the creek to the lake.

Photos: Pacificus Biological Services

Outcomes

After a professional assessment of log jam removal options, carefully placed explosives were used to clear wood from critical pinch points in the stream, without damaging the stream habitat. Charges were strategically placed to direct the force of the blasts upward and direct debris away from the stream and riparian area. The channel bed and banks were largely bedrock, which helped ensure the stream remained intact, and fish were removed from the area prior to work. This opened a channel for adult salmon to travel through. Following the log jam removal, adult salmon (species unknown) were observed migrating upstream from Mackenzie River into Mackenzie Lake, past the former barrier.

"Restoring fish passage helps to undo some of the past harms from our collective land use impacts. Maintaining free and unimpeded access to Mackenzie Lake is critical for the continued survival of the Mackenzie Sockeye and Coho salmon stocks."

Nicolas Lapointe
CWF Senior Conservation Biologist Freshwater Ecology
Canadian Wildlife Federation

TOTAL PROJECT COST:
$72,600

RESTORED ACCESS TO HABITAT:

DISTANCE:
6.5 km

AREA:
1,843,733 m²

SPECIES THAT BENEFIT:

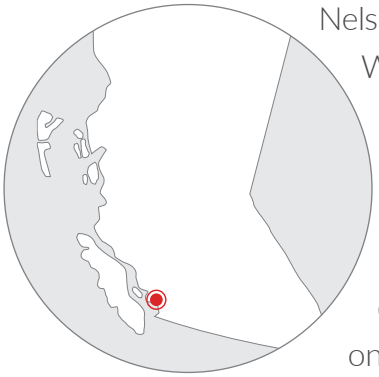
- COHO SALMON
- SOCKEYE SALMON

Acknowledgements

- Gwawaenuk Tribe

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

9 | Nelson Creek
Fish Ladder



Nelson Creek flows through Thunderbird Marina into Fisherman's Cove in West Vancouver, British Columbia. It was once important spawning habitat for Chum and Coho salmon, but the mouth of the creek was relocated with the development of the cove over the past 75 years. Salmon must now navigate a steep bedrock entrance at the mouth of the stream. Consequently, salmon movement upstream from the cove has been diminished. The West Vancouver Streamkeepers Society operates a hatchery on Nelson Creek to help bolster Chum and Coho salmon populations.

Why this project?

Years ago, a series of step pools were constructed in the bedrock to help returning salmon make their way up steep terrain at the mouth of the creek and on to valuable spawning and rearing habitat. However, access to the stream remains tidally influenced, with salmon being forced to hold in the marina at low tides until the tides rise enough to access the stream. This makes them easy prey for the Harbour Seals that frequent Thunderbird Marina. The West Vancouver Streamkeeper Society proposed the installation of a fish ladder to properly facilitate salmon migration upstream.

Photos: J. O'Neill; B. Rebellato

Outcomes

In October 2020, a fish ladder composed of six concrete boxes was installed at the mouth of Nelson Creek. The creek bed adjacent to the ladder was re-shaped with boulders and baffles, and a debris barrier was installed upstream to prevent branches and other materials from being swept into the steps. Approximately one week after construction was finished, the first Chum Salmon were observed making their way up the ladder. The ladder now allows salmon to access Nelson Creek at all but the lowest tides.

> *"The importance of this project is that it demonstrates that a collaborative effort can assist in restoring salmon stocks to our creeks. Nelson creek has seen Chum return after an absence of a decade. Streamkeepers hope to be able to build on this success in restoring stocks to our other streams and creeks."*
>
> Keith Moger
> West Vancouver Streamkeepers Society

Acknowledgements

- West Vancouver Streamkeeper Society
- Thunderbird Marina
- Pacific Salmon Foundation
- District of West Vancouver
- West Vancouver Community Foundation
- British Pacific Properties
- Ian and Rosemary Mottershead Foundation
- Arnold Wallner
- Whole Foods
- Kiwanis Club of West Vancouver
- In memory of Hugh Hamilton, Ross Lauder and Jim Torry

TOTAL PROJECT COST:

$175,453

RESTORED ACCESS TO HABITAT:

DISTANCE:

0.6 km

AREA:

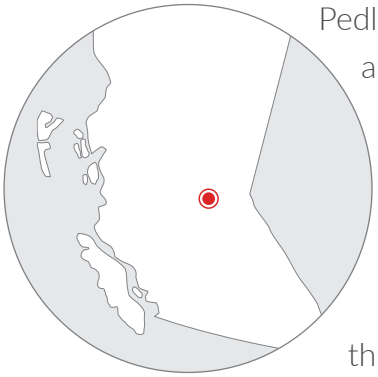
2,400 m²

SPECIES THAT BENEFIT:

- CHUM SALMON
- COHO SALMON

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

10 | Pedley Creek
Culvert Replacement



Pedley Creek flows over 7.5 kilometres from Pedley Lake into Naver Creek, a tributary of the Fraser River. The confluence of these creeks can be found roughly three km south of Hixon, a small community in the Central Interior region of British Columbia. A population of endangered Chinook Salmon resides in Naver Creek, and the Pedley Creek Watershed is thought to be part of this population's historic range. This group of salmon, and other spring-run Chinook Salmon in the area, continue to be threatened by over-harvest and declines in the quality of freshwater habitat. The conversion of agricultural use to residential/commercial land use is resulting in a loss of their rearing and overwintering habitat.

Why this project?

Fish passage into Pedley Creek was blocked by an undersized culvert located 200 metres upstream of the Pedley and Naver Creek confluence. The culvert was barricaded by woody debris on the upstream side and sat above the water line on the downstream side. This prevented migrating juvenile Chinook Salmon from entering Pedley Creek to rear and feed on their way to the ocean. Replacement of the old round culvert with a bridge would allow Chinook Salmon access to an additional 3.5 km of stream habitat upstream and would likely benefit the Rainbow Trout population also present in Pedley Creek.

Photos: BC Ministry of Transportation and Infrastructure (MOTI)

Outcomes

In November 2022, the old culvert was replaced with a bridge. The stream bed below was re-graded and restored with natural features to allow fish to pass. Chinook Salmon are expected to make the journey once again up Pedley Creek for years to come.

> *"Juvenile Fraser River Chinook Salmon need access to smaller tributaries on their migration out to the ocean. These tributaries provide opportunities to rest and feed, so that these salmon have the best chance of survival when they reach the Fraser River estuary. Restoring passage at Pedley Creek means that juvenile Chinook Salmon will have one more place to rest on their way to the ocean."*
>
> Betty Rebellato
> National Fish Passage Improvement Coordinator | Canadian Wildlife Federation

Acknowledgements

- BC Ministry of Transportation and Infrastructure

TOTAL PROJECT COST:

$1,515,439

RESTORED ACCESS TO HABITAT:

DISTANCE:

3.5 km

AREA:

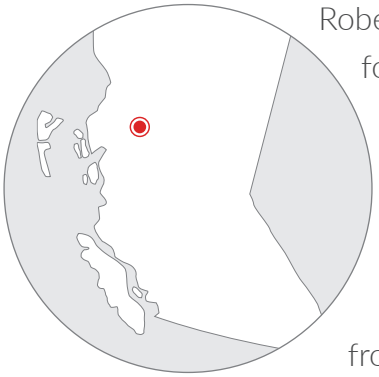
14,000 m²

SPECIES THAT BENEFIT:

- CHINOOK SALMON
- RAINBOW TROUT

This project is made possible in part by funding provided by the Canada Nature Fund for Aquatic Species at Risk. Learn more at FishPassage.ca.

11 | Robert Hatch Creek
Bridge Removal



Robert Hatch Creek flows through a patchwork of natural areas, working forests, acreages and ranches into Richfield Creek, a tributary of the Bulkley River in west-central British Columbia. Rainbow Trout are found throughout both waterways, and Dolly Varden, steelhead, Chinook and Coho salmon are present in Richfield Creek. Robert Hatch Creek passes through Hatch Creek Ranch, where the owners have undertaken several projects to restore creek-side habitat and to protect in-stream habitat from cattle. The creek has suitable spawning and rearing habitat for many salmon and trout species.

Why this project?

Robert Hatch Creek was obstructed by an old, collapsed wooden bridge where the creek passed through the Hatch Creek Ranch. Removal of this barrier and the restoration of stream banks would provide access to upstream habitat for Rainbow Trout, and possibly Dolly Varden, steelhead, Chinook and Coho salmon that make their way up from Richfield Creek.

Outcomes

The collapsed bridge was removed in September 2022 during the autumn low-water season. The creek bed was regraded to better accommodate fluctuations in flow, and the stream banks along the bridge removal site were replanted. These changes should provide vastly improved capacity for fish passage and water flow at the site.

Photos: Pacific North Coast Consulting Services, A. Wrench

"Many Pacific salmon and trout populations are in dire straits. By removing some of the barriers to migration and restoring connections to historical habitats these species have a better chance of survival. Our cultures, economies and ecosystems depend on the sustainability of wild fish stocks and it is our shared responsibility to scale up efforts to fix past harm."

Nicolas Lapointe
Senior Conservation Biologist Freshwater Ecology | Canadian Wildlife Federation

Acknowledgements

- Hatch Creek Ranch
- Fisheries and Oceans Canada Resource Restoration Unit

TOTAL PROJECT COST:

$7,500

RESTORED ACCESS TO HABITAT:

DISTANCE:

2.8 km

AREA:

6,925 m²

SPECIES THAT BENEFIT:

- RAINBOW TROUT
- CHINOOK SALMON
- COHO SALMON
- DOLLY VARDEN
- STEELHEAD

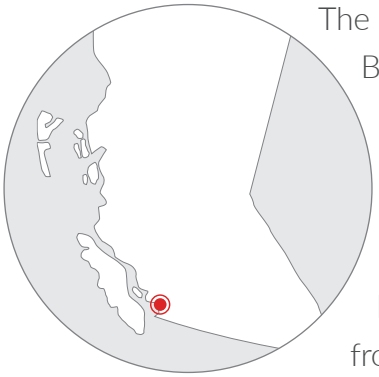
This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

CANADIAN WILDLIFE FEDERATION

Fisheries and Oceans Canada | Pêches et Océans Canada

BRITISH COLUMBIA

12 | Seymour River
Fish Barrier Removal



The Seymour River flows through the Pacific Ranges and North Vancouver, British Columbia, before emptying into Burrard Inlet. The river is important spawning habitat for Coho Salmon and steelhead, along with Pink and Chum salmon, and some Chinook. It is also an important drinking water source for Greater Vancouver residents. In 1961 the Seymour River dam was completed to hold and manage water supply. The dam is a barrier to fish movement, preventing already declining salmonid species from accessing historic spawning and juvenile rearing habitat in the upper watershed. The Seymour River Hatchery, run by the not-for-profit Seymour Salmonid Society, augments salmonid numbers by releasing ocean-ready juveniles into the watershed. Each year approximately 30,000 steelhead, 60,000 Coho Salmon and 375,000 Chum Salmon are released, and every odd numbered year, they release approximately 375,000 Pink Salmon.

Why this project?

In December 2014, a section of rock face collapsed into Seymour Canyon about five kilometres upstream from the river mouth, depositing over 7,000 standard-sized dump trucks worth of rock (~50,000 m^3) and blocking fish from accessing about 14 kilometres of spawning and rearing habitat upstream. Between 2016 and 2020 the Society led a team of professionals to break up the rockfall during the summer period, so that high flows in the fall and spring could wash the debris downstream to open up fish passage. However, during this process, a high-flow event in February 2020 swept a large amount of blasted material farther downstream in the Seymour Canyon, causing a two-metre-high fish barrier at a pool in the river known as The Well. Left in place, this would have created another fish passage obstacle for the returning adult salmonids from moving upstream. Removal of the blockage was necessary to allow fish to access important spawning and rearing habitat upstream.

Photos: Jim O'Neill, Seymour Salmonid Society

Outcomes

Using a combination of rock breaking and boulder removal, a secondary channel was created through The Well barrier to allow for fish passage. Reshaping of the channel was aided by mother nature through four high-flow events that helped mobilise the rock debris downstream. Coho Salmon and steelhead were found upstream of the blockage in fall 2020 following the rock-breaking work, indicating that fish passage had been improved.

> *"This project has brought together a wonderful and diverse group of people and has created a real connection between the community and the watershed."*
>
> Reece Fowler
> Seymour Salmonid Society

Acknowledgements

- Seymour Salmonid Society
- Fisheries and Oceans Canada
- Greater Vancouver Water District (Metro-Vancouver)
- BC Ministry of Forests, Lands and Natural Resource Operations
- Habitat Conservation Trust Foundation
- Canadian Wildlife Federation
- Pacific Salmon Foundation
- Squamish Nation
- Tseil-Waututh Nation

TOTAL PROJECT COST:

$63,336

RESTORED ACCESS TO HABITAT:

DISTANCE:

14 km

AREA:

420,000 m²

SPECIES THAT BENEFIT:

- COHO SALMON
- PINK SALMON
- CHUM SALMON
- CHINOOK SALMON
- STEELHEAD (SUMMER AND WINTER RUN)

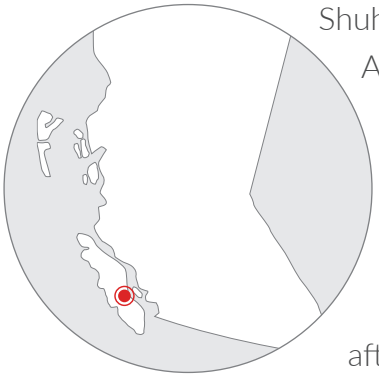
This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more and watch the video, visit FishPassage.ca.

CANADIAN WILDLIFE FEDERATION

Fisheries and Oceans Canada | Pêches et Océans Canada

BRITISH COLUMBIA

13 | Shuhum Creek
Culvert Replacement



Shuhum Creek flows from Little Turtle Lake to Sproat Lake in the Alberni-Clayoquot Regional District, on Hupačasath and c̓ išaaʔatḥ (Tseshaht) First Nation land, west Vancouver Island. The creek supports a healthy population of Coastal Cutthroat Trout and Coho Salmon. The salmon run is aided by the annual release of between 5,000 and 25,000 Coho Salmon fry into the stream by the Alberni Valley Enhancement Association. Coho Salmon return to the creek as adults after one to two years at sea.

Why this project?

At low water levels, fish passage was impeded by a culvert that sat above the water line where Shuhum Creek passes under Lakeshore Road. At higher flows, water entering the culvert flowed out its bottom through numerous rusted-out holes. Replacing the culvert with an open-bottom structure would restore the creek bed, remove barriers for fish, and improve access to high-quality spawning and rearing habitat upstream of Lakeshore Road.

Photos: B. Rebellato

Outcomes

In July 2022, the derelict culvert was replaced with a geotextile reinforced soil arch, which is an open bottom metal arch culvert backfilled with gravel and soils that are reinforced by geotextile fabrics. The creek bed under the arch was reconstructed to allow for water, sediment, and wood material to flow freely under the road without blocking fish passage. Raised streambanks along the creek bed provide travel corridors under the road for other animals, including small mammals and amphibians.

Additionally, four spawning platforms (areas augmented with suitable spawning gravels) and three large pools were constructed in the shade of the arch, providing more spawning habitat for returning adult salmon and cooler summer refuge areas for juveniles.

> *"This project showcases partnership opportunities to replace the failing culvert with innovative technology using an open bottom arch that was directly anchored to bedrock to restore upstream fish passage and also make public road infrastructure more resilient to climate change."*
>
> **Sean Wong**
> Senior Biologist | BC Ministry of Transportation and Infrastructure

Acknowledgements

- Hupačasath and ċ išaaʔatḥ (Tseshaht) First Nations
- BC Ministry of Transportation and Infrastructure
- Redd Fish Restoration Society
- Alberni Valley Enhancement Association
- Pacific Salmon Foundation
- Downstream landowners – Tim Seeton and family and Sina and Ivan Whipp

TOTAL PROJECT COST:

$907,500

RESTORED ACCESS TO HABITAT:

DISTANCE:

2.7 km

AREA:

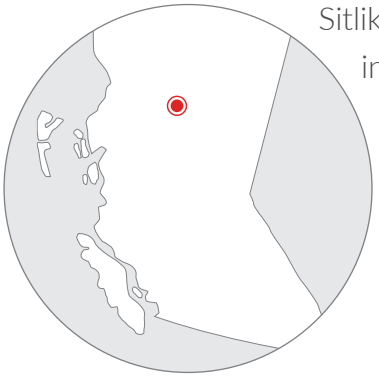
13,500 m²

SPECIES THAT BENEFIT:

- COHO SALMON
- COASTAL CUTTHROAT TROUT

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

14 | Sitlika Creek
Culvert Removal



Sitlika Creek flows into the north end of Takla Lake, the fifth-largest natural lake in British Columbia, located in the heart of Takla Lake First Nation traditional territory in north-central British Columbia. The lake and tributaries like Sitlika Creek are critical rearing and spawning habitat for many fish species, especially declining populations of Sockeye Salmon. In 2021, the Takla Lake First Nation opened a Sockeye Salmon hatchery that will release tens of thousands of Sockeye Salmon into the lake each year.

Why this project?

In the 1970s, a rail line was constructed across Sitlika Creek, and an undersized culvert was installed below it. The culvert became perched above the waterline and was a barrier to Sockeye Salmon and other fish that migrate through Sitlika Creek. When the rail line became inactive, there was an opportunity to remove the culvert and restore the creek channel.

Outcomes

In September 2021, the culvert was removed, and a new creek channel was constructed through the old rail line right-of-way. The terrain around the creek was re-shaped, reinforced with straw and mulch, and seeded with native grasses. Native trees and shrubs were planted the following spring. Sockeye Salmon and other fish now have access to valuable rearing and spawning habitat upstream.

Photos: Jim Trask

"Salmon and fish are really important to Takla Nation members; it's basically why we are still here. We've always taken care of fish and fish have always taken care of us, so this is a good example of Takla leadership taking a major role and getting all these partners together to look after the fish that looked after us for many generations."

Keith West
Fisheries Coordinator | Takla Lake First Nation

Acknowledgements

- Takla Nation
- CN Rail

TOTAL PROJECT COST:

$857,759

RESTORED ACCESS TO HABITAT:

DISTANCE:

3.2 km

AREA:

25,600 m²

SPECIES THAT BENEFIT:

- SOCKEYE SALMON
- DOLLY VARDEN
- RAINBOW TROUT

This project is made possible in part by funding provided by the Province of BC and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. The project is also supported by the Canada Nature Fund for Aquatic Species at Risk. To learn more and watch the video, visit FishPassage.ca.

CANADIAN WILDLIFE FEDERATION

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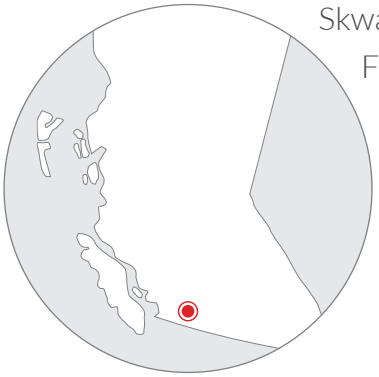
BRITISH COLUMBIA

15 | Skwawolt Creek
Culvert installation



Skwawolt Creek (also known as Freytag Creek) is a tributary of the Fraser River located 21 kilometres east of the village of Agassiz, southwest British Columbia. The creek is an important off-channel refuge from fast-flowing water for Pacific salmon during spring flooding. It passes through the traditional lands of the Chawathil First Nation, who have prioritized restoration of fish habitat in this creek.

Why this project?

Two culverts were installed on Skwawolt Creek where it passes under Highway 7. In low flows, a half-metre drop to the water line makes the culverts a barrier to fish that are seeking off-channel habitats upstream.

Outcomes

In September 2021, rocks were piled below the culvert, turning the 0.5 metre drop into a five-metre long riffle, which allows fish to pass upstream. A series of baffles (small fences) was installed in the east culvert to increase water depth and reduce velocities to further assist fish passage. A single baffle was installed in the west culvert to direct water into the east culvert during low flows. This baffle was dislodged during heavy rain and flooding from atmospheric rivers in winter 2021 and will be reinstalled in a different position to create an additional resting pool for migrating fish. These improvements are predicted to help fish enter Skwawolt Creek during all but the driest months.

Photos: B. Rebellato, Kerr Wood Leidal Associates Ltd.

"Chawathil First Nation has many environmental impacts from major developments using the land that are endangering the species that live with in the waterways.

In efforts to restore the natural habitat and provide passage for fish to take a break from the river as the coho once did in the ponds at Chawathil, assessments were done with help from: LFFA, Pearson Ecological, CWF, and KWL to improve the creek that comes from the river so that the coho could once again seek refuge within Chawathil's wetlands."

Chawathil First Nation

Acknowledgements

- Chawathil First Nation
- Skawahlook First Nation
- Lower Fraser Fisheries Alliance
- BC Ministry of Transportation and Infrastructure

TOTAL PROJECT COST:

$46,824

RESTORED ACCESS TO HABITAT:

DISTANCE:

0.5 km

AREA:

5,532 m²

SPECIES THAT BENEFIT:

- COHO SALMON
- COASTAL CUTTHROAT TROUT
- RAINBOW TROUT/ STEELHEAD

This project is made possible in part by funding provided by the Province of British Columbia and Fisheries and Oceans Canada through the BC Salmon Restoration and Innovation Fund. To learn more, visit FishPassage.ca.

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