ST'ÁT'IMC

Implementation Plan for the St'át'imc Government Services Fisheries Program: 2013 – 2017

“Fish have always been a staple sustenance to the St’át’imc, providing food throughout the year. Historically, fish have been a source of trade. We chose this land because of its rich abundance of fish.” ~ Larry Casper, Tsal’álh

Implementation Plan for the St'át'imc Government Services Fisheries Program: 2013 - 2017

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Summary

This fisheries plan was prepared by St'át'imc Government Services (SGS) to guide program activities over the period 2013 - 2017. It contains a set of policies, a management framework and describes an integrated set of 13 projects focussed on migrating salmon passing upstream and fish populations originating in the Territory. The plan focuses on the provision of technical services in support of community and Nation fisheries and seeks to combine scientific and traditional approaches. Priority activities that will be carried out annually over the 5-year planning period include:

- Application of St'át'imc Knowledge for Fisheries Management;
- Capacity Building and Career Development;
- Collaborative Management with DFO; and
- WUP Monitoring Program (St'át'imc Eco Resources).

Funding proposals, to be prepared jointly with communities, will be submitted to external agencies to expand the scope of the program. A SGS fisheries report will be prepared in March 2014 and annually thereafter and community forums will be scheduled to review annual progress and to present future planned activities.

Acknowledgements

This plan was prepared by Dr. Dave Levy, SGS Fisheries Advisor. The plan is intended to serve as a catalyst for future implementation of the fisheries components of the St'át'imc Hydro Agreement and also to further develop fisheries co-management in the Territory. Early drafts of the plan were reviewed by the St'át'imc Stewardship Advisory Committee, the Fisheries Technical Committee and the St'át'imc Chiefs Council. Financial support from BC Hydro during the preparation of the plan is gratefully acknowledged.

Numerous St'át'imc Chiefs, colleagues and friends patiently educated the author over an 8 year period about St'át'imc values in relation to the fishery notably Garry John, Michael Leach, Arthur Adolph, Saul Terry, Perry Redan, Harry O'Donaghey, Gerald Michel, Larry Casper and Bonnie Adolph. SGS Managers Ernest Armann, Darryl Peters and Rod Louie generously provided the author with the opportunity to synthesize a large body of existing fisheries information into a forward looking plan.

Over the next five years SGS intends to expand the scope of the plan with new initiatives that merge the wisdom of the elders with the technical approaches detailed in the present document.

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1. Introduction

Water, lakes, rivers and the fish contained within are sacred for the St'át'imc. The St'át'imc fishery provides sustenance, spiritual well-being, and formerly served as the basis for a thriving economy. Salmon and other fish resources historically represented the most important St'át'imc food item and sts'wan (wind-dried salmon) as well as salmon oil provided crucial winter food supplies. Both sockeye and chinook salmon are actively harvested and continue to provide an essential St'át'imc food source.

Previous impacts from the Hell's Gate slide, overfishing, hydropower development, climate warming and other forms of habitat change have combined to adversely affect the St'át'imc fishery. A proactive approach is needed to ensure that fisheries sustain present and future needs. This fisheries plan has been prepared by St'át'imc Government Services (SGS) as a contribution towards this objective by outlining St'át'imc fisheries priorities and a roadmap for implementation between 2013-2017.

Preparation of the plan was triggered by the completion of the 2011 St'át'imc Hydro Agreement which specifies programs for the restoration of fisheries resources in the Territory. The plan seeks to integrate traditional values with a modern management system to best serve the interests of communities and the Nation as a whole. It encompasses all aspects of fisheries management and reviews information collected by St'át'imc Nation Hydro, Northern St'át'imc Fisheries, DFO, BC Hydro, BC Ministry of Environment and the former International Pacific Salmon Fisheries Commission to provide a basis for future activities.

2. St'át'imc Fisheries

Ecosystem Considerations

St'át'imc values include living in harmony with all living things. St'át'imc have thrived over the millennia by evolving an ecosystem ethic that has both spiritual and biophysical dimensions. Principle 5 of the St'át'imc Land and Resource Authority Preliminary Draft Land Use Plan[1] reflects this worldview:

> *The St'át'imc agree that all land and resource based activities within the territory will protect the land, water, air, mineral, fishery, wildlife, plant, and cultural heritage resources for all generations (including but not limited to land features, stories and legends) and all living things that rely upon the environment. Thus, on St'át'imc territory, activities in the forest, including all planning and resource use or development must:*
>
> - *maintain fully functioning forests at all scales through time;*
> - *place protection of water quantity, quality and timing of flow, including watershed restoration, first and foremost;*
> - *focus on what to leave, not on what to take;*
> - *respect the ecological limits of various ecosystems to human disturbance;*
> - *maintain, protect, and where necessary, restore biological diversity and ecological integrity; including genetic, species, and community diversity; and,*
> - *respect and maintain disturbance regimes, landscape patterns and stand structures through time and space that are within the historic range of variability (which includes St'át'imc traditional management as an integral component).*

St'át'imc fisheries rely on healthy aquatic ecosystems. Human activities should enhance, rather than undermine, the functioning of aquatic ecosystems. Effective protection of aquatic ecosystems and wise utilization are essential for the persistence and sustainability of St'át'imc fisheries resources.

Importance of Salmon

Until recently, salmon have served as the most important food source for the St'át'imc. It is no co-incidence that St'át'imc communities are strategically located in close proximity to the Fraser River and its abundant salmon resources. The Fraser River can be viewed as a giant conveyor belt that delivers one of the best sources of protein on the planet to the doorsteps of the St'át'imc. St'át'imc communities have always been directly involved in fishing and historically, preserved

[1] St'át'imc Preliminary Draft Land Use Plan, Part 1. March 2004. http://www.statimc.net/report/part1.pdf

salmon served as the main component of winter food supplies when other food sources were scarce. Previous estimates suggest that 60% of the traditional St'át'imc diet was fish[2].

Formerly, the productivity of the salmon fishery put St'át'imc people at the hub of an extensive trade network extending from coastal areas of Sechelt, Sliammon and Stolo, to the forests of the Shuswap[3]. According to Kennedy and Bouchard[3], dried salmon and salmon oil were exchanged for goods such as dentalium shells, dried seafoods, coastal woods, berries, and even slaves who were brought by coastal tribes. Dressed skins of deer, elk, caribou and occasionally buffalo were traded from the east. Historically, Hudson's Bay Company posts in the interior also relied on the St'át'imc for winter supplies of dried fish.

When the salmon runs failed, the consequences were devastating. In the late 1850s, three consecutive years of run failures resulted in a severe famine and hundreds of deaths from starvation[2]. There have been numerous cases of salmon run failures due both to natural and human causes (e.g. Hell's Gate slide). Additionally, Fraser sockeye fluctuate in numbers from year-to-year due to cyclic dominance. During off-cycle years, there are relatively few sockeye returning to the Fraser River.

Salmon are the focus of numerous St'át'imc songs, dances and legends and salmon serve as a staple item at ceremonies and other important events. Traditionally, First Salmon ceremonies occurred in April-May following the start of the Chinook run and in early July when Early Stuart sockeye were migrating upstream. These fish are considered as a form of medicine and are provided preferentially to Elders.

There are different perspectives on the economic uses of St'át'imc salmon. On one hand is the historical precedence; salmon were a traditional form of commerce and barter. On the other, the wisdom of selling your food supply has been called into question.

One of the most important fishing locations in St'át'imc Territory is Sxetl , meaning "drop-off" in reference to the 3.5 m vertical change in river height between high water and low water where the river flows through a narrow channel beside the Bridge River. Formerly, there was a bridge for crossing between fishing areas at this site. Sxetl is also called Bridge River Rapids and Six Mile Rapids, a reference to the distance from the mouth of Cayoosh Creek.

[2] Rod Louie, personal communication

[3] Kennedy, I.D. and R. Bouchard. 1992. *Stl'atl'imx* (Fraser River Lillooet) Fishing. p. 266-354 *In* B. Hayden [ed.] A Complex Culture of the British Columbia Plateau. Traditional *Stl'atl'imx* Resource Use. UBC Press.

Salmon fishing provides an important opportunity for transfer of St'át'imc Knowledge related to fishing and fish processing. Transfer of this knowledge frequently occurs during occupation of summer fishing camps.

Sts'wan

Salmon Populations that Sustain the Fishery

The St'át'imc fishery mostly harvests salmon that are migrating to upstream spawning grounds. The status of these migratory salmon populations can be evaluated by analyzing escapement (the number of salmon that spawn) and catch data that are collected by DFO on an annual basis. Relevant data are summarized below. There are eight important sockeye stocks (Figure 1) that contribute to the St'át'imc Fishery: Early Stuart (ES), Late Stuart (LS), Stellako (S), Nadina (N), Horsefly (H), Chilko (C), Gates (G) and Portage (P).

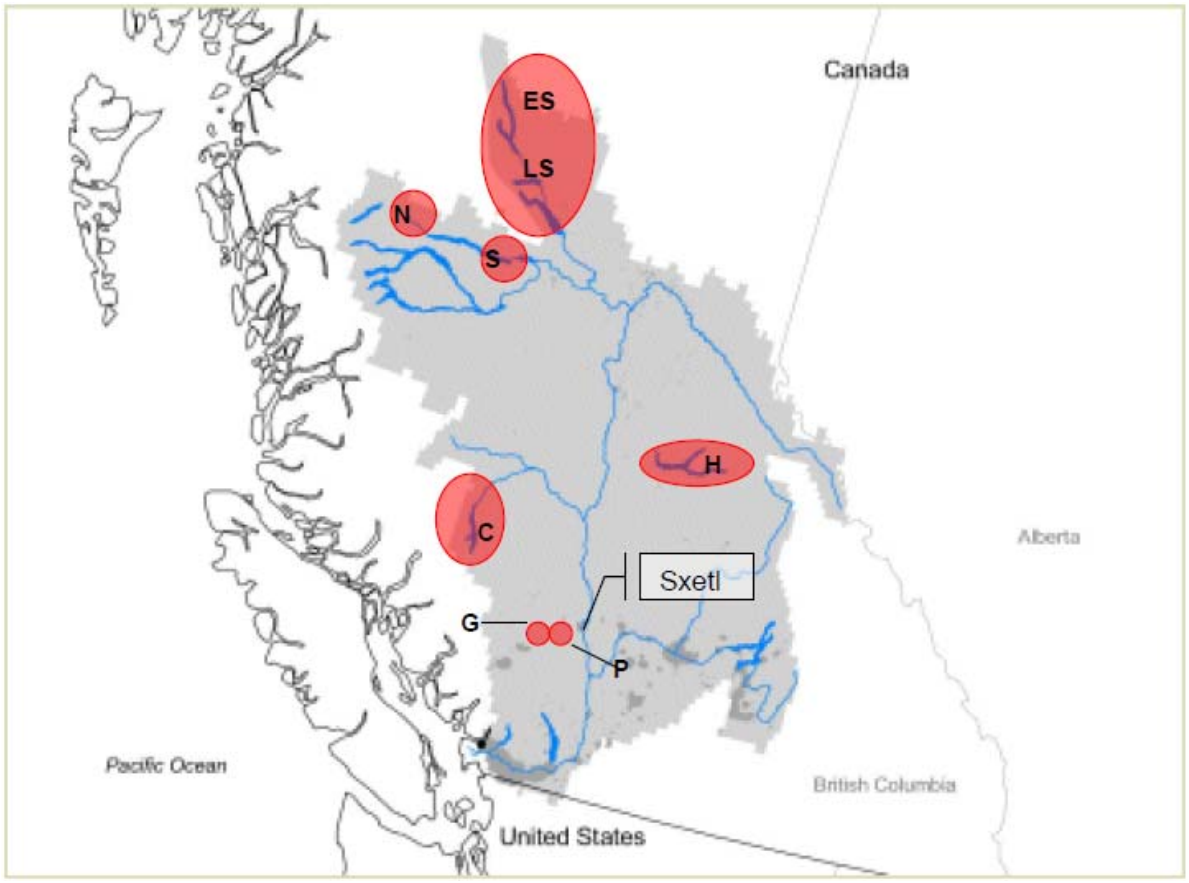


Figure 1: Location of sockeye stocks which contribute to the Northern St'át'imc fishery.

Sockeye in the Fraser River are managed by run timing groups of which there are four: 1) Early Stuart, 2) Early Summer, 3) Summer, and 4) Late. There are four major summer run sockeye stocks that have historically contributed the highest numbers of fish to the St'át'imc fishery: Horsefly, Chilko, Stellako and Late Stuart. These Summer Run sockeye have migration timing that places them in St'át'imc Territory during August when drying conditions are optimal.

Summer Run sockeye declined severely from the 1990's onwards (Figure 2). The long term decline coupled with the disastrous run failure in 2009 when only 1.5 million sockeye returned to the Fraser prompted the Government of Canada to establish the Cohen Commission of Inquiry which released its final report on October 29, 2012[4]. In 2010, production rebounded to 28.4 million. During 2012, the sockeye return to the Fraser River was approximately 2.3 million fish.

[4] www.cohencommission.ca

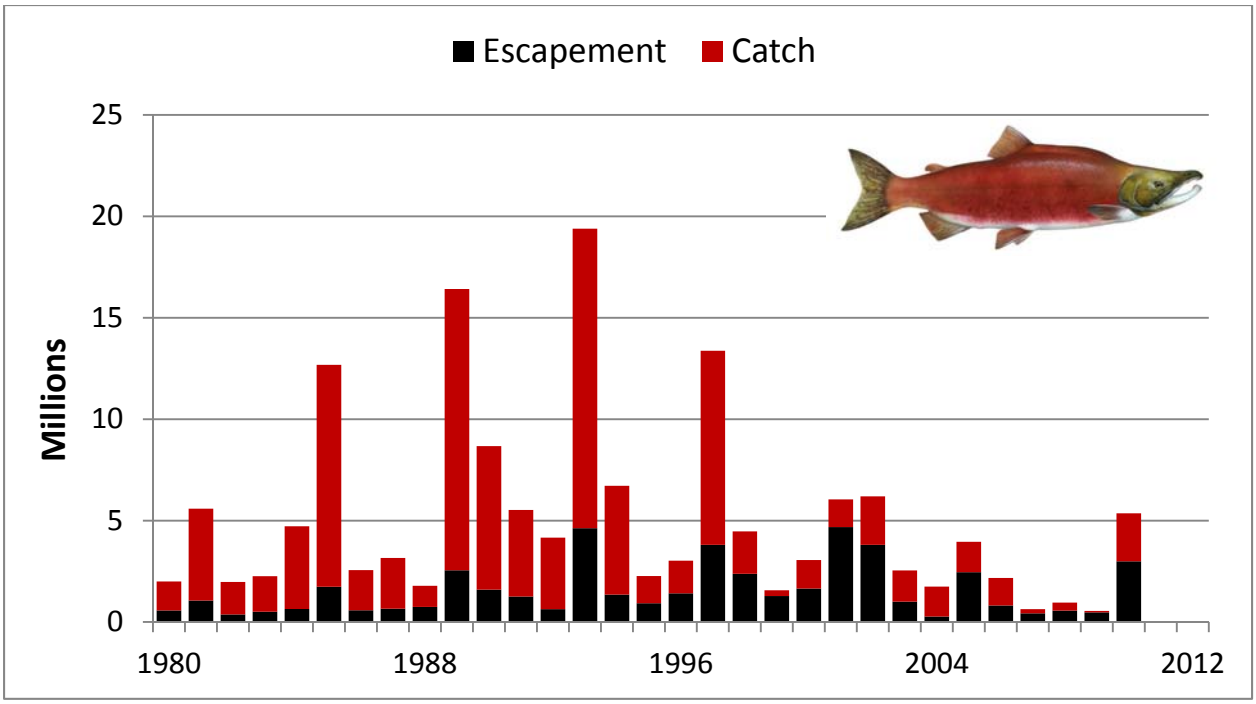


Figure 2. Time series of summer run sockeye production. Most of the catch between 1980 - 2005 was taken by commercial harvesters. Source: Pacific Salmon Commission.

Trends in sockeye escapements between 1980 – 2010 for the four summer run stocks which contribute to the St'át'imc fishery are shown in Figure 3. In all cases, there has been a modest or severe reduction in the escapement levels since the 1990's or early-2000's. The cyclic dominance patterns in these sockeye stocks have a profound impact on fish availability from year-to-year. During 2010, the year of the bonanza sockeye return to the Fraser, both Chilko and Portage Creek sockeye had exceptionally large escapements (Figure 3).

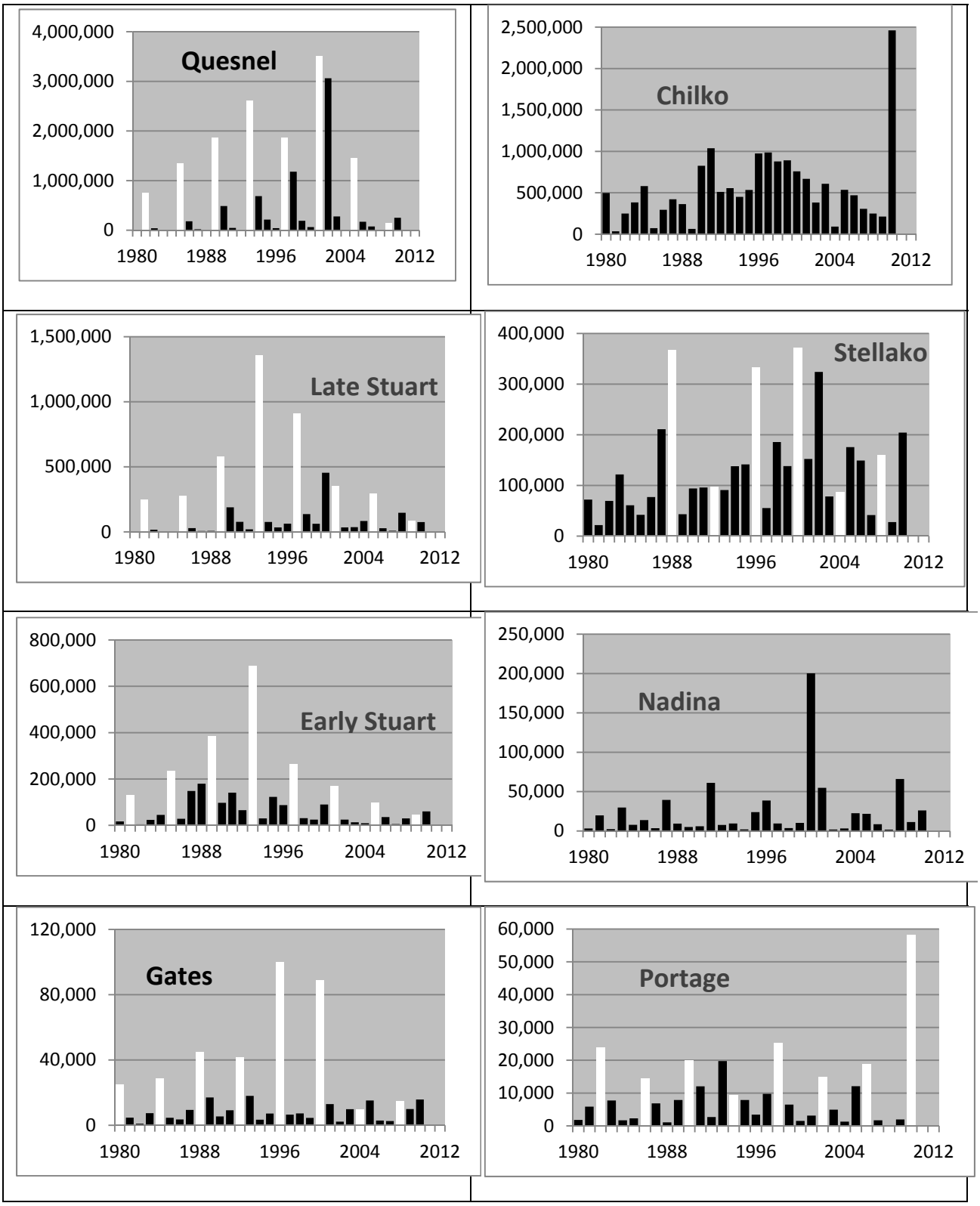
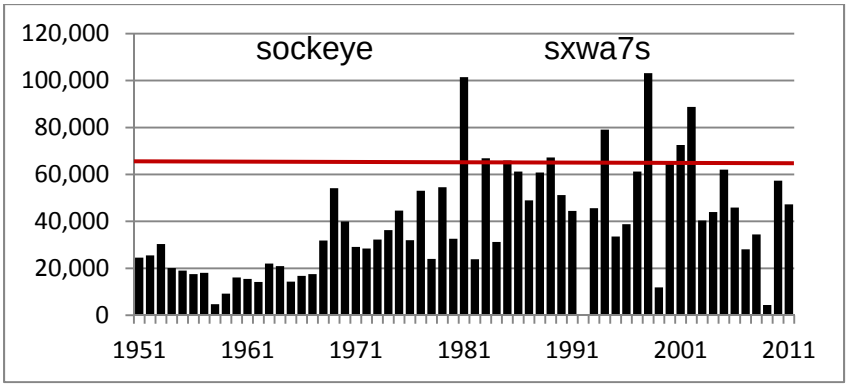


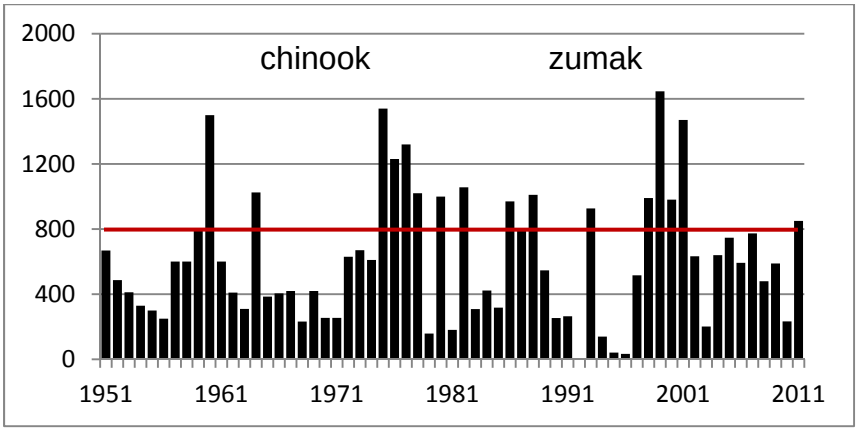
Figure 3. Time series of sockeye escapements for the eight populations of primary importance in the St'át'imc fishery. White bars indicate dominant year classes. Source: Pacific Salmon Commission.

There is minimal harvest of Gates Creek and Portage Creek sockeye, the two sockeye stocks that spawn within Northern St'át'imc Territory. Gates Creek sockeye are part of the Early Run timing group and Portage is a Late Run population that was transplanted from the Adams River. N'Quatqua have been working with other partners to rejuvenate the Gates Creek spawning channel and BC Hydro have modified their Seton Plant operations to protect downstream migrating smolts (both Gates Creek and Portage Creek).

Catches

Numbers of fish harvested by the St'át'imc fishery between Kelly Creek and Texas Creek are shown below. DFO allocations are indicated by the red horizontal lines: 65,000 sockeye and 800 chinook.





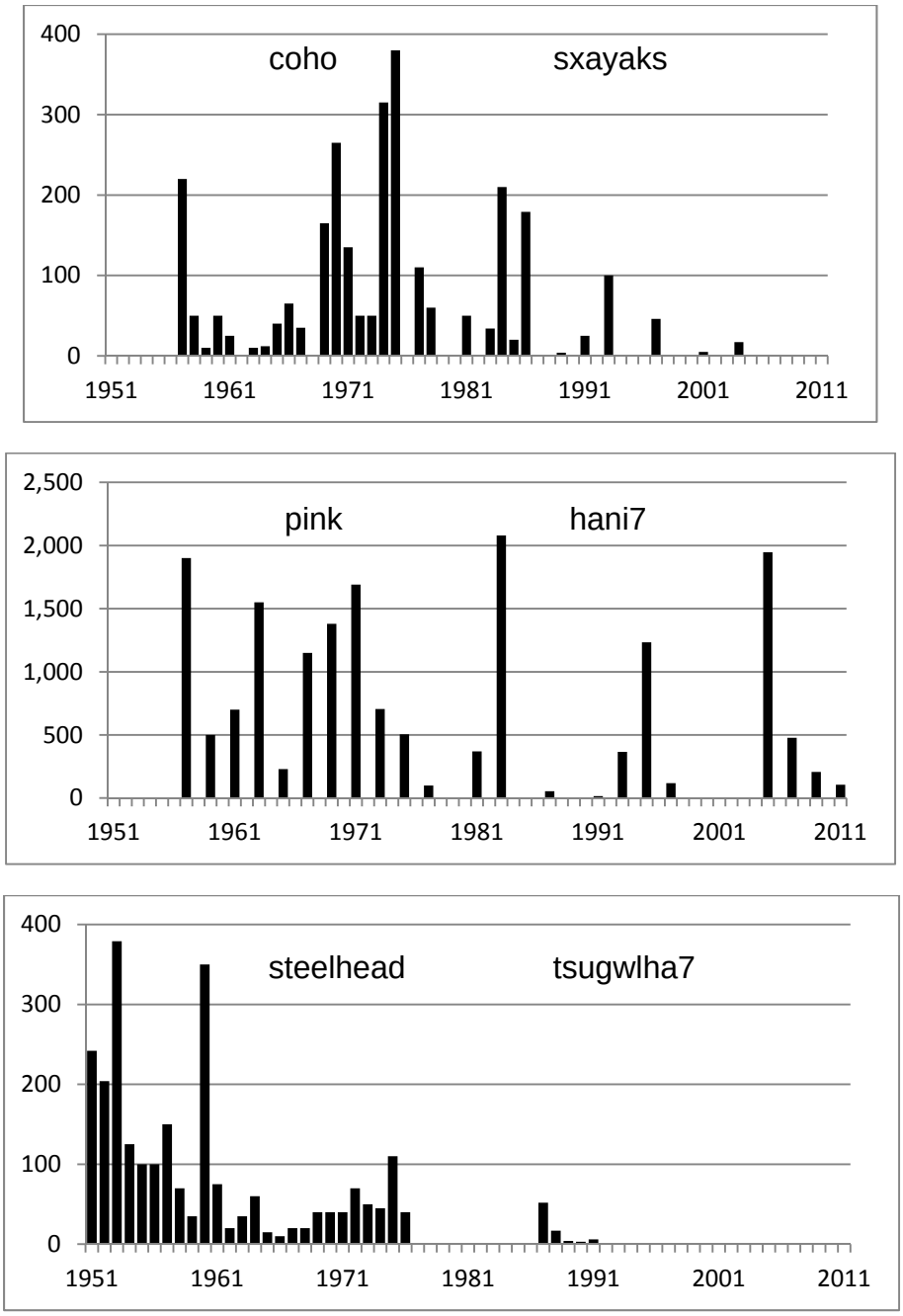


Figure 4. Numbers of salmon and steelhead captured in the St'át'imc fishery between 1951 – 2011. Catches were not enumerated in 1992. Source: DFO.

Sockeye catches peaked in 1998 with a catch of 103,000 fish and declined somewhat thereafter reaching a low of 4,400 fish in 2009 when the fishery was essentially closed due to low sockeye returns throughout the watershed. Reduced sockeye catches in certain years can reflect poor

drying conditions during August, increased availability of alternate food sources and a reduced number of salmon caught per fisher[5].

Traditionally, the St'át'imc fishery targeted high numbers of Chinook salmon as well as sockeye, and during the early 1900's, it was reported that Sam Mitchell's family (Xaxlip) alone dried 500-600 fish annually[6]. In recent years, Chinook catches peaked at 1646 in 1999 and 1470 in 2001. There were 850 chinook captured in 2011, slightly above the DFO allocation. Within St'át'imc Territory, there are several chinook populations including those in the Bridge, Portage, Seton, and Cayoosh Rivers. Bridge River Chinook are a remnant population that was largely eliminated following Mission (precursor to Terzhagi) Dam construction. Until recently, there was also a population in Gates Creek. This population likely originated from outplants of eggs into Gates Creek from the Upper Bridge River population (Tyaughton Creek) prior to construction of the Mission Dam.

Chinook captured in the St'át'imc fishery include those from a diverse array of chinook stocks that originate upstream of Sxetl (Figure 5).

[5] Gerald Michell, personal communication

[6] Kennedy, I.D. and R. Bouchard. 1992. *Stl'atl'imx* (Fraser River Lillooet) Fishing. p. 266-354 *In* B. Hayden [ed.] A Complex Culture of the British Columbia Plateau. Traditional *Stl'atl'imx* Resource Use. UBC Press.

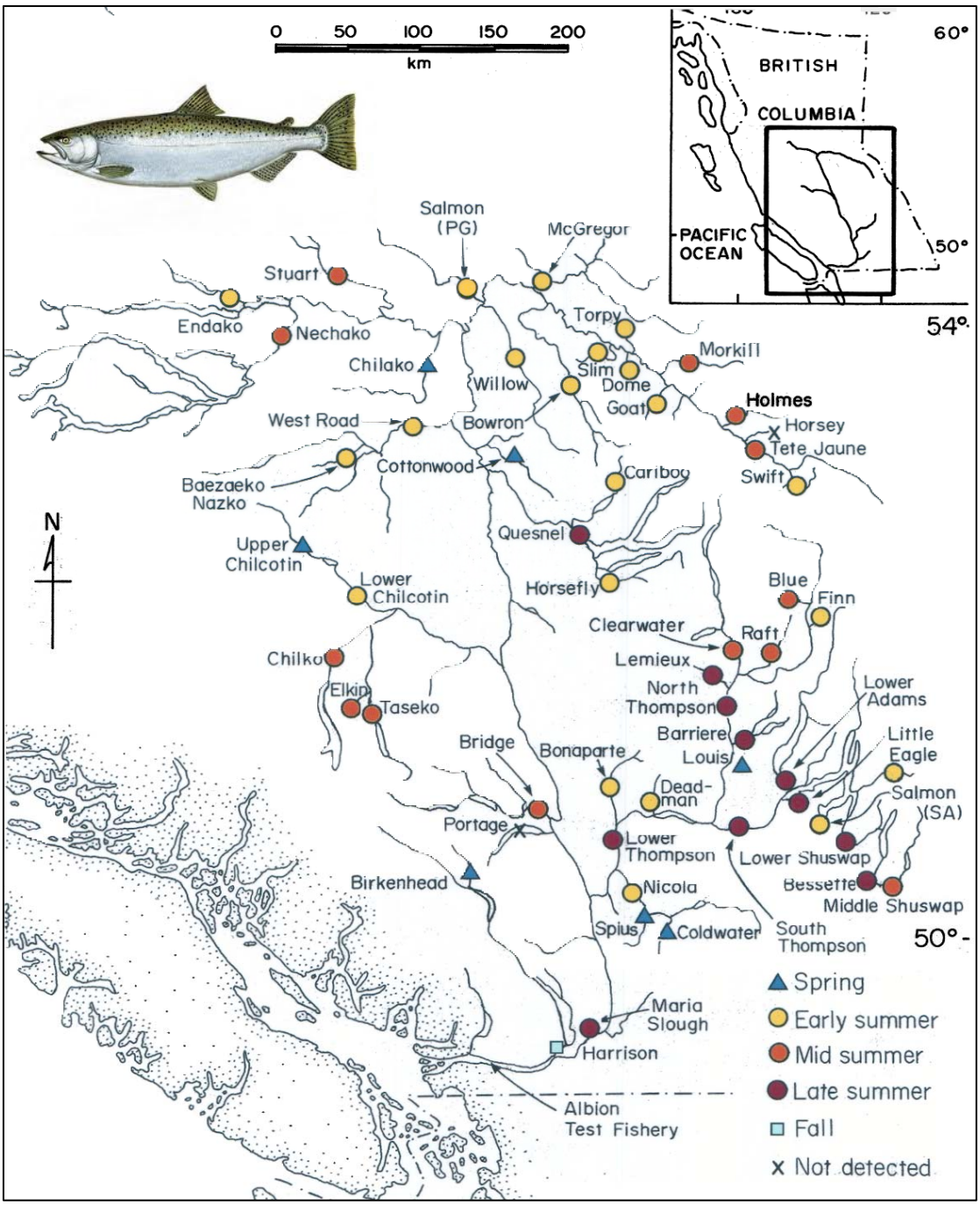


Figure 5. Location of chinook spawning grounds in the Fraser River. There are around 20 populations which support mean annual escapements of over 1000 fish. Source: DFO.

Presently there are no directed fisheries on coho or steelhead, and only modest numbers of pink salmon are harvested on odd-numbered years. Interior Fraser coho have been listed as endangered under COSEWIC and there is a serious conservation concern for steelhead; capture fisheries are prohibited.

Fish Populations in the Bridge/Seton Watersheds

There are at least 24 kinds of fish in the Bridge/Seton watersheds, including:

sockeye salmon	gwenish (kokanee)
chinook salmon	coho salmon
chum salmon	pink salmon
steelhead trout	cutthroat trout
rainbow trout	mountain whitefish
lake whitefish	Dolly Varden char
lake trout	bull trout
burbot	white sturgeon
longnose sucker	bridgelip sucker
peamouth chub	northern pikeminnow
redside shiner	torrent sculpin
prickly sculpin	slimy sculpin
coastrange sculpin	Pacific lamprey

The distribution of salmon populations that spawn within Northern St'át'imc Territory is shown in Figure 6.

Sockeye Salmon

Sockeye production is greatest in Gates Creek where it has been enhanced via the Gates Creek Spawning Channel. Portage Creek is also an important sockeye producer. Sockeye have been observed in smaller numbers in the Bridge, Yalakom and Seton Rivers. These fish are believed to be strays that enter the rivers when there are adverse migration conditions.

Chinook Salmon

The two largest chinook populations originate in the Bridge River and Portage Creek (Figure 7). Smaller numbers originate in the Seton River and chinook were formerly present in the Yalakom River (maximum observed = 450; Figure 7). Bridge River chinook have shown an alarming reduction in escapement levels and in 2009, only 11 adults were counted. In 2011, 77 adults were counted, well below the former range of between 500-1000 spawners below Terzhagi Dam.

Coho Salmon

The main coho producers are Bridge, Seton, Portage and Gates. Time series data (Figure 8) are highly variable which may be partially an artifact reflecting that coho are notoriously difficult to count during fall spawning periods.

Pink Salmon

Pink salmon are numerically the most abundant salmon species of salmon in odd-numbered years. They are absent during even-numbered years. While the two Seton pink salmon spawning channels have been converted to multi-species channels, large numbers of pinks still return.

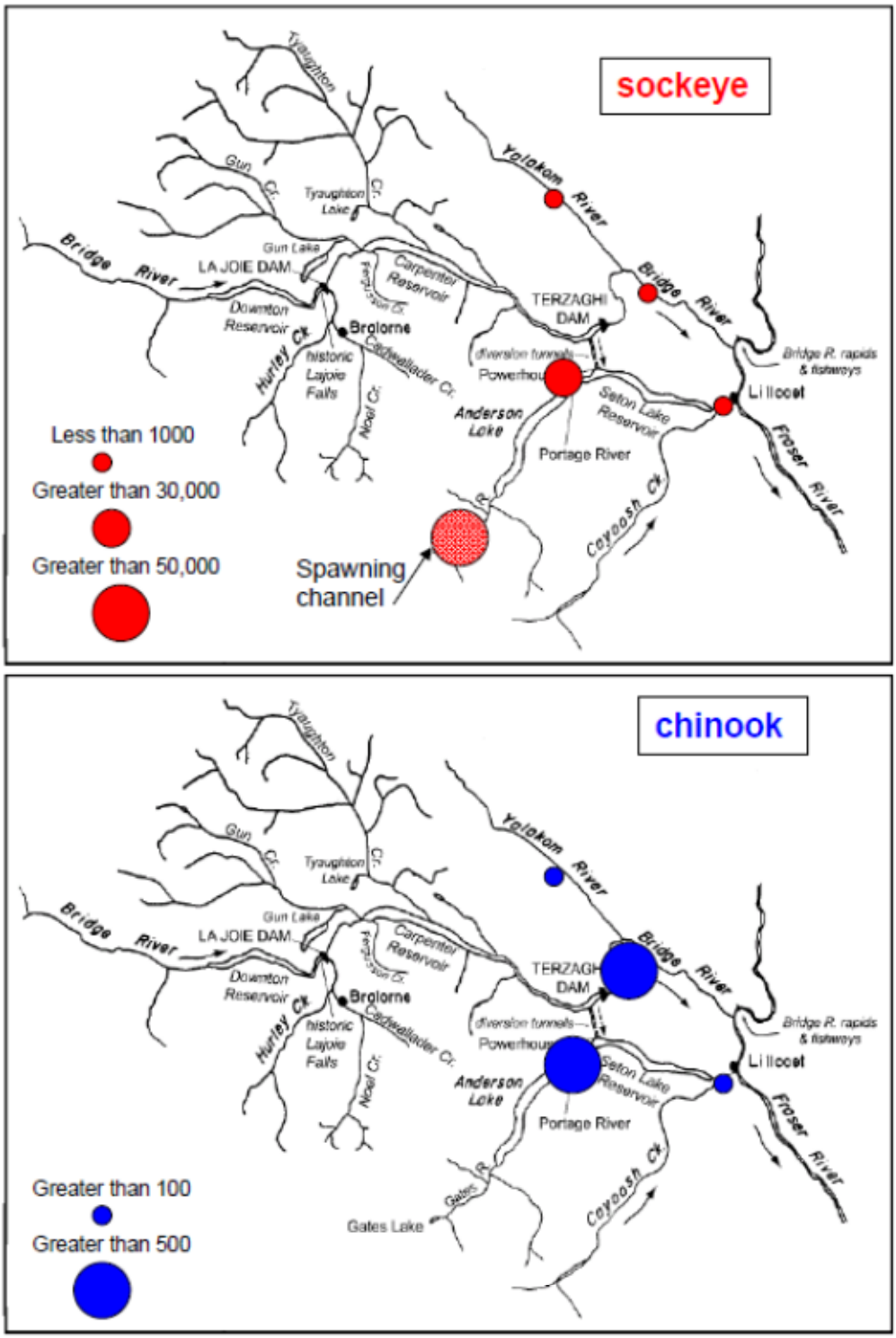


Figure 6. Salmon spawner distributions in the Bridge/Seton watersheds based on historical data[7].

[7] Komori, V. 1997. Strategic fisheries overview for the Bridge/Seton habitat management area. Report prepared for Fraser River Action Plan, Dept. Fisheries and Oceans, Vancouver, BC. 88 p.

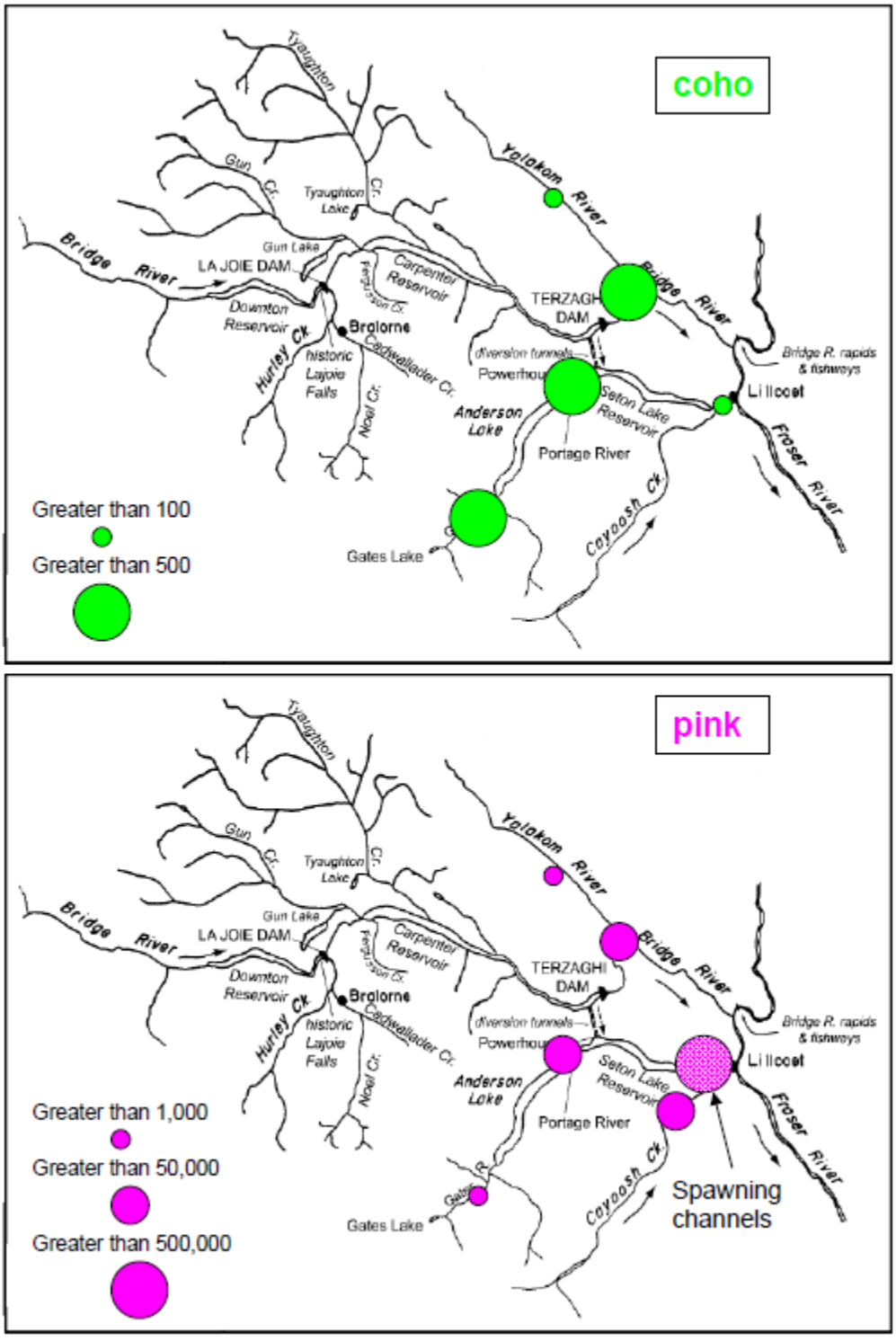


Figure 6 (cont'd).

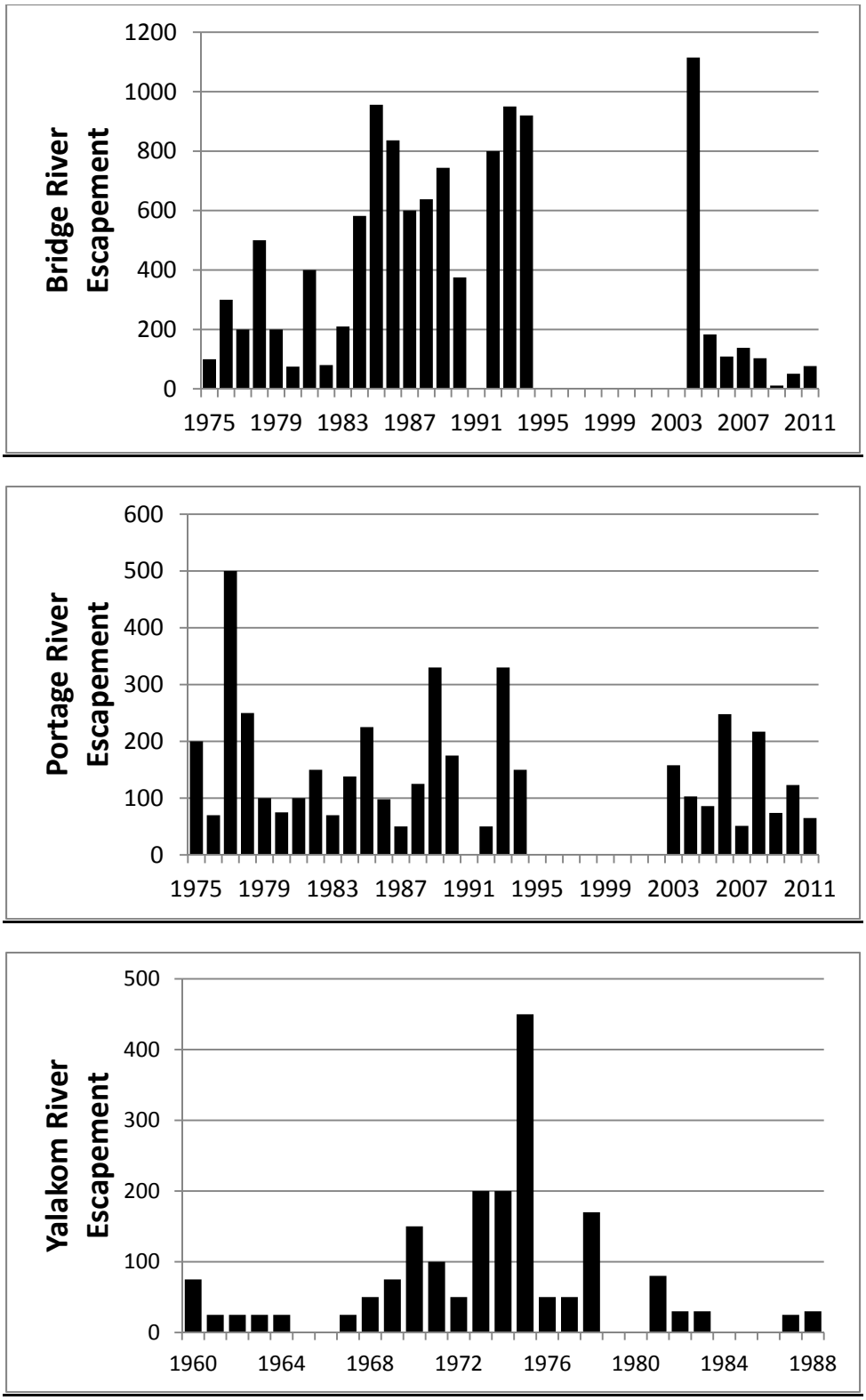


Figure 7. Trends in chinook escapement in the Bridge and Portage Rivers between 1975-2011 (upper and middle panels) and the Yalakom River between 1960 - 1988 (lower panel). Zero values indicate that no surveys were carried out or that data are unavailable. Source: DFO.

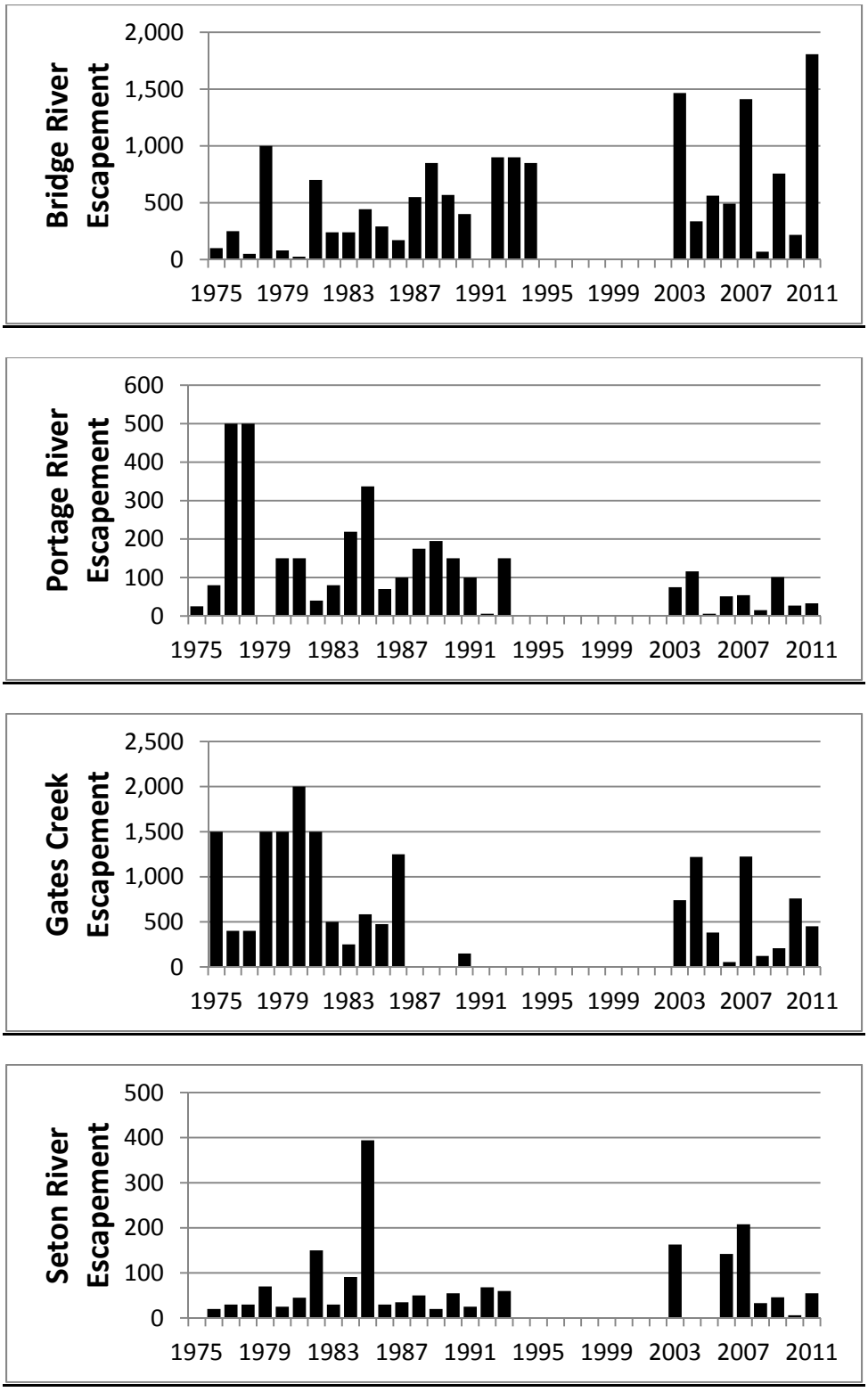


Figure 8. Trends in coho escapement in the Bridge, Portage, Gates and Seton Rivers between 1975-2011. Zero values indicate that no surveys were carried out or that data are unavailable. Source: DFO

Gwenish

Three of the lakes/reservoirs in the Bridge/Seton system produce kokanee, the land-locked form of sockeye salmon. These fish are known as gwenish, or "floaters" due to their tendency to float to the surface following lake spawning. Gwenish are most numerous in Anderson and Seton Lakes. Kokanee in Carpenter Reservoir are the progeny of transplanted fish from Meadow Creek, a tributary of Kootenay Lake.

Gwenish have unique spawning behaviors. The fish are black in colour (Figure 9) and utilize deep (20-70 m) spawning areas. Spawning periods extend throughout November in Seton Lake, and throughout January in Anderson Lake. Historically, gwenish were extremely numerous. Local residents report that dead gwenish used to be piled high and wide along the beaches of Seton and Anderson Lakes.

Figure 9. Gwenish (kokanee) from Anderson Lake, January 2001[8].

Two gwenish spawning areas have been identified in both of Seton and Anderson Lakes[9] (Figure 10). Gwenish spawners in Anderson Lake are older (4+ years old) than those in Seton Lake (2+ years old). Anderson Lake gwenish are also larger and heavier fish. Stables[10] surveyed gwenish spawning areas using hydroacoustics and an underwater video camera and found that highest densities of spawners were found at 30-60 m depths on gravel fans beside talus slopes along the lake shore.

[8] Morris, A.R., A. Caverly , M.W. Chamberlain and E. Braumandl. 2003. Seton and Anderson Lakes Kokanee and Char Assessment. Prep. for: Bridge Coastal Restoration Program.

[9] Morris, A.R. and A. Caverly. 2004. 2003-2004 Seton and Anderson Lakes Kokanee Assessment. Prep. for BC Conservation Foundation.

[10] Stables, T. B. 2004. Acoustic and video surveys of kokanee and their potential deepwater spawning habitat in Anderson Lake, BC. Final report prepared by Shuksan Fisheries Consulting for BC Conservation Foundation and BC Ministry of Land, Water, and Air Protection, Kamloops. 38p.

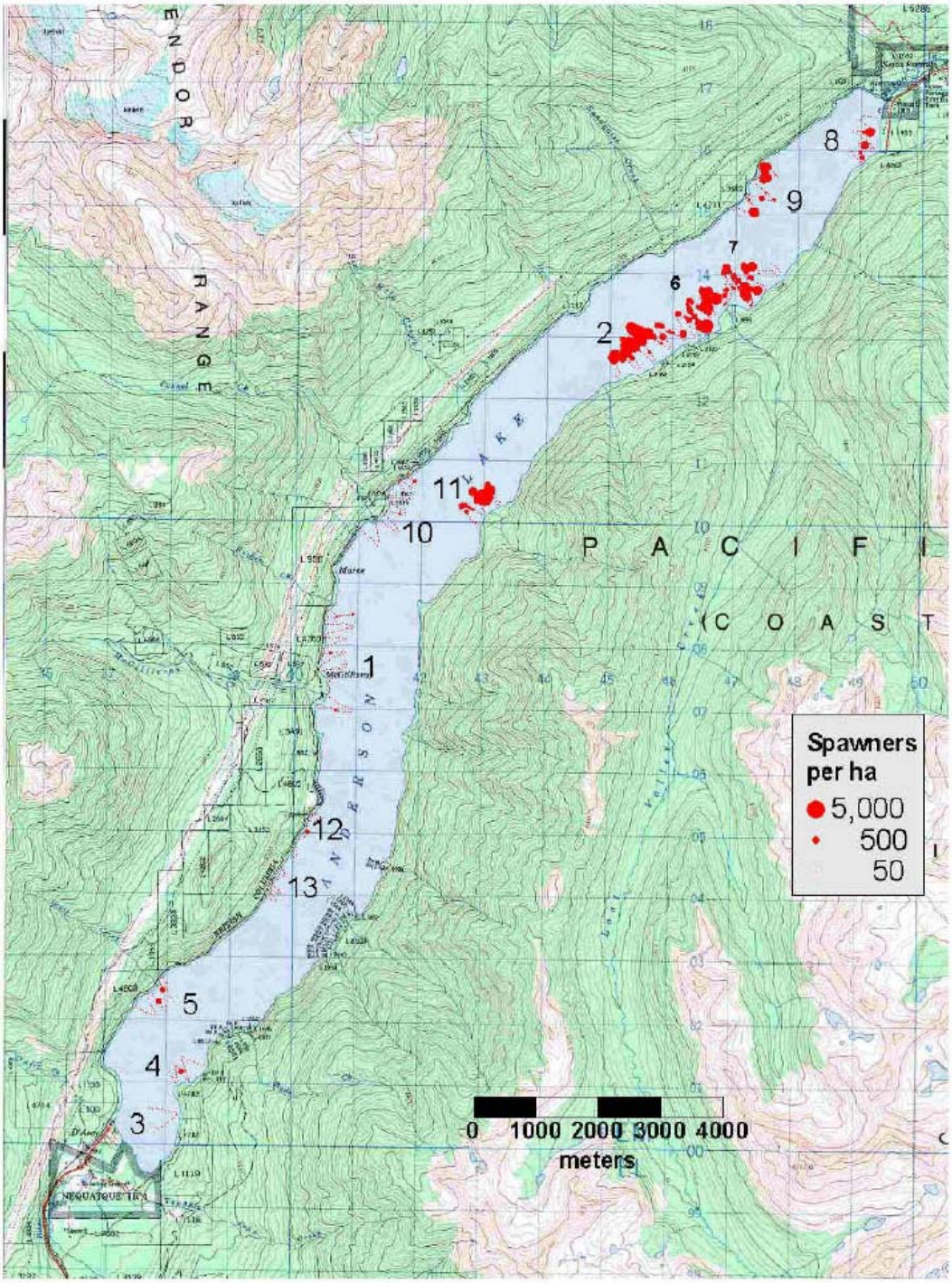


Figure 10. Gwenish spawning areas (red circles) in Anderson Lake[11].

[11] Stables, T. B. 2004. Acoustic and video surveys of kokanee and their potential deepwater spawning habitat in Anderson Lake, BC. Final report prepared by Shuksan Fisheries Consulting for BC Conservation Foundation and BC Ministry of Land, Water, and Air Protection, Kamloops. 38p.

Japanese researchers recently reported the discovery of a new species of land-locked salmon in Lake Saiko that turns black during spawning, occupies deep water (30-40 m) spawning habitats and which spawns in winter or spring. It has been named as a separate species (*Oncorhynchus kawamurae,* common name "kunimasu") and was thought to have been extinct since 1940[12]. This important Japanese discovery raises a question as to whether gwenish in Seton and Anderson Lakes, which show similar behaviors as kunimasu, are a separate species as this would have significant conservation implications that need to be evaluated.

Steelhead and Rainbow Trout

Steelhead and rainbow trout are the same species, *Oncorhynchus mykiss*. Steelhead are the sea-run form, while rainbow trout reside in freshwater. Within St'át'imc Territory, steelhead are concentrated in the Bridge and Yalakom Rivers. Radiotagging of steelhead at the mouth of the Bridge River[13] identified the following spawning areas:

- upstream of the Yalakom confluence;
- Yalakom River; and,
- Bridge River downstream of the Yalakom.

A population estimate for the entire Bridge River population in 2000 was 155 spawning adults.

Within the Seton system, steelhead spawning occurs primarily in the Cayoosh Creek compensation channel[14]. Steelhead are also present in Portage Creek and Gates Creek.

Rainbow trout are widely distributed throughout the Bridge/Seton watersheds. Rainbow trout habitats have been affected by reservoir construction and operation, but there is no quantitative estimate of the magnitude of these effects.WUP monitoring programs have been designed to fill these data gaps.

[12] Nakabo, T., K. Nakayama, N. Muto amd Miyazawa. 2011. *Oncorhynchus kawamurae* "Kunimasu," a deepwater trout, discovered in Lake Saiko, 70 years after extinction in the original habitat, Lake Tazawa, Japan. Ichthyological Research 58: 180-183.

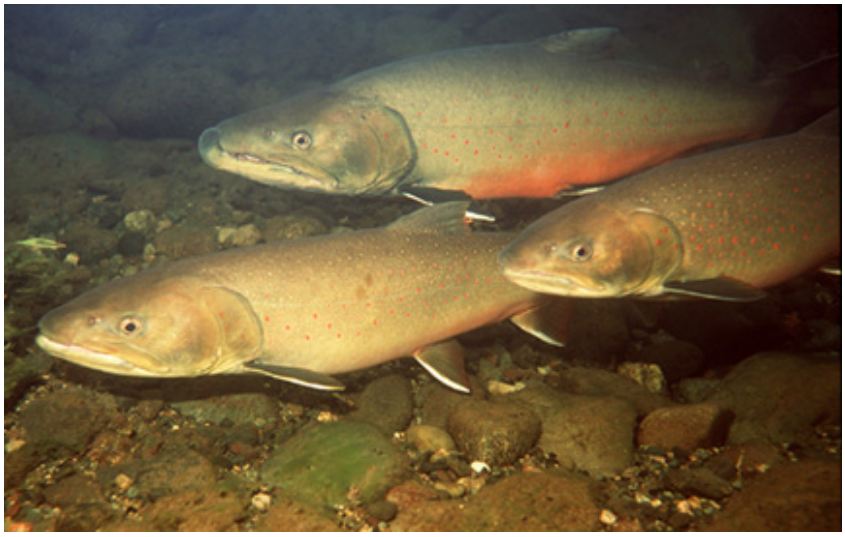
[13] Hagen, J. 2001. Adult steelhead (*Oncorhynchus* mykiss) habitat use and population size in the Bridge River, springtime 2000. Prepared for BC Environment, Fisheries Branch, Kamloops.

[14] Webb, S., R. Bison, A. Caverly and J. Renn. 2000. The reproductive biology of steelhead *(Oncorhynchus mykiss)* in the Bridge and Seton Rivers, as determined by radio telemetry 1996/97 and 1998/99. Technical report of the BCMinistry of Environment, Lands, and Parks, Kamloops 42 pp.

Bull Trout

Bull trout are a member of the char family (genus *Salvelinus*) and were formerly misidentified in many parts of the province as Dolly Varden. Bull trout occur in larger tributaries of Anderson Lake, Gates Creek, Portage River and the Bridge River. Bull trout from the Anderson Lake system migrate into the Gates Creek spawning channel when sockeye are present. Stream walks during September/October 2000[15] in two tributaries of the Portage River, Spyder Creek and Whitecap Creek, yielded a total of only 6 adult bull trout. A total of 7 adult bull trout were observed during an August snorkel survey downstream of the counting weir in Gates Creek.

Bull trout in the Bridge River were radio-tagged in April/May 2000 and tracked in the mainstem Bridge River between the Fraser River and the Yalakom River confluence[16]. After initial tagging, bull trout moved upstream to spawn in the Yalakom River during September. Bull trout in the Bridge River appear to divide their time between the Bridge River mainstem, the Yalakom River and over-wintering in either the Bridge or Fraser Rivers.



Bull Trout[17]

[15] Morris, A.R., A. Caverly, M.W. Chamberlain and E. Braumandl. 2003. Seton and Anderson Lakes Kokanee and Char Assessment. Prep. for: Bridge Coastal Restoration Program.

[16] Chamberlain, M. W. 2002. Bridge River Bull Trout (*Salvelinus confluentus)* Investigation 2000. Prepared for BCRP.

[17] photo courtesy of Dr. E. Taylor, Dept. of Zoology, UBC

Aquatic Habitats

St'át'imc Territory includes the Seton, Anderson and Bridge watersheds, the Lillooet/Harrison/Birkenhead watersheds that drain into Harrison Lake, and the headwaters of the Nahatlach and Stein Rivers which join the Fraser River below Lytton (Figure 11). An evaluation of aquatic habitats in Bridge/Seton watershed is provided in Appendix 1.

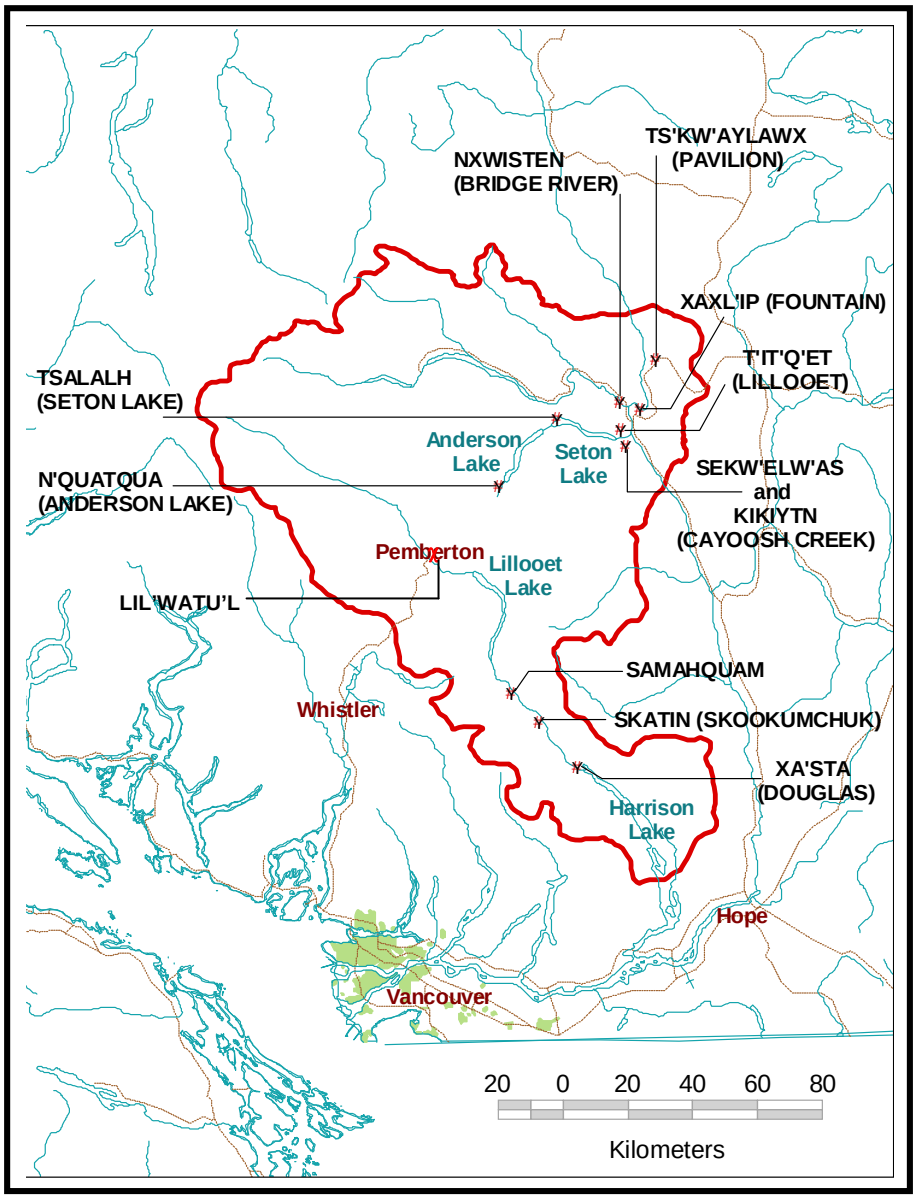


Figure 11. Traditional territory of the St'át'imc Nation[18].

[18] Westland Resource Group. 2004. Draft. St'át'imc socioeconomic impact assessment. Prepared for St'át'imc Nation Hydro and BC Hydro. Victoria.

Hydro Impacts and Mitigation

Aquatic habitats directly affected by hydro operations include Seton Lake, Carpenter Reservoir, Downton Reservoir, Seton River, Bridge River, Cayoosh Creek and numerous small tributaries. Harrison Lake, Lillooet Lake, and many smaller streams may be indirectly affected by transmission lines and adjacent right-of-ways (Figure 12).

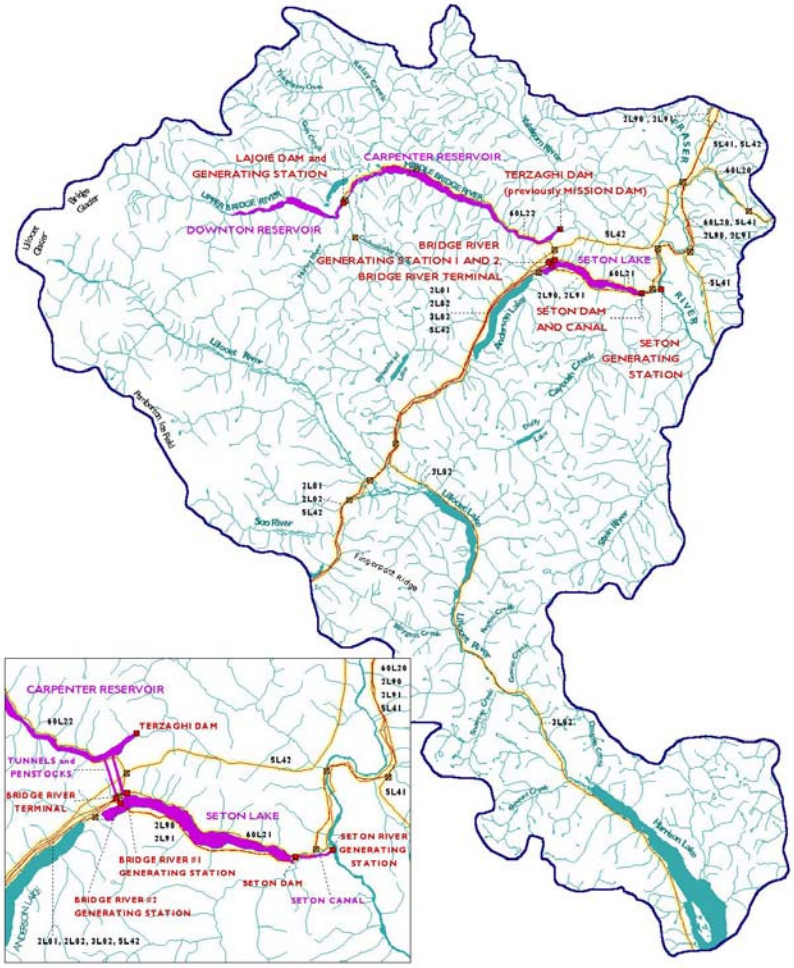


Figure 12. Aquatic habitats and BC Hydro developments within St'át'imc Territory[19].

During the negotiation of the Hydro Agreement, St'át'imc Nation Hydro undertook analyses to evaluate the footprint and operational impacts of the BC Hydro system on aquatic resources. The main aquatic impacts and present and previous approaches to mitigation are summarized in Appendix 2.

[19] Westland Resource Group. 2004. Draft. St'át'imc socioeconomic impact assessment. Prepared for St'át'imc Nation Hydro and BC Hydro. Victoria.

Lil'wat and Southern St’át’imc Fisheries

People from Lil'wat and Southern St’át’imc communities fish primarily in Harrison Lake, Lillooet River, Lillooet Lake and the Birkenhead River (Figure 13). Many members also fish at Sxetl during the August sockeye fishery. The two main salmon stocks that are fished are the Birkenhead chinook run and the Birkenhead sockeye run. Birkenhead chinook are a spring run population and the sockeye are late run. Coho and small numbers of chum are also fished.

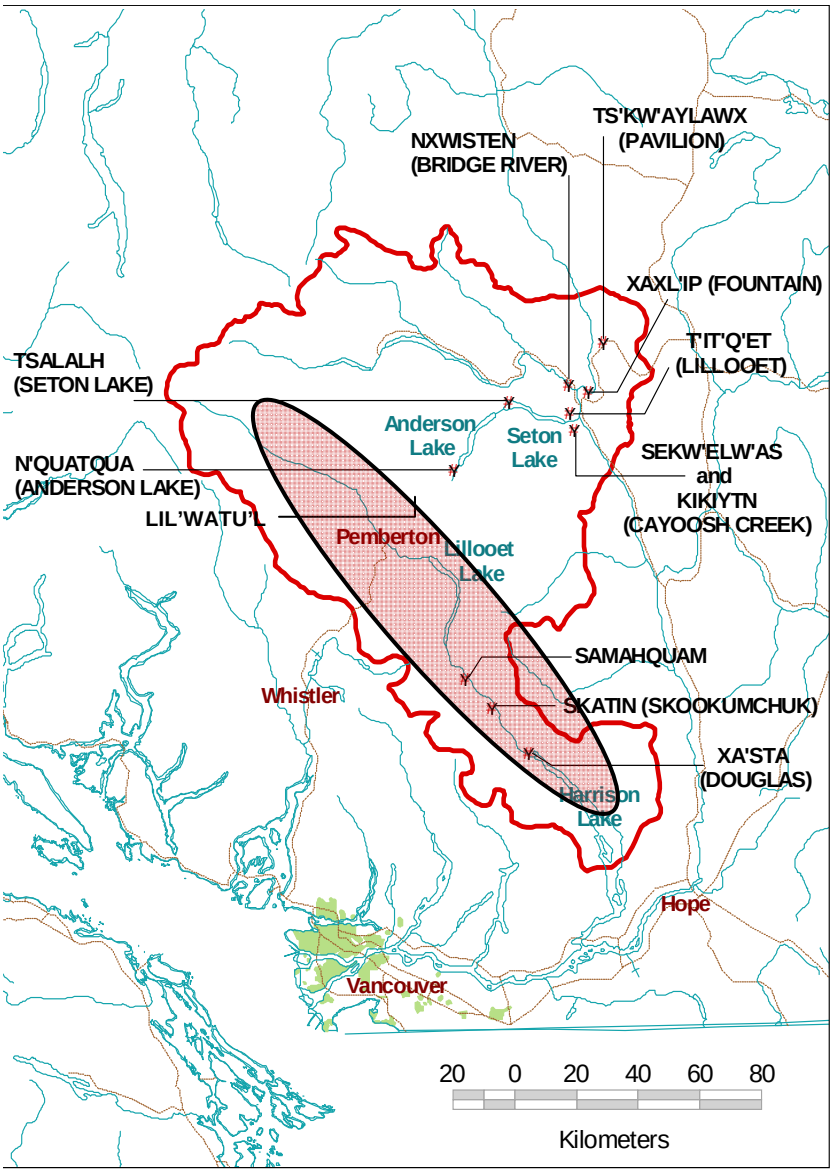


Figure 13. Areas fished by Lil'wat and Southern St’át’imc Communities.

Schubert et al.[20] documented the status of Birkenhead chinook. There are 3 predominant fisheries that harvest Birkenhead chinook including the Alaska troll, First Nations fisheries in the Lower Fraser and First Nations fisheries in the Lillooet system. Harvest rates are about 50%. The spawner population neither increased nor decreased over a 30 year period when both enhancement (Birkenhead Hatchery) was attempted and conservation actions were applied to the fisheries, with an average spawner population of 480 fish. The population has a number of distinctive attributes:

- geographical isolation from other Fraser chinook populations;
- very early entry into the Fraser and Lillooet Rivers starting in the winter. The fish complete their migration before most other chinook populations have even entered the Fraser River;
- the marine distribution extends further north into Alaska than any other Fraser chinook population;
- a large body size and older age-at-maturity among males; and,
- utilization of lake habitats while rearing as fry

As documented by Schubert et al. there are around 15 fishing sites where set nets are utilized, the main ones (Figure 14) include various locations in the lower Lillooet River (In-SHUCK-ch reserves at Douglas, Skatin, Peters and Baptiste-Smith, with the highest effort at the bridge near Douglas) and along the foreshore at the upper end of Lillooet Lake (Lil'wat). Since 1991, angling with bait or lure has been utilized in the Lower Lillooet River and Upper Lillooet Lake and also in the lower Birkenhead River. Historically, the fishery was managed through permits issued to individual band members. It was open seven days per week but in response to conservation concerns, DFO requested that First Nations limit their annual harvest to 25 Chinook in 1976 and subsequent years. Beginning in 1986, the early season fishery was reduced to one day per week. Since 1991, the fishery again expanded to seven days per week as a result of the *Sparrow* decision.

[20] Schubert, N.D., J.R. Candy, R. Cook, J. Greenbank, D. Lofthouse, R. McNicol, C.K. Parken, D. Sneddon, J.A. Tadey and K. Wilson. 2007. Status of Birkenhead River Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Science Advisory Secretariat Research Document 2007/019.

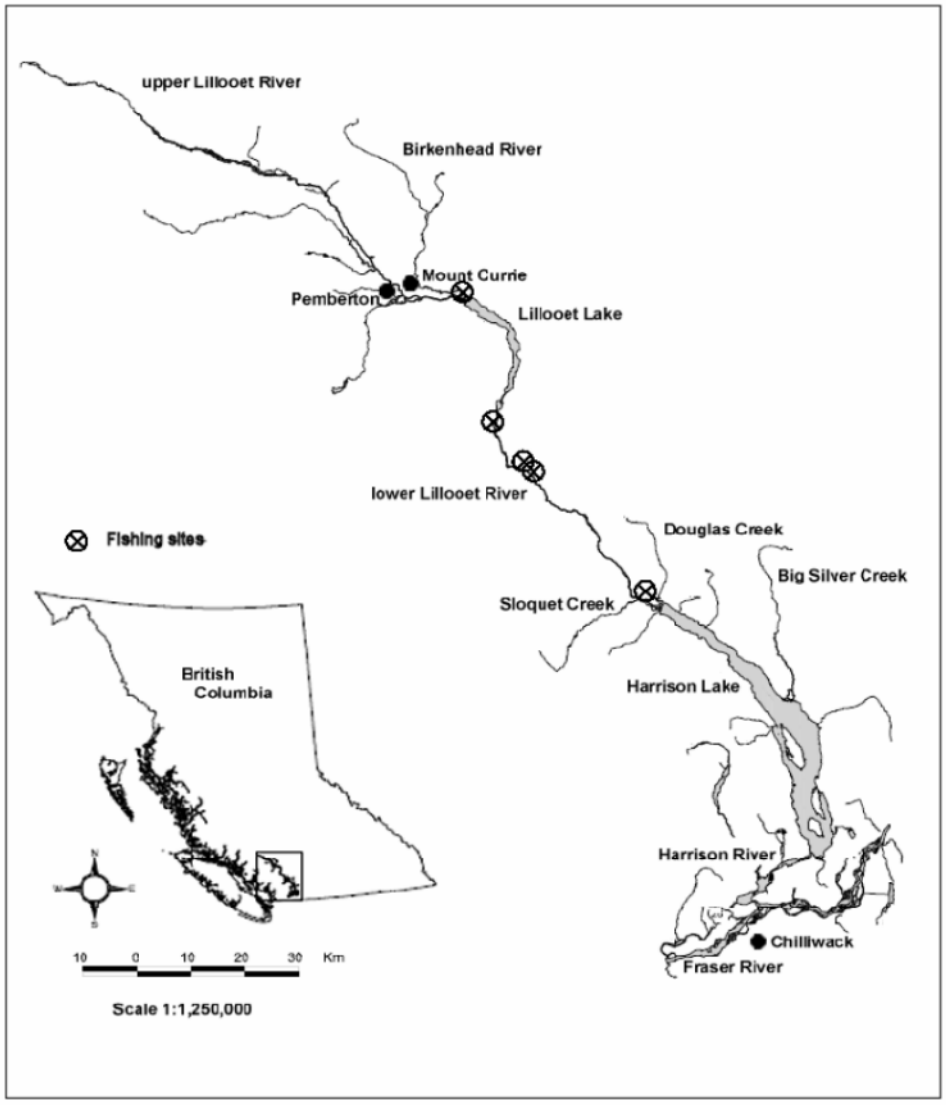


Figure 14. Main fishing sites for Birkenhead chinook[21].

The Schubert et al. paper that was reviewed in draft form by the PSARC Salmon Subcommittee[22]. Key conclusions and recommendations of the Subcommittee included:

1. Little is known about juvenile rearing habitats and the factors that limit the population's freshwater productivity.

[21] Schubert, N.D., J.R. Candy, R. Cook, J. Greenbank, D. Lofthouse, R. McNicol, C.K. Parken, D. Sneddon, J.A. Tadey and K. Wilson. 2007. Status of Birkenhead River Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Science Advisory Secretariat Research Document 2007/019.

[22] B. Riddell (ed.) Proceedings of the PSARC Salmon Subcommittee Meeting Series 2006/018. May 17-18, 2006. Pacific Biological Station. Nanaimo, BC

2. The current assessments of terminal (mainly First Nations) harvest and spawning escapement estimates are inadequate to allow a scientifically defensible characterization of population status; improvements are required.

3. The available escapement data, while of uncertain accuracy and precision, show a population that is small though relatively stable but at an abundance that may threaten its future viability.

4. Biological evidence is sufficiently compelling of the relative uniqueness of the Birkenhead River Chinook population that these and certain other lower Fraser River spring populations (e.g., Upper Pitt River) warrant consideration as a conservation unit under the Wild Salmon Policy.

5. The process currently underway to acquire aboriginal traditional knowledge from Lil'wat Nation elders should be expanded to include the In-SHUCK-ch Nation.

6. A response team should be formed to develop population and habitat assessment frameworks that are consistent with the information requirements for conservation units under the Wild Salmon Policy (WSP).

7. The large uncertainty in the terminal return data and the lack of a confidence measure around annual escapement estimates necessitates that caution be used in actions that could impact the abundance or productivity of Birkenhead River Chinook.

The Birkenhead sockeye run (Figure 15) is also harvested. These sockeye are depressed compared to historical levels of abundance, a trend that is present in most Fraser sockeye populations, nevertheless, they represent an important St'át'imc fisheries resource.

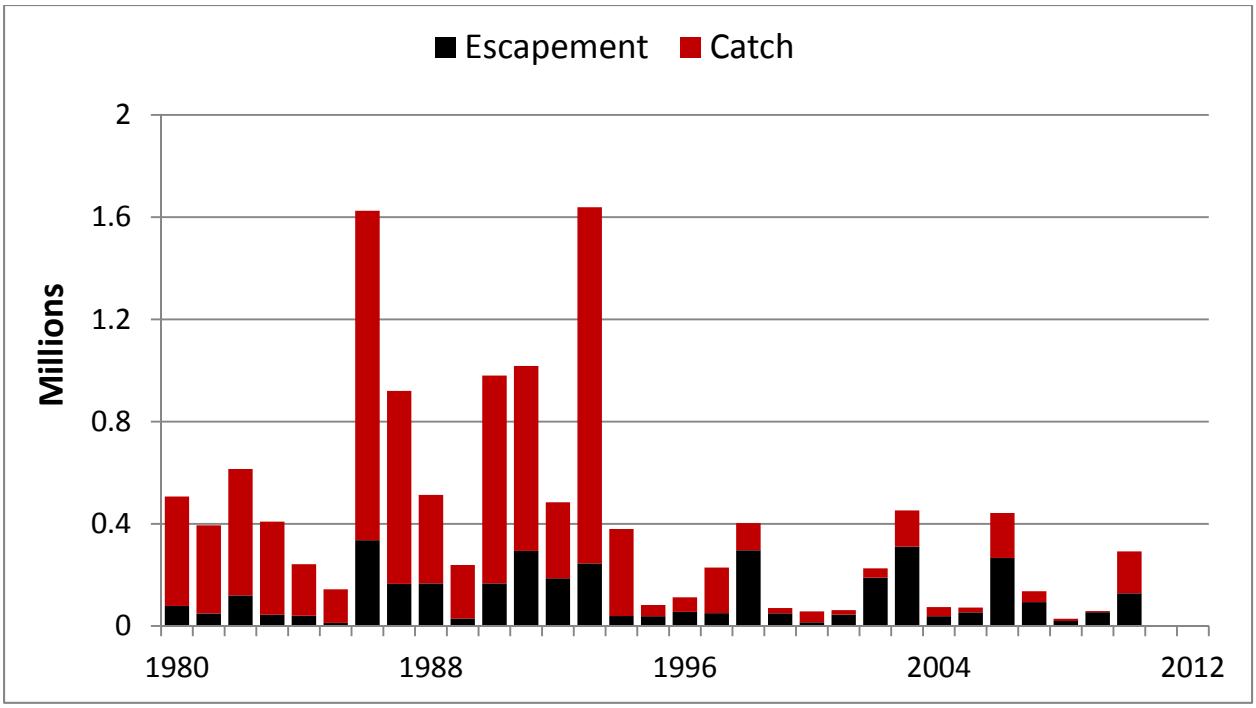


Figure 15. Time series of Birkenhead sockeye catches and escapements.

3. St'át'imc Fisheries Policies

A policy is a guiding principle intended to influence decisions that lead to the accomplishment of specific goals. Fisheries policies include the allocation of catch, enforcement of fishing regulations, fisheries management, enhancement, conservation and habitat protection. St'át'imc fisheries policies are summarized below.

Protection of Fishing Rights

The fundamental principle is to be able to practice fishing in an unrestricted fashion. The timing, location, and gear types for fishing are determined by St'át'imc laws and regulations which are administered by the St'át'imc Communities.

St'át'imc fishing rights[23] include:

- We have a right to fish seven days a week without endangering the salmon stock.
- We have a right and a responsibility to assist in the management and conservation of the salmon stock guarding the salmon throughout the salmon's life cycle, on the spawning grounds, in the ocean, and in the rivers.
- We have a right to fish according to our traditional rules and practices.
- We have a right to fish for the purpose of barter and sale as it is essential in strengthening our traditional Indian economy.

Although St'át'imc never ceded the authority to regulate the fishery according to St'át'imc laws and procedures, under Canadian law, the Minister of Fisheries and Oceans makes the final fisheries management decisions. The overlapping jurisdiction of St'át'imc and DFO has led to conflict and litigation. For example, Bradley Bob of Xaxlip was arrested on July 17, 1978 for fishing at Sxetl during a fisheries closure. This case was won by Lillooet Tribal Council in 1979 when defense lawyers argued that Bradley had been fishing within the Bridge River Band reserve area and was merely exercising his aboriginal right to fish for food.

The 1984 "Statement on the Lillooet Tribal Fishery" elaborates St'át'imc fisheries policies in relation to Fishing Rights:

[23] "Our Fishing Rights" in the Lillooet and South Central Tribal Councils Fishing Proposal (July, 1980)

L I L L O O E T T R I B E

STATEMENT ON

THE LILLOOET TRIBAL FISHERY

We the underwritten Chiefs of the Lillooet Tribe do state:

That we from time out of mind have fished in our Tribal Territory, and continue to do so today as was done by our Forefathers who passed on this sacred tradition to our people, so that we could survive from generation to generation as Indian people and as a Tribe. Today the very survival of the Fishery and our people is being threatened, we therefore, will use every method available to us to ensure the continuation of our inheritent cultural fishing rights. Our actions will continue until the people of Canada, and their governments understand that we are the rightful owners of our Tribal Territories, and everything pertaining thereto, and that we have never given up our title to this land, for we are the only ones that can give that right. We also would like to make it understood that the Government of Canada must recognize the need for our involvement in the Conservation and Management of this sacred resource, so all our children will survive the years yet to come and that our Declaration of May 10, 1911, is still strong in our minds and supersedes this statement as the law of our People.

Furthermore, we speak for our people, and will not allow any other Government, Organization or institution to speak on our behalf. However, we will work in Co-operation as necessary, to continue the protection, enhancement and use of this all important Fishery.

Therefore, we as a Tribe speak in a unified voice and will deal with the Fishery in the following order of priorities:

1) Aboriginal Title and Rights
2) Conservation and Management of the Fishery
3) Food fishing to meet the needs of our people for health and growth
4) Barter, our Economy, using our Fish
5) The sale of Fish as determined by the people and to what extent.

These are our priorities for the survival of the Fishery and our people. We speak the truth as witnessed by the Lillooet Tribal Chiefs on this 28 day of JAN 1984

Fisheries in downstream and coastal areas have a direct bearing on the numbers of fish that reach St'át'imc Territory. Effective downstream catch regulation is required to ensure that adequate numbers of fish pass upstream for harvest and spawning escapement. Habitat impacts both upstream and downstream of the Territory also have a profound impact on salmon availability.

Appication of St'át'imc Knowledge

St'át'imc Knowledge (SK) and values have allowed St'át'imc people to survive and thrive. The community of Tit'qet has developed the following description of St'át'imc values[24]:

> *The St'at'imc way of life has traditionally been linked to the land and the gifts of the seasons. St'at'imc people have always understood that the natural order upon which their lives depend involve balance and respect among all the people and creatures, including not only those living in the present but also those of the past and future. 'Sharing and caring' are important traditional family concepts. The connections and concepts identified above are at the heart of St'át'imc values and principles and are reflected in the following workshop statements:*
>
> - *All living things are brothers and sisters*
> - *Respect all living things, Mother Earth, family, language and culture.*
> - *Care for the ancestors seven generations back*
> - *Care for the future seven generations*
> - *Take only what we need*
> - *Live with self-reliance, nature, families, our language, culture and land*
> - *Share sustainable natural resources*
> - *Share what you have*
> - *Help one another in everyday life whenever one can*
> - *Preserve language and culture*
> - *Pass on knowledge, traditional skills (food preservation, fishing, hunting,etc.) and ways (bartering, sharing resources,etc.)*

The integration of SK with scientific information is a desirable approach for fisheries management within the Territory. A previous analysis undertaken as part of the WUP process documented SK related to gwenish[25]. Three community workshops were held at Sekw'el'was, Chalath and T'it'q'et to solicit knowledge and concerns about gwenish. The study focussed on

[24] www.titqet.org

[25] Circa (2002). Using heart and head together: St'át'imc Knowledge, western science and the water use planning process.

gwenish biology, distribution, and population change in Seton and Anderson Lakes. Similar information is required for other species, in particular, for sockeye and chinook salmon.

A conference on Indigenous Knowledge (cited in Circa 2002) described Indigenous Knowledge as:

- practical common sense;
- teachings and experience passed through generations;
- knowing the country;
- rooted in spiritual health;
- a way of life;
- a system of rules for resource use;
- respect;
- obligation to share;
- wisdom in using knowledge, and,
- using heart and head together.

To this list can be added a recognition of the connectedness of all living species.

Both St'át'imc and scientific ways of knowing are important approaches for understanding the ecosystem. SK can be viewed in the context of wider spiritual and cultural beliefs. In effect, SK can provide the big picture in St'át'imc Territory, while science can provide the magnifying glass.

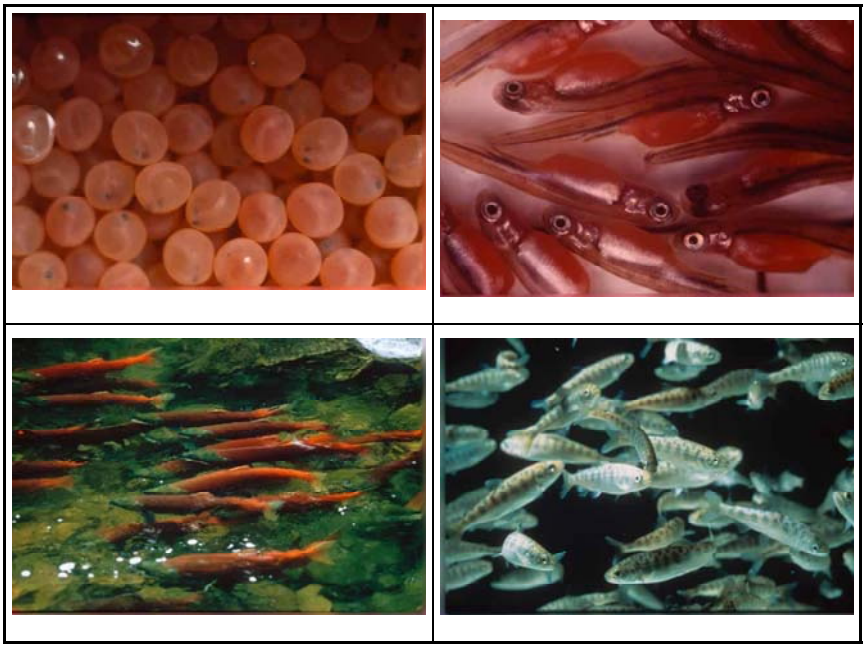
In many assessments, SK is treated as an "add-on" to the technical analysis, and is not included in a meaningful way - essentially a "science first" approach. The most relevant SK study associated with the WUP (gwenish analysis referenced above) was undertaken only after the draft WUP was largely complete. To develop a balanced perspective, it is necessary to incorporate SK throughout fisheries and environmental assessments, particularly during the initial scoping and objective-setting stages.

Restoration of St'át'imc Fisheries

During the negotiations leading up to the Hydro Agreement, St'át'imc Nation Hydro identified and evaluated potential fisheries mitigation options. Some of the options are listed in Table 1. Several of the projects have already been implemented or are underway[26] and some will be

[26] Minimization of Seton sockeye smolt mortality; Improve water flows in the Lower Bridge River; Rejuvenate Gates Creek Spawning Channel; Habitat enhancement at Applespring

carried out as WUP monitoring projects[27]. Recently, Crane Creek Enterprises and Lillooet Tribal Council investigated the potential for restoration, enhancement, and compensation opportunities within Northern St'át'imc territory[28]. The list of potential fisheries restoration opportunities identified under this project is shown in Appendix 3.



[27] e.g. projects addressing Carpenter, Downton and Seton fisheries data collection, planning, and restoration

[28] St'at'imc Nation Fisheries Projects. Watersheds and Infrastructure, 2011 Summary Report. Prepared for Fraser Salmon & Watersheds Program by Lillooet Tribal Council and Crane Creek Enterprises.

Table 1. List of potential St'át'imc fisheries projects previously identified by St'át'imc Nation Hydro.

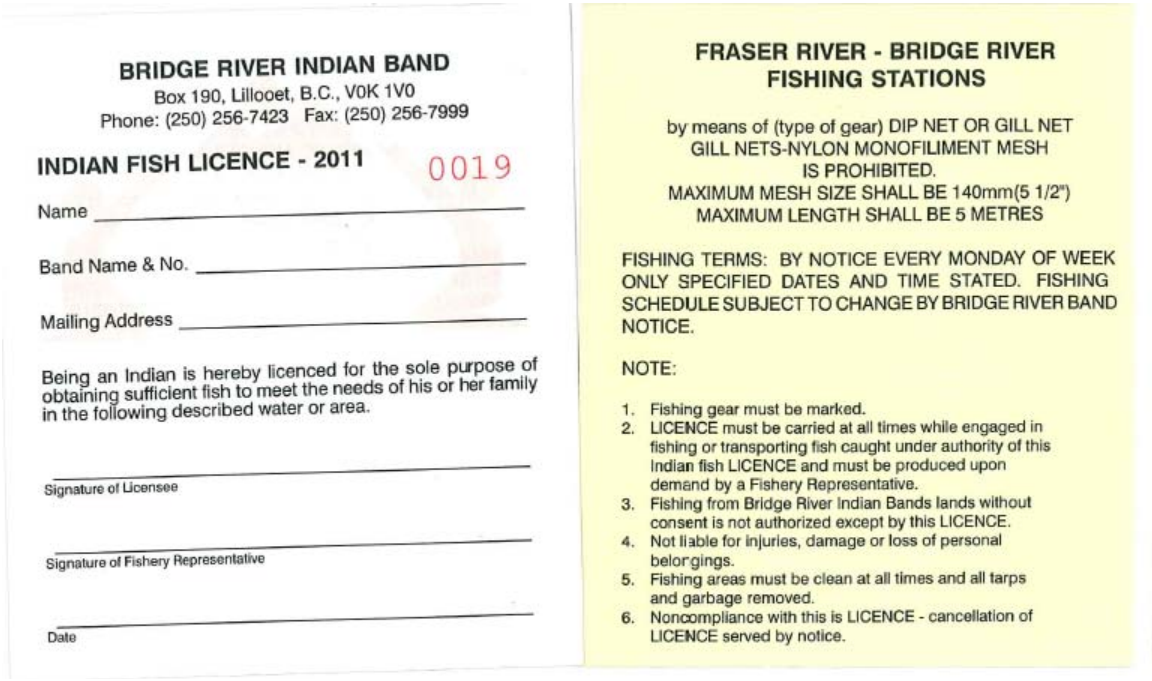
Water Management
Minimization of sockeye smolt mortality
Eliminate adult salmon tailrace delay
Improve water flows in the Lower Bridge River
Cayoosh Creek flow stabilization and fisheries enhancement
Enhancement
Rejuvenate Gates Creek spawning channel
Off-channel spawning and rearing habitat in Gates Creek
Portage Creek spawning channel
Habitat enhancement: 1) Applespring, 2) Beaverdam, 3) Horseshoe Bend, 4) below Terzhagi
Gwenish enhancement via lake fertilization
Stream fertilization
Bridge River coho and chinook hatchery
Restoration
Terzhagi fish ladder feasibility
Bridge R. salmon restoration via Terzhagi fish ladder or other means (to be determined)
Yalakom R. obstruction removal and assessment
Gates Ck chinook re-establishment
Riparian revegetation projects
Samahquam fisheries restoration at km 27 In-Shuck-ch Forest Service Road
Monitoring
Water quality and fish health monitoring
Fisheries inventory & monitoring
Catch monitoring
Management & monitoring of agency activities
Process and Capacity Building
St'át'imc fisheries policy development
Application of St'át'imc Knowledge
Training in fisheries assessment
University training in fisheries
Internship program
Community Natural Resource Officers
Administration and Infrastructure
St'át'imc Fisheries Office
Fisheries Interpretive Centre
Fisheries Information Network
Transfer Seton spawning channels to Sewk'elw'as
Applied Fisheries Studies
Fountain L. trout fishery rehabilitation
Gates Ck. watershed restoration study
Gwenish assessment
Water quality review
Carpenter Reservoir fisheries data collection, planning, and restoration
Downton Reservoir fisheries data collection, planning, and restoration
Seton Lake fisheries data collection, planning, and restoration

Catch Regulation and Decision-making

St'át'imc authority to manage the fishery is vested in the people from the Creator. The manner in which this occurs is through community meetings. The Chiefs hold the responsibility for implementing the wishes of the people and St'át'imc fisheries management practices stem from the authority held by the Chiefs.

The regulation of catch is a St'át'imc responsibility. The default situation is a 7-day per week fishery that is regulated by the individual communities. Where there is a conservation concern, individual communities determine how to restrict fishing so as to permit the safe migration of weak stocks e.g., Early Stuart sockeye.

At Xwisten, a Band By-Law formalizes the authority for managing the fishery. Regulations are reflected in a system of licensing which is enforced by Fisheries Monitors. Licensing and enforcement are the main activities undertaken in-season. Licensing at Sxetl is administered by Xwisten and all those who participate in the fishery must purchase a license, shown below.



BRIDGE RIVER INDIAN BAND
Box 190, Lillooet, B.C., V0K 1V0
Phone: (250) 256-7423 Fax: (250) 256-7999

INDIAN FISH LICENCE - 2011 0019

Name _____

Band Name & No. _____

Mailing Address _____

Being an Indian is hereby licenced for the sole purpose of obtaining sufficient fish to meet the needs of his or her family in the following described water or area.

_____
Signature of Licensee

_____
Signature of Fishery Representative

_____
Date

FRASER RIVER - BRIDGE RIVER FISHING STATIONS

by means of (type of gear) DIP NET OR GILL NET
GILL NETS-NYLON MONOFILIMENT MESH IS PROHIBITED.
MAXIMUM MESH SIZE SHALL BE 140mm(5 1/2")
MAXIMUM LENGTH SHALL BE 5 METRES

FISHING TERMS: BY NOTICE EVERY MONDAY OF WEEK ONLY SPECIFIED DATES AND TIME STATED. FISHING SCHEDULE SUBJECT TO CHANGE BY BRIDGE RIVER BAND NOTICE.

NOTE:

1. Fishing gear must be marked.
2. LICENCE must be carried at all times while engaged in fishing or transporting fish caught under authority of this Indian fish LICENCE and must be produced upon demand by a Fishery Representative.
3. Fishing from Bridge River Indian Bands lands without consent is not authorized except by this LICENCE.
4. Not liable for injuries, damage or loss of personal belongings.
5. Fishing areas must be clean at all times and all tarps and garbage removed.
6. Noncompliance with this is LICENCE - cancellation of LICENCE served by notice.

Presently, monitors are hired under contract to DFO, but previously, monitors were hired out of the proceeds from license sales (present cost is $20/license). At present, any member of the St'át'imc Nation is entitled to fish, but outsiders may only participate through intermarriage.

The main St'át'imc salmon fishing areas are shown in Figure 16. The areas of responsibility of the different communities are colour-coded on the GIS map. Sxetl (Xwisten Territory) attracts the highest number of St'át'imc fishers from communities throughout the Traditional Territory.

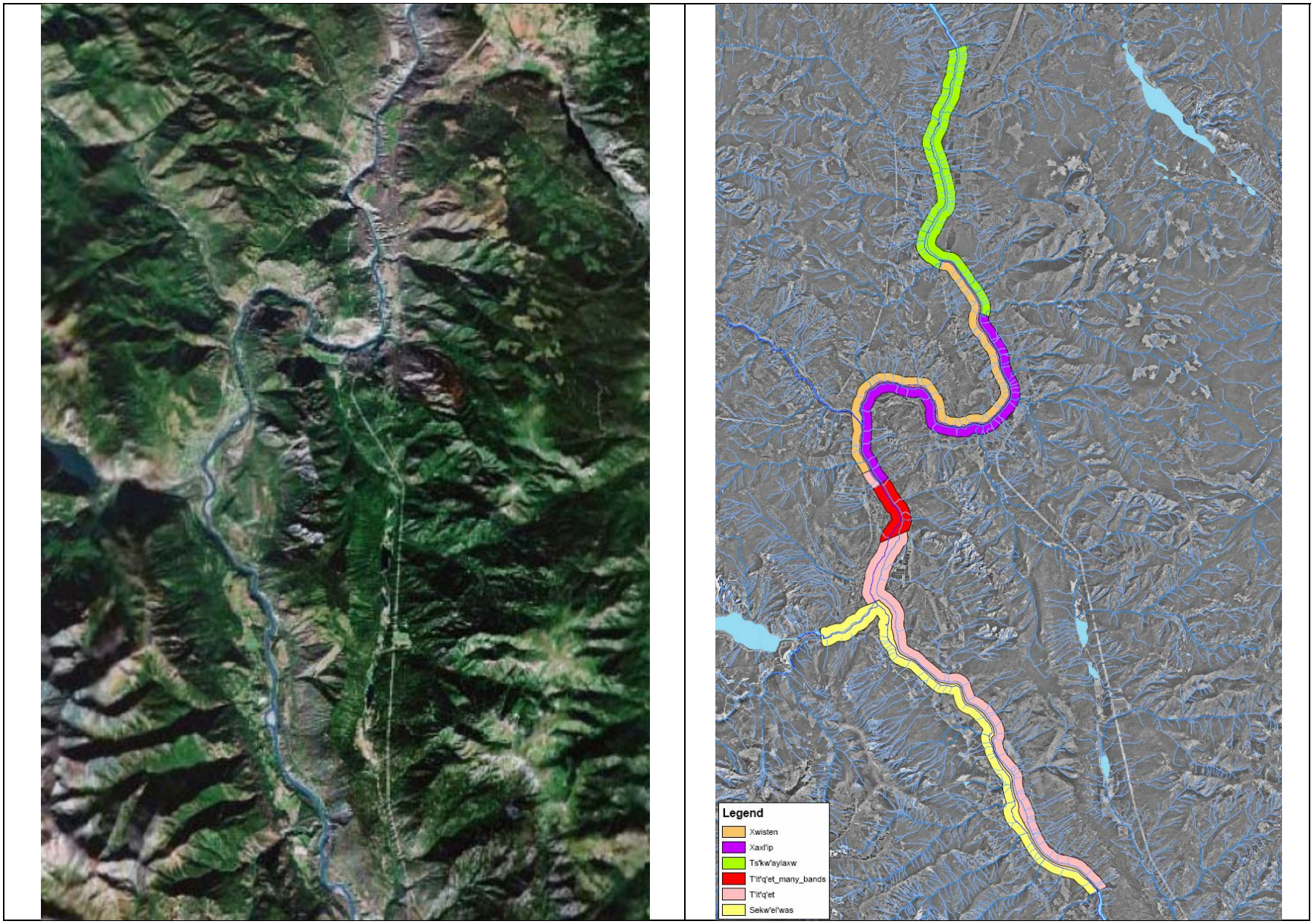


Figure 16. St'at'imc Fishery Areas in the Fraser River. GIS map courtesy of Randy James.

4. Fisheries Management Framework

Vision

A vision for fisheries has been adopted from a statement developed by the St'át'imc Land and Resource Authority[29]:

> *Our vision is of a continuing and renewed relationship between St'át'imc people (úcwalmicw) and the land (tmicw) which:*
>
> - *respects St'át'imc cultural traditions, using the ways (nt'ákmen) and laws (nxék7men) of our people as passed down through the generations;*
> - *respects nature by keeping the health of the water, air, plants, animals and the land before all else;*
> - *is under St'át'imc authority, where our people decide collectively how the land and resources of the St'át'imc territory will be managed; and,*
> - *serves the St'át'imc communities and recognizes that resources continue to provide sustenance in old and new ways to all our people.*

Objectives

Objectives that guide the SGS Fisheries Program include:

1. Maximize the benefits of fisheries and aquatic resources;
2. Minimize industrial impacts;
3. Restore St'át'imc watersheds to former levels of productivity;
4. Decision-making authority for aquatic resources and fisheries in St'át'imc Territory;
5. Employment including short-term jobs and long-term careers; and,
6. Capacity building

The first 4 objectives were articulated previously by Northern St'át'imc Fisheries. Objectives 5 and 6 were included to reflect the overarching importance of capacity building and career development in SGS programming.

[29] St'át'imc Preliminary Draft Land Use Plan, Part 1. March 2004. http://www.statimc.net/report/part1.pdf

Fraser Watershed Processes

St'át'imc have taken a lead role in the development of the Inter-tribal Treaty Organization (ITO) and its pre-cursor, the Inter-Tribal Fishing Treaty (ITFT) that was signed in Lillooet on July 27, 1989 by 47 Chiefs. The ITFT was described as a Treaty of Mutual Purpose and Support between Indian Nations. The ITO was active between 2007-2010 and held meetings throughout the watershed in Lillooet, Merritt, Kamloops, Vernon, Prince George and Takla Landing. Recently the SCC agreed to revive this initiative. Grand Chief Saul Terry holds the fisheries portfolio for the Nation.

The SGS Fisheries Program also engages, without prejudice, with other First Nations and DFO during Tier 1 (First Nation to First Nation) and Tier 2 (First Nation to DFO) meetings. Ongoing processes include the Forum on Conservation and Harvest Planning for Fraser Salmon and the Road Map (fisheries strategic planning) meetings that are held throughout the watershed. An invitation has been extended by SGS to host a future Forum on Conservation and Harvest Planning in St'át'imc Territory in the spring of 2013.

Collaborative Management

St'át'imc have agreements with BC Hydro and Canada covering aquatic resource management. Collaborative management[30] may provide a relevant framework for the different parties to work together effectively. Collaborative management can be defined as:

> *A partnership agreement in which participants share the responsibility and authority for fisheries management. A formal agreement would specify the respective rights, shared decision-making powers and obligations of the parties regarding fisheries management and allocation in the Traditional Territory.*

Principles of collaborative management include:

- Recognition of existing rights, agreements and obligations;
- Cooperative, transparent and informed decision-making;
- Capacity building[31] to enhance the abilities of the parties to participate;
- Management processes that are adaptive to allow for change over time;
- Multi-party decision-making based on traditional and local knowledge as well as the best available scientific data; and,
- Accountability to communities and others having an interest in the fishery.

[30] also called co-management and joint management

[31] capacity building is a 2-way process that can involve transfer of technical capability to First Nations and sensitization of Agencies and Governments to First Nations traditional management practices and world views

Since 1979, there have been a number of court decisions reaffirming aboriginal rights to fish for food, social and ceremonial purposes. DFO, via the *Fisheries Act*, has the authority to regulate catches and make decisions regarding the fishery e.g. determining fishing openings and closures. However, in recent years it has moved in the direction of a collaborative management model. This has been facilitated by the establishment of several First Nations organizations including the Fraser River Aboriginal Fisheries Secretariat, Upper Fraser Fisheries Conservation Alliance and the Lower Fraser Fisheries Alliance. There is no mid-Fraser First Nation fisheries organization at present although some preliminary discussions have already occurred between the Secwepmec, N'lakapa'mux Nation, Nicola Tribal Association, Okanagan Nation Alliance and St'át'imc.

5. St'át'imc Government Services Fisheries Program

Guiding Principles

1. Role

SGS will provide support services to the Nation and to communities by conducting fisheries projects involving engagement of experts, project design, proposal preparation, reporting, budgeting, staffing, training, and provision of technical advice.

2. Stewardship

The Stewardship Co-ordinator and the St'át'imc Stewardship Advisory Committee (SAC) ensure that program activities are consistent with St'át'imc values and community priorities. The SGS Stewardship Co-ordinator is Larry Casper and members of the SAC are listed below.

Representative	Community	Email
John Terry	Bridge River-Xwisten	johnny_mowich@yahoo.ca
Not yet appointed	Lil'wat	
Howard Bob Jeff Saul (alt.)	Fountain – Xaxli'p	hbxiv2@yahoo.ca
Pauline Peters	Samahquam	cpjp_sam@yahoo.ca
Chief Robert Shintah	Pavilion-Ts'kw'ay'laxw	rshintah@tskwaylaxw.com cc: lsaultier@tskwaylaxw.com
Ida Mary Peter Crystal Branget (alt.) Chief Garry John (alt.)	Seton Lake – Tsal'álh	ida_ptr@yahoo.ca cbranget@gmail.com kukwpi7@yahoo.com
Melvin Patrick Travis Peters (alt.)	N'Quatqua	councilor03@nquatqua.ca travistpeters@hotmail.com
Xavier Williams	Skatin	xavier_williams98@yahoo.com
Bonnie Adolph Chief Michelle Edwards (alt.)	Cayoose Creek – Sekw'elw'as	bonnieadolph@yahoo.ca michell_edwards@hotmail.com
Carl Machell Marie Barney (alt.)	Lillooet – T'it'q'et	carlmachell@rocketmail.com mbarney@uniserve.com
Chief Don Harris Randel Charlie (alt.)	Douglas – Xa'xtsa	don.harris@xaxtsa.ca

3. St’át’imc Knowledge

SGS will seek to incorporate St’át’imc Knowledge into all of its fisheries activities and will combine this knowledge with scientific knowledge.

4. Scientific Defensibility

Fisheries investigations will be carried out to address priority management questions in a scientifically-defensible fashion so as to contribute to a body of fisheries information that can be used to support informed decision-making.

5. Capacity Building and Career Development

Capacity building and career development are high priority components of SGS. In addition to formal training activities, SGS will promote job shadowing opportunities that arise during fisheries projects.

6. Focus on Safety

Most fisheries activities involve working on water and using boats, nets and other forms of sampling equipment. These activities carry risks which must be effectively mitigated to avoid injury or drowning. SGS will work with Safety Consultants to ensure that operations are carried out with high safety standards.

7. Learning from the Past

During the initiation of new programs, there is considerable value in analysing existing technical information to inform the design of subsequent work. Review studies (e.g. water quality review) will be undertaken either in-house or contracted out to specialists where necessary to analyse existing information and to optimize project sampling designs.

8. Capital Expenses

Fisheries projects can require equipment and boats valued at hundreds of thousands of dollars and which require ongoing maintenance. For projects where large investments are required, SGS will carry out initial feasibility work by leasing equipment and boats for the short-term, outsourcing laboratory analysis with commercial labs and partnering with other agencies where possible. Once initial results have been collected and analysed (2-3 years) the utility of the collected information will be evaluated before making investment recommendations.

Environment and Natural Resources Fund

The 2011 Settlement Agreement includes provisions for the Environment and Natural Resources Payments as follows:

a) Commencing on the first (1st) Anniversary and continuing on each Anniversary thereafter for 99 years to and including the 100th Anniversary, BC Hydro will on behalf of and at the direction of St'át'imc (PC[32]) pay to the Trust the aggregate initial amount of $440,000, subject to adjustment for CPI[33] in accordance with Section 2.5(b) (the "**Environment and Natural Resources Payment**").

b) Commencing on the second (2nd) Anniversary and on each Anniversary thereafter to and including the 100th Anniversary, the Environment and Natural Resources Payment will be CPI Adjusted for the 12 month period ending at the end of the month that is the third month prior to the month in which the particular Anniversary falls, such adjustment to be applied to the immediately preceding Environment and Natural Resources Payment.

c) St'át'imc (PC) agrees to use the Environment and Natural Resources Payment only for the purposes of funding environment and natural resource mitigation and enhancement initiatives, including inventory, monitoring, planning, research programs and the Bridge-Seton Watershed Strategic Plan.

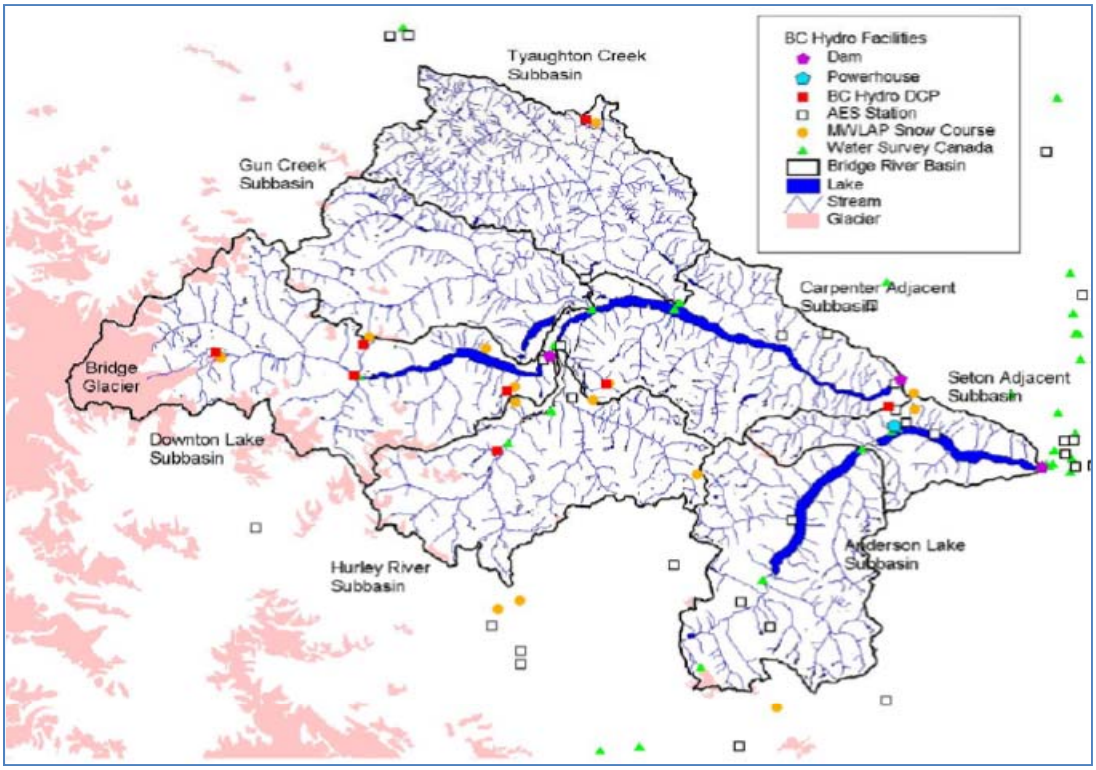
Bridge Seton Watershed Strategic Plan

The Bridge Seton Watershed Strategic Plan development is described in the 2011 Settlement Agreement as follows:

Within 3 years of the Effective Date (or some other date agreed to in writing by BC Hydro and St'át'imc), the Steering Committee or any designated sub-committee or working group will develop the initial Bridge Seton Watershed Strategic Plan as follows:

a) review existing or proposed environment or natural resource mitigation projects of St'át'imc, BCRP funded projects and the physical works projects and monitoring programs ordered under the Bridge River WUP within the Bridge-Seton Watershed as identified on the map below;

[32] Participating Communities
[33] Consumer Price Index



b) prepare a draft Bridge Seton Watershed Strategic Plan which coordinates the projects and programs identified in Section 12.1(a) so as to achieve synergies and cost savings and avoid duplication of efforts in respect thereof;

c) invite representatives from the Federal Department of Fisheries and Oceans and the British Columbia Ministry of Environment, to review and discuss the proposed Bridge Seton Watershed Strategic Plan; and

d) recommend the draft Bridge Seton Watershed Strategic Plan to the Principals of BC Hydro and St'át'imc.

A future Bridge-Seton Watershed Strategic Plan could involve the following elements:

- Strong linkages to existing programs, including local and regional land use planning processes, water quality, fisheries and wildlife programs, and similar programs, to optimize use of available information and minimize duplication of effort
- Clear designation of responsibilities, timetables, and anticipated costs for project actions
- Ongoing monitoring and reporting of progress to the Steering Committee
- Periodic review and revision of the plan
- A flexible, adaptable plan

Water Use Plan Monitoring

There are 16 Water Use Plan Monitoring (WUP) Projects and one BC Hydro Works project that have been awarded by BC Hydro to St'át'imc Eco Resources Corporation (SER)[34] and supported by Crane Creek Enterprises. The WUP monitoring projects are mostly fisheries projects and will be undertaken according to the schedule shown in Table 2. The projects are designed to evaluate the effects of the current hydro operating regime, referred to in the WUP as N2-2P, on aquatic resources. The total value of these projects over 10 years is around $17 million. A primary objective of the WUP monitoring work is capacity building. A pool of St'át'imc technicians will be hired and allocated across projects as the demands arise. Field sampling schedules will be developed that share technicians between projects and which expose technicians to as many different projects as possible, with a focus on "job-shadowing".

SER has assembled a team of highly qualified scientists to oversee the various projects. They include:

Project		Project Manager
	WUP Program Lead Biologist	Dr. Dave Levy, SGS
	WUP Statistician and Data Base Manager	Dr. Josh Korman, Ecometrics
MON1	Lower Bridge River Aquatic Monitoring	Alyson McHugh, Coldstream Ecology
MON2	Carpenter Reservoir Riparian Vegetation Monitoring	Kim North, Split Rock Environmental
MON3	Lower Bridge River Adult Salmon and Steelhead Enumeration	Don Mccubbing. In-stream Fisheries Research
MON4	Carpenter Reservoir and Middle Bridge River Fish Habitat and Population Monitoring	Gene Tisdale
MON5	Downton Reservoir Riparian Vegetation Monitoring	Kim North
MON6	Seton Lake Aquatic Productivity Monitoring	Chris Perrin, Limnotek
MON7	Downton Reservoir Fish Habitat and Population Monitoring	Gene Tisdale
MON8	Seton Lake Resident Fish Habitat and Population Monitoring	Gene Tisdale
MON9	Seton River Habitat and Fish Monitoring	Gene Tisdale
MON10	Carpenter Reservoir Productivity Model Validation and Refinement	Chris Perrin
MON11	Lower Bridge River Riparian Vegetation Monitoring	Kim North
MON12	Bridge-Seton Metals and Contaminant Monitring Program	Randy Baker, Azimuth
MON13	Seton Sockeye Smolts Monitoring Program	Alyson McHugh
MON14	Salmon Migration in the Seton-Anderson Watershed	Dr. Scott Hinch
MON15	Seton Lake Erosion Mitigation Program	Barry Chilibeck, Northwest Hydraulics Consultants
MON16	Lower Bridge River Spiritual and Cultural Value Monitoring	Larry Casper, SGS
WORKS1	Carpenter Revegetation	Kim North

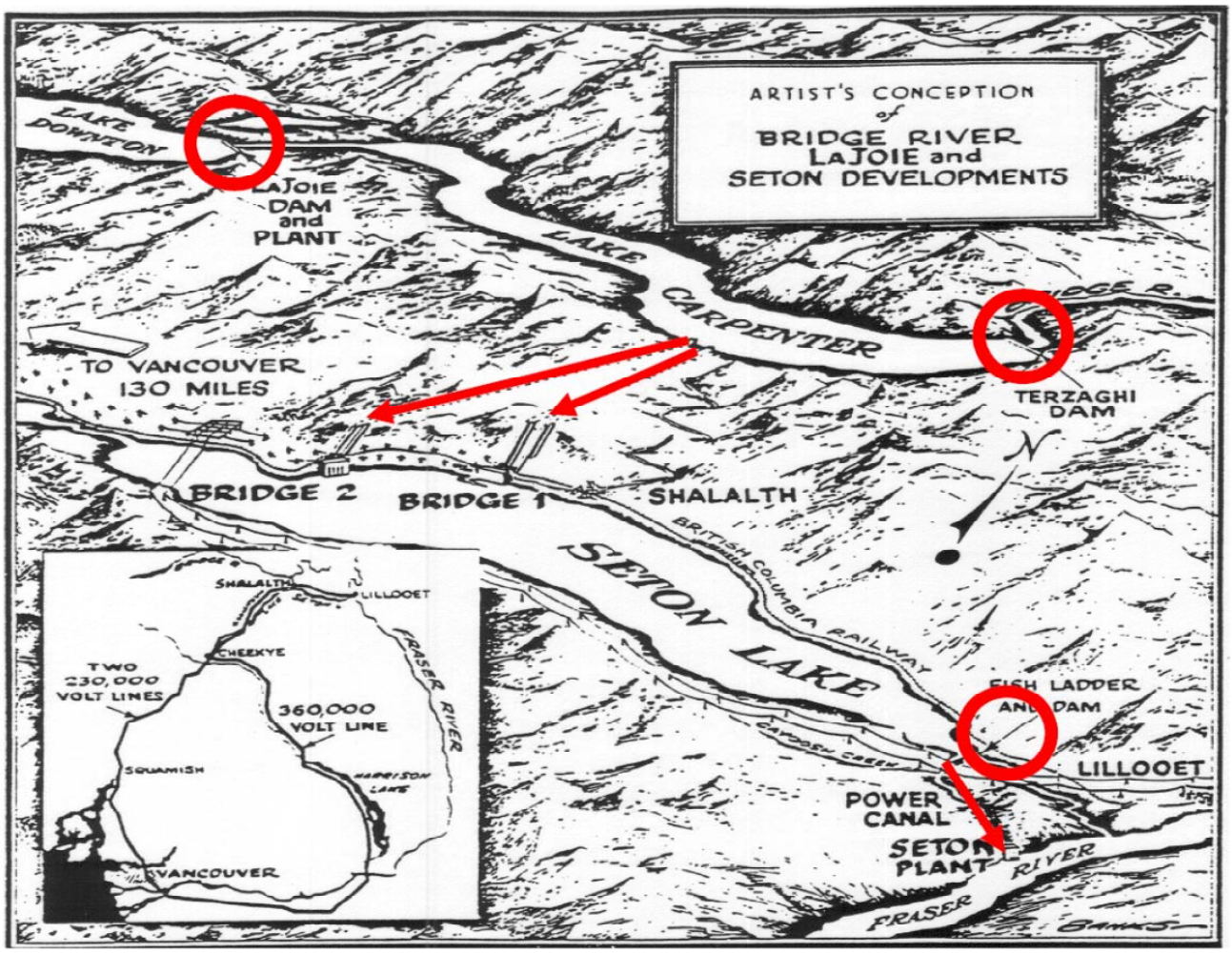
[34] SER is owned by SCC

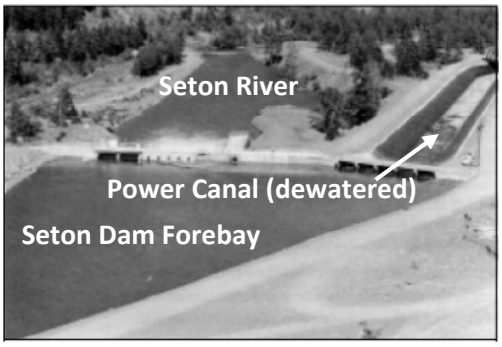
Table 2. Schedule and budgets for Water Use Plan Monitoring Projects to be conducted by between 2012 - 2021.

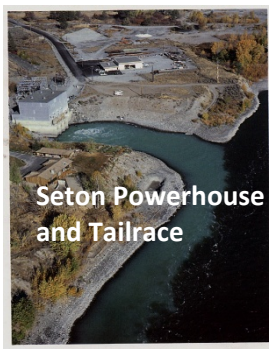
PROJECT	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
MON1	189,000	193,000	221,000	197,000	201,000	190,000	194,000	198,000	202,000	249,000	**2,033,000**
MON2	96,000		22,000	23,000	23,000	27,000	24,000			131,000	**347,000**
MON3	496,000	187,000	205,000	194,000	198,000	136,000	107,000	109,000	111,000	137,000	**1,882,630**
MON4	114,000	116,000	118,000	121,000	131,000	134,000	136,000	139,000	142,000	145,000	**1,294,000**
MON5	135,000									168,000	**303,000**
MON6	start-up in 2014										
MON7	72,000	74,000	75,000	77,000	85,000	87,000	89,000	90,000	92,000	94,000	**835,000**
MON8	79,000	80,000	82,000	84,000	85,000	87,000	89,000	90,000	92,000	94,000	**862,000**
MON9	154,000	107,000	109,000	111,000	122,000	94,000	96,000	97,000	99,000	116,000	**1,100,000**
MON10	start-up in 2014										
MON11	139,000		28,000		149,000		30,000		141,000	21,000	**507,000**
MON12	58,000	30,000	30,000	31,000	31,000	65,000	33,000	33,000	34,000	70,000	**415,000**
MON13	164,000	201,000	170,000	174,000	219,000	181,000	184,000	188,000	192,000	196,000	**1,869,000**
MON14	518,000	755,000	452,000	415,000	47,000						**2,188,000**
MON15	83,000	84,000				91,000		95,000		99,000	**453,000**
MON16	87,000	89,000	91,000	93,000	95,000						**454,514**
WORKS1		253,000	226,000	230,000	235,000	274,000					**1,217,000**
Total	**2,384,000**	**2,169,000**	**1,829,000**	**1,750,000**	**1,621,000**	**1,366,000**	**982,000**	**1,039,000**	**1,105,000**	**1,520,000**	**15,760,144**

MON1	Lower Bridge River Aquatic Monitoring	MON10	Carpenter Reservoir Productivity Model Validation and Refinement
MON2	Carpenter Reservoir Riparian Vegetation Monitoring	MON11	Lower Bridge River Riparian Vegetation Monitoring
MON3	Lower Bridge River Adult Salmon and Steelhead Enumeration	MON12	Bridge-Seton Metals and Contaminant Monitring Program
MON4	Carpenter Reservoir and Middle Bridge River Fish Habitat and Population Monitoring	MON13	Seton Sockeye Smolts Monitoring Program
MON5	Downton Reservoir Riparian Vegetation Monitoring	MON14	Salmon Migration in the Seton-Anderson Watershed
MON6	Seton Lake Aquatic Productivity Monitoring	MON15	Seton Lake Erosion Mitigation Program
MON7	Downton Reservoir Fish Habitat and Population Monitoring	MON16	Lower Bridge River Spiritual and Cultural Value Monitoring
MON8	Seton Lake Resident Fish Habitat and Population Monitoring	WORKS1	Carpenter Revegetation
MON9	Seton River Habitat and Fish Monitoring		

As part of the WUP monitoring activities, there will be two annual workshops wherein investigators will present their preliminary findings (fall workshop) and outline their sampling plans for the successive field season (spring workshop). SGS personnel will participate in these workshops.







External Funding

The Fish and Wildlife Compensation Program (FWCP) formerly known as BCRP (Bridge Coastal Restoration Program) is a partnership between BC Hydro, BC Environment and DFO that funds projects that mitigate footprint impacts adjacent to BC Hydro facilities. Within the BC Hydro "Bridge Coastal Generation Area" there is approximately $1.7 million available annually for fisheries and wildlife projects. St'át'imc have successfully carried out numerous fisheries and wildlife projects under this program for many years. The FWCP has prepared a Salmonid Action Plan for the Bridge and Seton Watersheds[35] and looks favorably on applications that address "high priority" projects.

Within the FWCP Salmonid Action Plan, projects have been classified according to agency priorities taking into account the results from a multi-stakeholder workshop conducted in Lillooet in April, 2009. Highest priority projects in the Action Plan are shown in Table 3 (salmon) and Table 4 (resident salmonids).

There are good opportunities for SGS to collaborate with communities to undertake FWCP-funded projects focussing on:

- Fisheries assessment and further enhancement of the Seton spawning channels
- Habitat assessment in Gates Creek
- Off-channel habitat development at Horseshoe Bend in the Lower Bridge River
- Gwenish ecology project
- Bull trout assessment project
- Spyder Creek irrigation intake relocation project

35 http://www.bchydro.com/etc/medialib/internet/documents/about/our_commitment/fwcp/pdf/funding_donations/watershed_action_plans/salmonid_action_plans/bridge_seton_salmonid_plan.Par.0001.File.bridge_seton_salmonid_action_plan_oct_final_draft.pdf

Table 3. Salmon projects identified as top FWCP priorities.

Waterbody	Project Description	SGS Evaluation
Lower Bridge	Assessment of gravel immediately downstream of Terzaghi Dam to determine if it is functioning effectively to maximize egg to fry success	Evaluate experimentally via egg plants in different substrates coupled with gravel surveys. Challenging project.
	Develop off channel sites to provide spawning and rearing habitat for coho, steelhead and other salmonids. Possible locations include Apple Springs and Horseshoe Bend.	The Applespring Project was completed by Xwisten in 2009-2010. **Xwisten and DFO have initiated preliminary work on the Horseshoe Bend project and there is a strong interest in completing this project in 2013-2014**
	Gravel placement and maintenance for spawning. Potential locations include platforms in the lower Bridge River above the confluence of the Yalakom, areas upstream of Yalakom that were affected by a spill event in 1982, and Seton-Portage	Project is not recommended since it will confound the interpretation of the LBR flow trials
Seton River	Assess the use of Seton spawning channels by all species	**Priority project that could be implemented by Sek'w'el'was and SGS. Excellent training potential.**
	An evaluation and feasibility assessment of increased fish passage at Seton Dam. Any assessment must adhere to the Fish Passage Decision Framework	This project will be undertaken by St'át'imc Eco Resources as a component of WUP MON 14: Salmon Migration in the Seton-Anderson Watershed
	Following assessment of pink salmon spawning channels undertake the advised enhancement work (e.g., additional complexing, riparian planting, maintenance of siphons, etc), first in the lower channel and then in the upper.	**Priority project that could be implemented by Sek'w'el'was and SGS. Excellent training potential.**
Gates Creek	Develop options to improve habitat quality in Gates Creek and its tributaries for coho, bull trout, rainbow trout and oither species. Possible activities include: i) Overview flights in winter to identify possible off channel projects, ii) Determination of coho (and other species distribution) etc. iii) smolt estimates, iv) opportunistic Chinook DNA sampling to assess whether this is a separate run or straying individuals	**Priority project that could be implemented by N'Quatqua and SGS. Excellent training potential.**

Table 4. Resident salmonid projects Identified as top FWCP priorities

Waterbody	Project Description	SGS Comment
Seton Lake	Determine locations of lake spawning habitats for kokanee (gwenis)	This work was completed in 2004 in Anderson Lake. Highest densities were found at 30-60 m depths on gravel fans beside talus slopes along the lake shore. **Need to explore with FWCP and Shalath whether a more broadly focussed project evaluating all aspects of gwenish ecology would be supportable.**
	Determine the impact of sedimentation on kokanee (gwenis) spawning success and evaluate options to improve spawning success	**Need to explore with FWCP and Shalath whether a more broadly focussed project evaluating all aspects of gwenish ecology would be supportable.**
Portage/Yalakom/ Spyder/Whitecap	Assess feasibility and restoration opportunities for bull trout (e.g. in the Yalakom and Portage Rivers, and Spyder and Whitecap Creeks)	Study design should be discussed with BC MOE which completed similar work in the LBR, Yalakom and Gates Creek 10 years ago. **SGS should apply to undertake this project in future and develop a strong training component involving Shalath, Xwisten and N'Quatqua.**
Spyder Creek	Screen or relocate irrigation intake on Spyder Creek	Need pre-design study by a fisheries engineer

Aboriginal Affairs and Northern Development Canada sponsor the BC Capacity Initiative (BCCI) Program, that funds capacity development projects in First Nations communities. Both Xaxlip and Lillooet Tribal Council have previously undertaken projects with BCCI support. The program supports multi-year training projects in BC and SGS will be applying to this program for funding support in 2013-14 to target capacity development in fisheries and aquatic resource management,.

DFO Agreement

An agreement between SGS and DFO was signed in May, 2012 and will contribute $100,000 to SGS during fiscal year 2012-2013. The Fisheries Manager (FM - Janice Billy) receives guidance from SGS and SCC and is responsible for managing the Food, Social, and Ceremonial fishery, implementing field programs such as swift water safety training, wilderness first aid training for the catch monitor programs, budgeting, planning, and reporting. The FM works closely with the

St’át’imc Fisheries Technical Committee (FTC), which is comprised of community fisheries representatives and DFO:

Representative	Community	Email	Phone
BJ Alexander	Representative Seton Lake Indian Band	tiiya7@yahoo.com	250-259-8170
Bonnie Adolph	Representative Cayoose Creek Band	bonnieadolph@yahoo.ca	250-256-4136
Dean Billy	Council - T’it’q’et Administration	deaneabilly@gmail.com	250-256-0230
George Napoleon	Council - T’it’q’et Administration	georgen@titqet.org	250-256-8680
Gerald Michel	Lands and Resource Coordinator - Xwisten	fisheries@xwisten.ca	250-256-7423
Harry O'Donaghey	Fisheries Manager N'Quatqua	qeliwa53@hotmail.com	604-452-3204
Ida Peter	Lands and Resources Seton Lake Indian Band	slib_adm07@yahoo.com	250-259-8227
Janice Billy	Fisheries Manager SGS	jbilly@statimc.net	250-256-7523
Kelsey Alec	Natural Resource Assistant Ts'kw'aylaxw First Nation	kelsey@tskwaylaxw.com	250-256-4204
Michelle Edwards	Chief Cayoose Creek Band	michell_edwards@hotmail.com	250-256-4136
Stephanie Barney	Lands and Resources Officer - T’it’q’et Administration	stephb@titqet.org	250-256-4118
Valarie Diablo	C&C Fisheries Portfolio Xaxl'ip Band	council@xaxlip.ca	250-256-4800
Tom Grantham	DFO Detachment Supervisor	tom.grantham@dfo-mpo.gc.ca	250-256-2665
Cynthia Breau	DFO Fisheries Technician	cynthia.breau@dfo-mpo.gc.ca	250-256-2652
Dean Allen	DFO Resource Manager-BC Interior	dean.allan@dfo-mpo.gc.ca	250-851-4821
Mervin Mochizuki	DFO	merv.mochizuki@dfo-mpo.gc.ca	250-851-4952
Tracy Robinson	DFO	tracey.robinson@dfo-mpo.gc.ca	

Specific tasks of the FM include:

1. Coordination of the development of a Community Harvest Management Plan.
2. Development of a communication plan.
3. Reporting to leadership.
4. Meeting regularly with DFO Resource Management staff to discuss ongoing fisheries management issues and concerns.
5. Visiting St'át'imc Communities to gather information on fisheries priorities.
6. In consultation with the FTC and SAC, the FM develops and prepares proposals for projects that have been identified.
7. Strengthening the relationship with neighbouring Nations.
8. Identifying opportunities for SGS to host future Forum on Conservation and Harvest Planning meetings with Fraser River and South Coast Marine Area Nations.
9. Participation in the planning and hosting of community outreach activities within the St'át'imc Area. The stewardship events include:
    - Walking with Smolts - to raise awareness of the salmon smolt out migration.
    - Salmon in the Canyon Festival.
    - St'át'imc Community Pre and Post Fisheries Forums (2 one day events) - raise awareness of conservation to community members.

Communications

SGS will prepare an Annual SGS Fisheries Report prior to March 31, 2014 and once a year thereafter. During April 2014 and annually thereafter, a SGS Community Fisheries Forum will be scheduled to review annual progress and to present the next years' activities. Consideration will be given to co-ordinating these communication activities with those of the SGS Heritage and Wildlife programs and future WUP monitoring project workshops.

6. 2013 - 2017 Implementation Plan

There are numerous fisheries projects that could be pursued and careful consideration is required to prioritize them and carry them out in the right sequence. Descriptions of high priority fisheries projects are provided in Appendix 4. They include:

Project	Objective	Page #
Application of St'át'imc Knowledge	Integrate SK into fisheries management	84
Capacity Building	Trained St'át'imc fisheries professionals including technicians and managers	84
Water Quality and Fish Health Monitoring	Healthy aquatic environments and safe food for consumption	86
Fisheries Assessment and Monitoring	Monitor the status of fish populations over time	86
Harvesting of Gates and Portage Sockeye	Additional fishing opportunities	87
Habitat Development adjacent to Gates Creek	Increased production of salmon and trout	88
Habitat Enhancement in the Lower Bridge River	Increased production of salmon and trout	89
Seton/Anderson Lake Limnology Evaluation and Monitoring	Monitoring	92
Gwenish Ecology	Increased understanding of this unique and culturally important species	93
Coho Enhancement in Seton Spawning Channels	Increased coho production	94
Improved Fish Passage in the Yalakom River	Increased coho, chinook and steelhead production	95
Fountain Lake Fishery Rehabilitation	Rehabilitation of the rainbow trout fishery	96
Projects Identified by the LTC/Crane Creek Evaluation	Future implementation of restoration projects	97

The following high priority initiatives will be carried out continuously over the 5 year period:

1. Application of St'át'imc Knowledge
2. Capacity Building
3. Collaborative Management with DFO
4. WUP Monitoring Program (St'át'imc Eco Resources)

Potential fisheries projects can be related to mitigation, restoration, enhancement, research, and monitoring. While all 5 types of projects are necessary for a well-balanced fisheries program, the top priority of the SGS will be mitigation, restoration and enhancement. Projects will include an

assessment component to evaluate project effectiveness over time. All of the WUP Monitoring Projects are by definition "monitoring" however they also have mitigation implications by evaluating and making recommendations related to the present WUP flow regime and how it might be modified during the next WUP cycle (2022-2031). WUP Monitoring projects will generate the highest demand for fisheries technicians in the short-term, beginning later in 2012.

Table 4 provides a strategy and identification of priority fisheries projects that will be implemented between 2013-2017 as resources permit.

Seton Smolt Monitoring Crew

Table 4. SGS schedule and funding strategy for implementing priority fisheries projects

Potential Project	Implementation Strategy	Timeframe	Possible Funding Source
Application of St'át'imc Knowledge	• Access existing LTC information • Engage qualified expert to lead the project • Expand scope to include wildlife, heritage resources etc. • Collect new information as required • Verify results at an Elders Forum	2013-2017	
Capacity Building	• Technician Training courses (5 week duration) delivered by Vancouver Island University, coupled with Swiftwater, Wilderness First Aid and first aid transportation endorsement • Prepare BC Capacity Initiative (Aboriginal Affairs and Northern Development Canada) application for October, 2012 • Job shadowing	2013-2017	WUP monitoring: on-the-job Environment and Natural Resources Fund BC Capacity Initiative
Water Quality and Fish Health Monitoring	• Project design and data review by contractor • Water quality analysis and training	2013 2014 - research/training project at Sxetl	Environment and Natural Resources Fund Agency (tbd): in-kind support
Fisheries Assessment and Monitoring	• 2013: develop database and identify data gaps • Initiate training/monitoring in Seton channels	2014-2017 - sampling as required; design as training project	Piggy back on new and existing programs
Harvesting of Gates and Seton Sockeye	• 2012: evaluate fish counter as a management tool • Test out concept at fish ladder	2013-2017 implementation	Environment and Natural Resources Fund

Habitat Development Adjacent to Gates Creek	• Investigate whether landowners accept concept, preliminary design work to follow • Require partnership and funding (FWCP?)	Defer until after landowners support	
Habitat assessment in Gates Creek	• Work with N'Quatqua and submit FWCP application Nov. 1, 2015	2016-2017	Fish and Wildlife Compensation Program
Habitat Enhancement in the Lower Bridge River	• Work with Xwisten on Horseshoe Bend project • Submit FWCP application on Nov. 1, 2012	Construction in 2013 - 2014	Fish and Wildlife Compensation Program
Seton/Anderson Lake Limnology Evaluation and Monitoring	• Make request to DFO to provide analysis of previous data; design project • Work with Shalath and N'Quatqua to carry out shoreline surveys	2013 2014 - 2015	None Agency (tbd): in-kind Environment and Natural Resources Fund
Gwenish Ecology	• Request DFO to provide analysis of previous data; design project surveys • Work with Shalath to carry out surveys	2013 2014 - 2015	Agency: in-kind Fish and Wildlife Compensation Program
Coho Enhancement in Seton Spawning Channels	• Work with Sekw'el'was to initiate partnership with DFO • Submit proposal to FWCP by Nov. 1, 2012	2013: fisheries assessment in channel, collect brood stock; 2014 introduce fry and monitor	Fish and Wildlife Compensation Program
Improved Fish Passage in the Yalakom River	• Work with Xwisten to prepare project concept and submit for agency review in 2013	2014	Environment and Natural Resources Fund
Fountain Lake Fishery Rehabilitation	• Work with Xaxlip and implement as a training project involving university partner	2013-2014	BCCI Environment and Natural Resources Fund

Following is the SGS strategy for supporting communities to develop fisheries projects with external support:

Project	2012	2013	2014	2015	2016	2017
Fish and Wildlife Compensation Program						
Lower Bridge R. off-channel habitat enhancement (Horseshoe Bend)	Proposal Nov. 1	Implementation				
Fisheries assessment and further enhancement of the Seton spawning channels, including coho fry additions	Proposal Nov. 1	Implementation				
Gwenish ecology project		Proposal Nov.1	Implementation			
Habitat assessment in Gates Creek			Proposal Nov.1	Implementation		
Bull trout assessment project				Proposal Nov. 1	Implementation	
Spyder Creek irrigation intake relocation project				Proposal Nov.1	Implementation	
BC Capacity Initiative						
SGS capacity building in aquatic resource mgmt	Proposal October	Implementation				

Appendix 1: Aquatic Habitats

Seton and Anderson Lakes

Changes in Seton Lake following hydro development include reduced temperature, reduced dissolved mineral content, increased turbidity, and increased flushing rate[36]. Seton surface temperatures have decreased by 5.5°C in summer, and water residence time has decreased from 1300 to 230 days. In response to increased turbidity, plankton production in Seton Lake has decreased. Shallow zones along the Seton Lake shoreline are affected by water level fluctuations.

Environmental conditions for Seton and Anderson Lakes[37] include:

	Seton	Anderson
Surface area	24 km^2	28 km^2
Mean depth	85 meters	140 meters
Water residence time	0.8 years	7.1 years
Mean epilimnetic temp	13.5 °C	14.5 °C
Thermocline depth	22.4 m	18.4 m
Euphotic zone depth	11.2 m	22.6 m

Source: Shortreed et al. 2001

Optimum sockeye escapement to Seton and Anderson Lakes, based on lake productivity is 437,000 fish[30]. The historical mean sockeye escapement to the Seton/Anderson watershed is 41,000 fish. The maximum observed escapement is 104,000 sockeye. These figures indicate that there is much scope for sockeye enhancement in the Seton/Anderson watershed. Sockeye smolts

[36] Geen, G.H. and F.J. Andrews. 1961. Limnological changes in Seton Lake resulting from hydroelectric diversions. Int. Pacific Salmon Comm. Progress Rept. 8

[37] Shortreed, K. S., K.F. Morton, K. Malange and J.M.B. Hume. 2001. Factors limiting juvenile sockeye production and enhancement potential for selected BC nursery lakes. DFO, CSAS Research Document 2001/098. http://www.dfo-mpo.gc.ca/csas/Csas/English/Research_Years/2001/2001_098e.htm

in Seton Lake are among the largest in the Fraser Watershed, indicating good food and growing conditions. Seton and Anderson Lakes could easily support the annual production of tens of millions of sockeye smolts.

Despite higher sockeye fry numbers in Seton Lake and lower plankton food supplies (compared to Anderson Lake), fry in Seton Lake have higher growth rates than fry in Anderson Lake. The slower growth rates of sockeye in Anderson Lake may be the result of competition from high densities of gwenish. Another hypothesis relates to the relaxation of diel vertical migration behaviour of sockeye juveniles in Seton Lake owing to high turbidity and camouflage from visually-feeding predators[38].

Anderson Lake

[38] J. Hume, DFO, personal communication

Carpenter Reservoir

Carpenter Reservoir was formed following construction of the Mission Dam (precursor to the Terzhagi Dam), and sits atop the former Upper Bridge River floodplain. The reservoir, 50 km long and 1 km wide, undergoes water level fluctuations (drawdowns) on the order of 30 m[39]. Under low pool conditions, the upstream half of the reservoir dewaters, forcing fish into confined habitat near Terzhagi Dam.

A limnological survey of Carpenter Reservoir has been carried out to measure water temperatures, oxygen concentrations, nutrient concentrations, phytoplankton and zooplankton (densities and biomass)[32].

A previous survey assessed fish habitat and production in the Hurley River/Cadwaller Creek drainage[40] which joins the Middle Bridge River immediately downstream of the La Joie Dam (Figure 17).

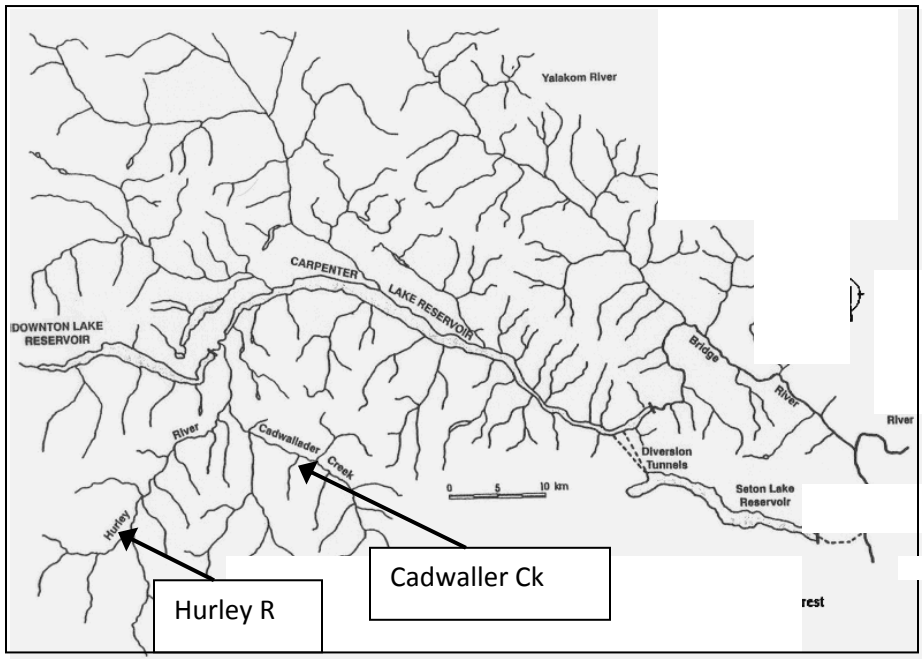


Figure 17. Location of Cadwaller Creek and the Hurley River[40].

[39] Perrin, C.J. and R.H. MacDonald. 1999. A phosphorus budget and limnology of Carpenter Lake Reservoir, 1995-1996. Prepared for R.P. Griffith and Associates.

[40] Griffith, R.P. 1997. Assessment of fish habitat and production in the Hurley River/Cadwaller Creek drainage. Prepared for BC Conservation Foundation and BC Environment.

Rainbow trout was the most numerous fish species captured. Numbers were extremely low, and distribution was restricted. Extreme glacial turbidity was the main constraint to rainbow trout production. Small rainbow trout showed advanced sexual development indicating low population productivity.

Tributary streams in the Carpenter Reservoir drainage, including Tyaughton Creek[41], Gun Creek, and the Hurley River, were classified as unproductive trout habitat[42] due to:

- Limited stream length accessible to migratory fish,
- Limited amount of suitable spawning substrate, and,
- Limited rearing capability due to lack of cover.

Rainbow and bull trout were the 2 predominant fish species in these tributaries.

Gillnetting in Carpenter Reservoir indicated the presence of rainbow trout, bull trout and kokanee. Stranding of redside shiners and bull trout was observed during receding water levels.

There is evidence for mercury contamination in Carpenter Reservoir. Samples from bull trout showed mercury levels of 0.54 parts per million[43], higher than the Canadian consumption guideline of 0.50 parts per million. Other fish species tested had mercury levels below Canadian consumption guidelines. Mercury concentrations in reservoirs usually peak about 10-25 years following reservoir creation, which in Carpenter Reservoir would have occurred between 1960-1985. It is unclear whether the elevated mercury concentrations in Carpenter Reservoir are a consequence of reservoir creation or former mining and tailings disposal.

Downton Reservoir

Downton Reservoir was formed by the construction of La Joie Dam. The reservoir is 26.5 km long and 1-1.5 km wide. The reservoir collects water from the glacially-fed Upper Bridge River making for a cold, turbid reservoir[44]. Both rainbow trout and bull trout utilize Downton Reservoir.

[41] Tyaughton Creek was an important chinook, coho and steelhead spawning stream prior to reservoir creation.

[42] Griffith, R.P. 1997. Assessment of fish habitat and production in the Hurley River/Cadwaller Creek drainage. Prepared for BC Conservation Foundation and BC Environment.

[43] Aqualibrium. 2001. Carpenter Reservoir, Seton Lake and Bridge River: metals and mercury concentrations in sediments and fish. Prep. for BC Hydro.

[44] Perrin, C.J. and P.M. Kiffney. 2000. Limnology of Downton Lake Reservoir, 1996-97. Report prepared for BC Hydro. 73p.

Figure 18.. La Joie Falls in the 1920's[45].

During May 1996, there was a severe drawdown of Downton Reservoir that stranded fish in pools in the drained reservoir bottom. Recovery of the population was tracked by Griffith[46] who concluded that there were minimal population consequences. However Griffith's analysis relied only on visual observations rendering this conclusion tenuous.

Fish habitat assessments have been undertaken in 22 tributaries of Downton Reservoir[47] (Figure 19). Rainbow trout spawned in 13 of the tributaries. Peak spawning occurred during the third week of July.

[45] BC Archives

[46] Griffith, R.P. 1996. Fish stranding and other implications of the 1996 drawdown of Downton Lake Reservoir. Prepared for BC Hydro.

[47] Tisdale, A.E. 1999. 1999 Downton Lake Reservoir rainbow trout spawning assessment (*Oncorhynchus mykiss*) June 9 – August 18, 1999. Prepared for BC Hydro.

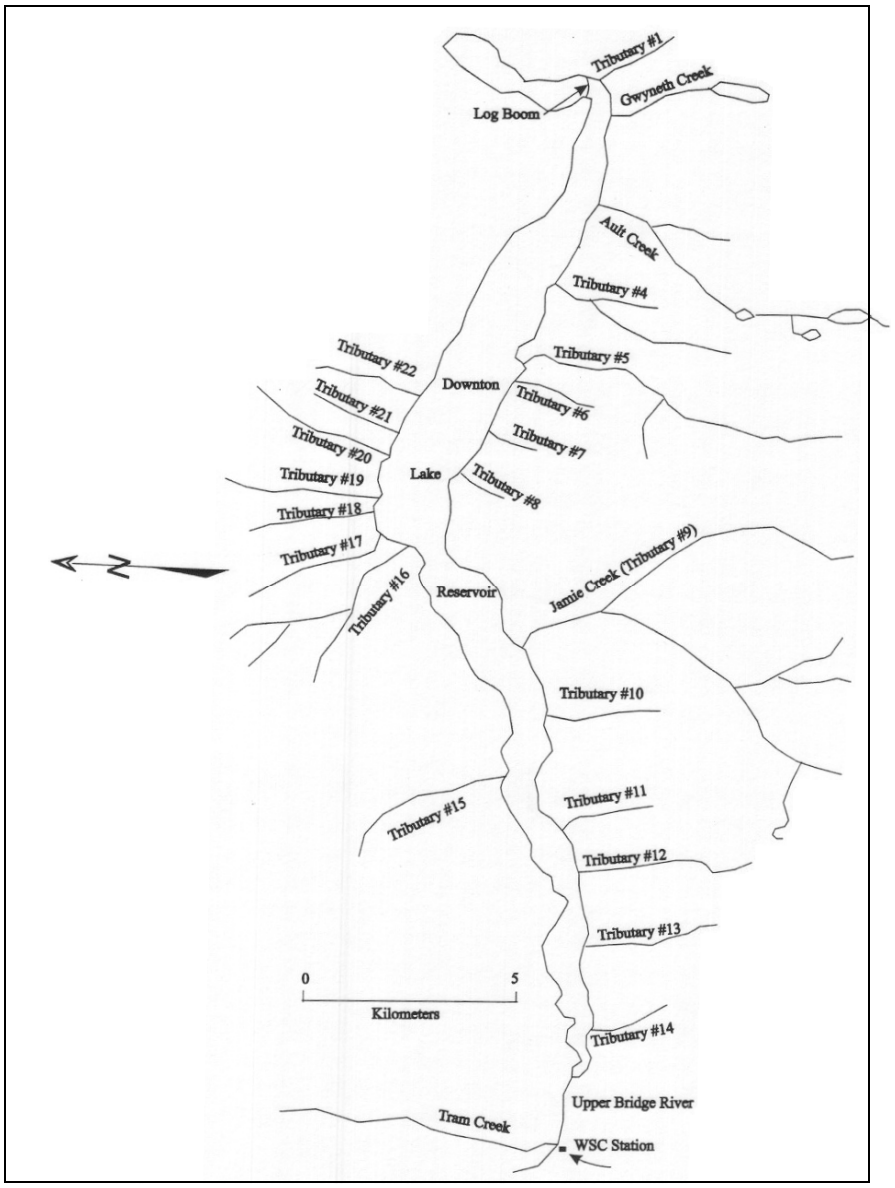


Figure 19. Downton Reservoir and its tributaries[48].

Seton River

Seton River has similar water quality to Seton Lake, lower in temperature and higher in turbidity than pre-hydro development conditions. Flow regulation has created local environmental impacts due to bank instability. River shorelines in certain locations require armoring so as to

[48] Tisdale, A.E. 1999. 1999 Downton Lake Reservoir rainbow trout spawning assessment (*Oncorhynchus mykiss*) June 9 – August 18, 1999. Prepared for BC Hydro.

reduce soil and land loss. Spills also have negative impacts on the Seton River and fish are susceptible to stranding during downramping.

Bridge River

BC Hydro has carried out numerous studies to investigate the effects of Terzhagi Dam flow releases on stream ecology and fish populations of the Bridge River[49]. During 1992, a spill at the Terzhagi Dam lowered water temperatures in the Bridge River by 4-5^{o}C and greatly increased suspended sediment levels[50]. During downramping, DFO salvaged 10 fish species, including 727 adults and 16,206 juveniles, mostly coho, rainbow, chinook, and redside shiners.

Several weeks prior to the spill, 1000 m^3 of gravel were deposited at 3 sites along the Bridge River for fish spawning and rearing[51]. These sites were heavily eroded by the spill.

BC Hydro fish monitoring locations in the Bridge River are shown below:

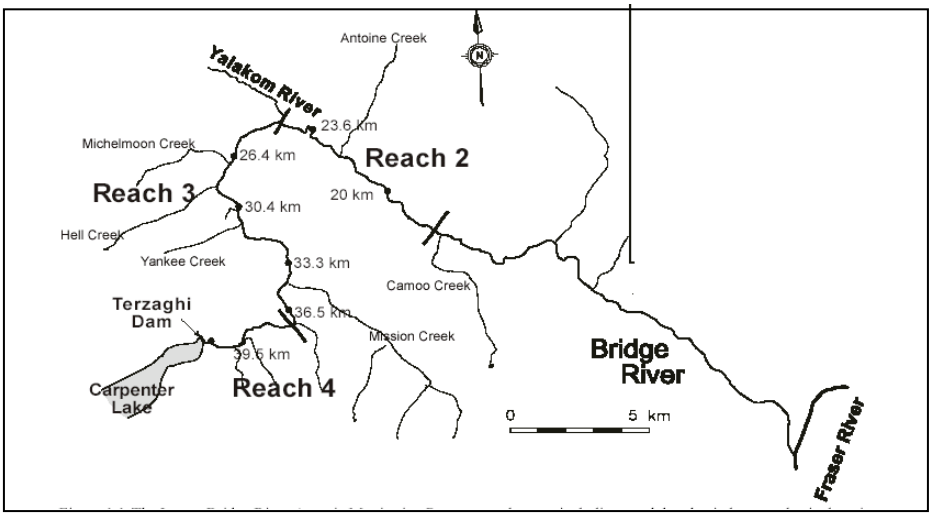


Figure 20. Location of fish sampling reaches in the Lower Bridge River.

[49] e.g. Lister, D.B., and R.J. Beniston. 1995. Bridge and Seton Rivers habitat inventory and fish stock assessment, 1993. Prepared for BC Hydro

Riley, S.C., P.S. Higgins and T. Nevin. 1997. Bridge River stream ecology and stock assessment program: 1996. Data Report. Prepared for BC Hydro.

Riley, S.C., P.S. Higgins and T. Nevin. 1998. Bridge River stream ecology and salmonid stock assessment program: 1997. Prepared for BC Hydro.

[50] Higgins, P.S. 1994. An assessment of the 1992 Bridge River flow ramping and fish salvage program. BC Hydro Rept. ER-94-04.

[51] Fotiou, D. 1993. Bridge River spawning platforms: impact of 1992 spill and assessment of alternative design options. BC Hydro Rept. No. H2773.

Gates Creek

Gates Creek is an important tributary which supports most of the sockeye salmon spawning in the Seton/Anderson watersheds[52]. The Gates Creek spawning channel, originally constructed by IPSFC in 1968, has a usable spawning area of 16,000 m^2 and capacity for 29,000 spawners.[53]

During 2003, N'Quatqua undertook a feasibility project for fish habitat restoration in Gate's Creek[54]. Juvenile fish (bull trout, Dolly Varden, rainbow trout, coho) were sampled by means of minnow trap. The project identified an area with excellent fish habitat potential:

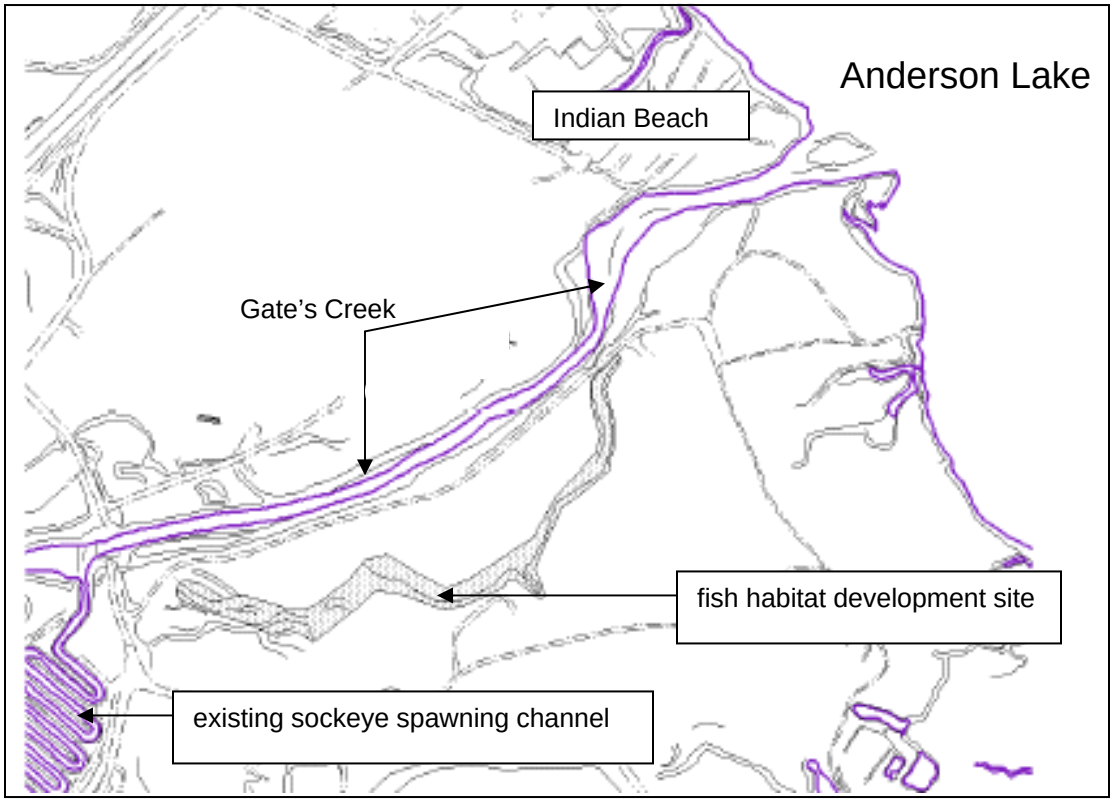


Figure 21. Location of the Indian Beach in N'Quatqua IR No. 1 and the potential off-channel fish habitat.

[52] The other spawning area is the Portage River.

[53] DFO. 1995. Fraser River sockeye salmon. Prepared by Fraser River Action Plan, Fishery Management Group. Vancouver, BC. 55p.

[54] Threvarge, C. 2004. Gates Creek fish habitat restoration project: feasibility and fencing. Final Report Prepared for: N'Quatqua and BCRP.

Habitat assessment and juvenile population data for Gates Creek are available[55]. Gates Creek has a stream length of 15 km of which 14 km are potentially accessible to salmon.

Smaller Tributaries

Numerous small tributary streams drain the Bridge/Seton watershed. These tributaries contain spawning and rearing habitat for rainbow trout, bull trout and salmon. The tributaries also serve as a source of organic inputs and nutrients for downstream habitats.

Aquatic Habitats Largely Unaffected by BC Hydro Development

These include habitats in the Harrison/Lillooet watershed, and lakes/tributaries upstream of BC Hydro operations:

- Harrison Lake;
- Lillooet Lake;
- Yalakom River; and ,
- other small lakes and streams in the Seton/Anderson watershed.

[55] Matthew, P.L. and R.W.J. Stewart. 1987. Summary of juvenile and adult salmonid studies in selected streams of the Adams River drainage and several mid-Fraser tributaries. Prepared for Community Economic Development Program, Salmonid Enhancement Program, Dept. of fisheries and Oceans.

Appendix 2: Hydro Impacts and Mitigation

Impacts

This section of the report describes fisheries impacts and quantifies the extent of fish habitat alteration.

Bridge River

1. Fish blockage at the Terzhaghi Dam resulted in the destruction of salmon populations in the middle Bridge River and its tributaries, e.g. Tyaughton Creek and Fergusson Creek. This extirpation occurred after 1948 when the Mission Dam (predecessor of the Terzhagi Dam) was constructed.

2. Low water discharge at Terzhaghi Dam has limited fish production in the lower Bridge River. Since 2000, a base flow of 3 m^3/sec/year, representing about 3% of the natural flow discharge, was allocated for downstream fisheries protection. Low flows restrict instream habitat quantity and access to former off-channel habitat. However, the higher summer temperatures associated with reduced flows may have partially offset rearing habitat losses. In 2011, the flow was increased to 6 m^3/sec/year as part of the adaptive management flow release experiment, a component of the Water Use Plan.

3. Flood release spills over Terzhaghi Dam previously damaged downstream fish populations and habitats. In summertime during years of high snow pack, water spills can occur. These spills harm fish and fish habitats, causing fish stranding and mortality during downramping. They also increase total gas pressure (TGP) and sediment levels. When necessary, BC Hydro spill preferentially in the Seton River rather than the Bridge River.

4. Gravel and large woody debris (LWD) recruitment below Terzhagi Dam has been eliminated. River gravels (including cobble, rocks and large boulders) and dead trees, branches and root

wads have important functions related to river dynamics and provision of fish habitat. Terzhagi Dam disrupts the supply of these materials to the Lower Bridge River.

5. Extensive stream, wetland and riparian habitats in the Middle and Upper Bridge River were lost following flooding of Carpenter and Downton Reservoirs.

6. Variation in Upper Bridge R. water flows below La Joie Dam has increased. Large spring drawdowns also affect fish access to tributaries in Downton Reservoir.

7. Drawdowns of Carpenter Reservoir (30 m amplitude) have created unstable fish habitat throughout the reservoir and reduced fish access to tributaries.

8. Bridge River salmon delay their migration at the Seton tailrace and the Seton River due to the high proportion of diverted homestream water. To date, concerns related to migratory delays have focussed on Seton sockeye salmon, but similar effects are also likely on Bridge River chinook, coho and steelhead.

Seton Lake and River

1. Sockeye smolt mortality has increased. Smolts are vulnerable when they migrate out of Seton Lake and into the diversion canal leading to the power turbine. Entrained smolts suffer high mortality compared to downstream passage via alternate routes. Since 2006, BC Hydro has effectively mitigated the mortality rate by adopting 6-hour nightly shutdowns for 30 days in April and May to coincide with the main smolt migration period.

2. Adult salmon migration efficiency has been reduced by delays at the Seton tailrace. Fish are attracted, delayed or injured in the tailrace before entering the Seton River. The tailrace delay increases salmon mortality.

3. At the Dam, Seton salmon are attracted to discharges greater than 60 m^3/sec through the radial gate and they delay going up the fish ladder on the opposite side of the river channel.

4. Large chinook salmon were formerly prevented from entering Seton Lake by the previous fishway which did not accommodate large fish.

5. Water quality conditions have been altered. Following the Bridge River diversion, sediment load and turbidity levels increased in Seton Lake, resulting in decreased light penetration. Bridge River water is also colder than Seton water, resulting in a decrease in late summer water temperatures. These physical changes have reduced the biological productivity of Seton Lake.

6. Fish spawning and rearing habitat close to the former lake outlet has been destroyed. Much of this habitat alteration was associated with dredging of 45,000 m^2 to construct the approach channel for the powerhouse canal.

7. Water level changes have reduced shore zone productivity due to physical habitat changes associated with flow variations.

8. Uncontrolled water spills in Cayoosh Creek and Seton River have caused fish displacement and loss of habitat. Fish stranding occurs during downramping after spill events.

9. Construction of the Seton Project reshaped the river channel below the dam, altered riparian habitats and destabilized the river banks.

System-Wide Impacts

1. Aquatic habitats were altered following construction of facilities, transmission line rights-of-way, and BC Hydro access roads.

2. Salmon harvests have been reduced due to elimination of traditional fishing areas. These impacts are most severe in the Seton River and in the upper, middle, and lower reaches of the Bridge River.

The magnitude of habitat alteration (aquatic, semi-aquatic, and terrestrial) due to BC Hydro development as measured by GIS analysis[56,57] is shown below:

[56] Regional Consulting Ltd. 2000. Bridge Coastal Fish and Wildlife Restoration Program Strategic Plan. Volume 2: Watershed Plans. Prepared for BC MELP, DFO, and BC Hydro. 393 p.

[57] Westland Resource Group. 2004. Draft. St'át'imc socioeconomic impact assessment. Prepared for St'át'imc Nation Hydro and BC Hydro. Victoria.

	Habitat Loss
Seton	
dredging (approach channel)	45,000 m^2
dam	2,286 m^2
canal	15,000 m^2
generating station	750 m^2
tailrace pool	7,000 m^2
Terzhagi/Carpenter	
dam	131,000 m^2
generating stations	unknown
land flooded	47 km^2
mainstem river channel length	92 km
mainstem river channel area	7.6 km^2
mainstem riparian zone[58]	5.5 km^2
tributary length (km)	55 km
tributary riparian zone	1.7 km^2
wetland	0.5 km^2
La Joie/Downton	
dam	97,900 m^2
land flooded	22 km^2
mainstem river channel length	65 km
mainstem river channel area	4.4 km^2
mainstem riparian zone	3.9 km^2
tributary length	25 km
tributary riparian zone	0.75 km^2
wetland	2.4 km^2
Transmission Lines and Rights-of-Ways	
ROWs	44 km^2
transmission line length	864 km
transmission line corridor[59]	425 km

Figure 22 shows the inundated Bridge River channel compared to present reservoir shorelines. The fish habitat alterations encompassed by the developments above will extend over the duration of the hydro project until decommissioning and habitat restoration takes place.

[58] Mainstem and tributary riparian zones calculated at 30 m and 15 m from each bank, respectively.

[59] Some transmission lines share ROWs or have adjacent ROWs, making the corridor length shorter than the total length.

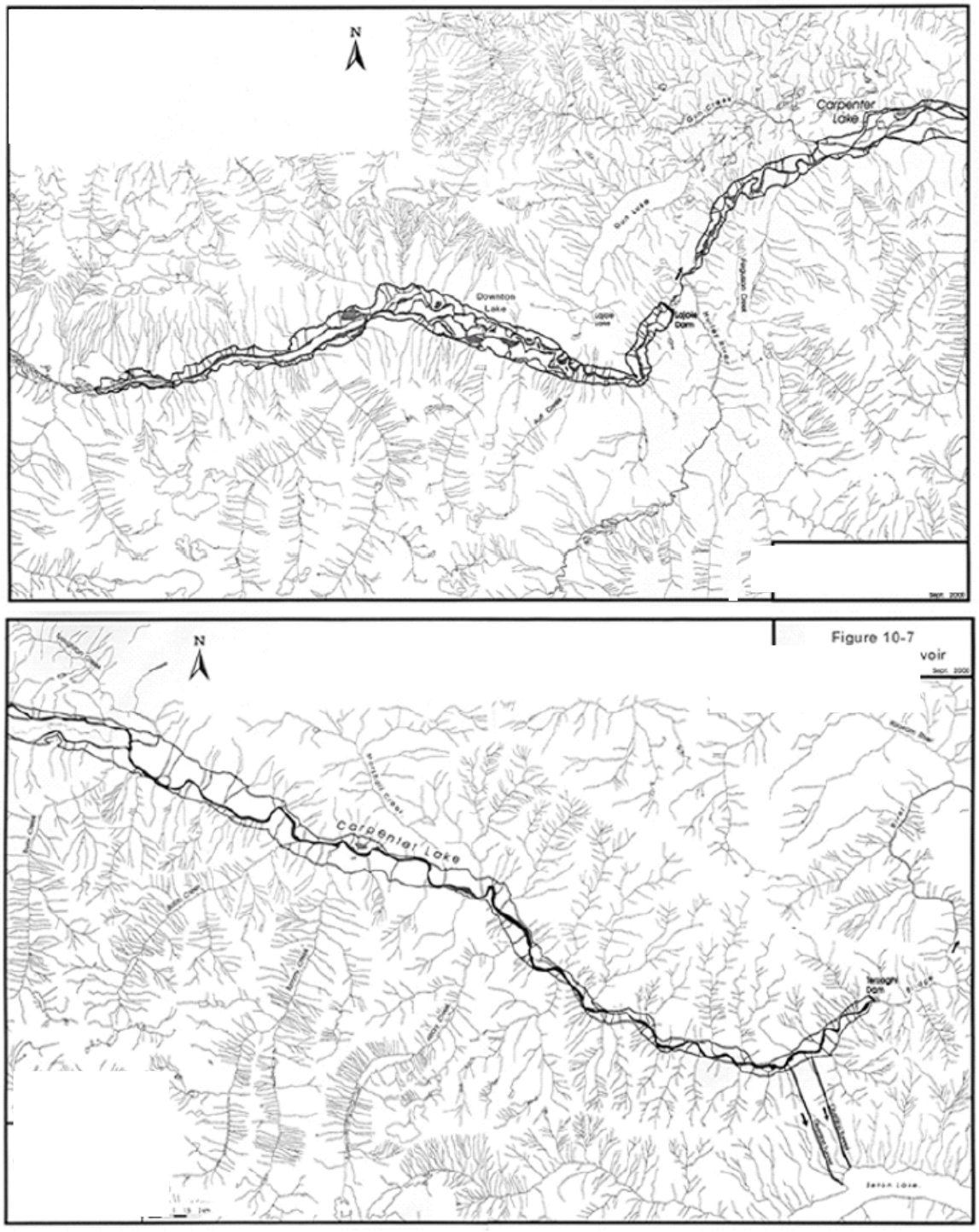


Figure 22. Maps[60] showing the former Bridge River channel (dark line) relative to present day reservoir shore lines in Downton (upper map) and Carpenter (lower map) Reservoirs.

[60] Regional Consulting Ltd. 2000. Bridge Coastal Fish and Wildlife Restoration Program Strategic Plan. Volume 2: Watershed Plans. Prep for BC MELP, DFO, and BC Hydro. 393 p.

Previous and Ongoing Mitigation Activities

1. Re-establishment of the Portage River sockeye run. This mitigation effort was undertaken in 1951 by transplanting Adams River sockeye eggs into the Portage River. This is one of the few successful sockeye transplants that have occurred in B.C. This run currently produces thousands of sockeye and is part of the Late Run timing group, similar to Adams River sockeye.

2. Pink salmon spawning channels in the Seton River. These channels (2) were constructed to mitigate the effects of the Seton Project on pink salmon spawning grounds below the lake outlet. Both spawning channels have been "complexed" to develop juvenile rearing habitat for coho, chinook, and steelhead.

3. Sockeye spawning channel at Gates Creek. This channel provides much-needed sockeye spawning habitat and has been effective. In some years, most of the sockeye in Gates Creek are spawning channel fish.

4. Renovation of the Gates Creek spawning channel. N'Quatqua and Northern St'át'imc Fisheries, in partnership with DFO, replaced all of the spawning gravel in 2008 and 2009 with suitable-sized material to improve sockeye egg-to-fry survival

5. Fish protective devices at Seton Dam. These include a vertical-slot fishway, a gate for maintaining required minimum flows, and a wire screen across the canal intake to prevent adult salmon from being swept into the power canal.

6. Construction of the Cayoosh Creek diversion channel. The diversion channel is used to manipulate the concentration of Cayoosh Creek water in the Seton River. This mitigation reduces but does not eliminate salmon tailrace delay.

7. Flow control facilities at Terzhagi Dam. These were established (post 2000) in an out-of-court settlement between BC Hydro and DFO. Fisheries flows to the Lower Bridge River were initially set at 3 m^3/sec/year and raised to 6 m^3/sec/year in 2011.

8. Gravel placements in the Bridge River to provide spawning habitat. Gravel placements for fish spawning have been largely ineffective. Water spills during 1982 and 1992 washed away previously installed gravel platforms.

9. Nightly Seton Plant closures during sockeye smolt migrations to reduce entrainment-induced mortality. This mitigation activity has been followed since 2006 and has been highly successful at reducing smolt mortality associated with power canal entrainment and migration through the powerhouse. Under the 2011 Hydro Agreement, the BC Hydro and St'át'imc are working co-operatively to ensure that mortality rates remain below 5%..

Fisheries Mitigation and the Bridge River Power Development Water Use Plan

The Bridge Water Use Plan (WUP) was prepared by a multi-agency working group called the Consultative Committee. The WUP defines preferred operating strategies at BC Hydro facilities in the Bridge/Seton watersheds. The WUP was finalized on March 17, 2011.

Figure 22 shows the Bridge-Seton system and the location of flow control facilities at Terzhagi Dam, La Joie Dam, Seton Dam and the Bridge diversion tunnels. The dams regulate Bridge/Seton watersheds for power production and other uses.

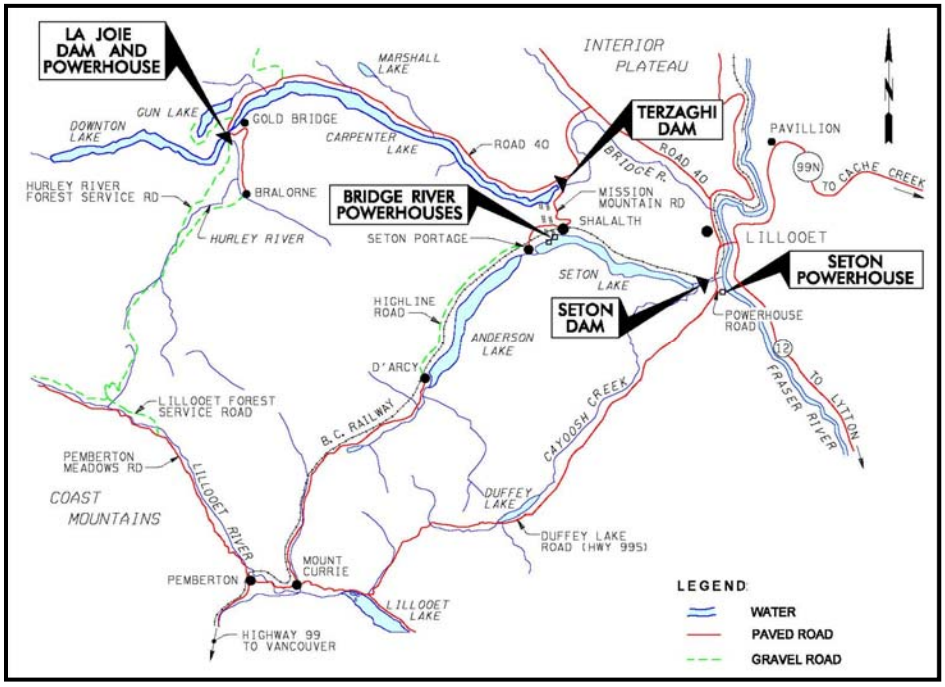


Figure 22. Location of BC Hydro facilities in the Bridge/Seton watersheds.

All components of the system are connected so that changes in operations at one point in the system will affect water flows, operations and environmental impacts elsewhere in the system. The WUP specifies the water discharges at the three dams and contains the operating rules for water management.

To monitor the effectiveness of the WUP, BC Hydro has contracted a joint venture between St'át'imc Eco Resources and Crane Creek Enterprises to carry out aquatic monitoring to determine how new WUP operating rules affect fish and other aquatic resources. Most of the focus is directed towards monitoring although there are specific mitigation components involving revegetation of Carpenter Reservoir and mitigation for erosion processes in Seton Lake. In the Bridge River, 6 cms (around 6 % of the former annual flow) is released to the downstream portion of the watershed below Terzhagi Dam.

Timing of Events that have Affected Fisheries in the Bridge/Seton watershed[61].

1903	Government constructed a hatchery at the Seton-Cayoosh confluence to incubate sockeye eggs; St'át'imc smolt weirs located at the outlets of Anderson and Seton lakes; Fraser River commercial fishery well-developed.
1909	1 million sockeye destined for upper Fraser River temporarily entered Seton Creek after natural blockage of Fraser River 5 miles above Seton confluence.
1911	Salmon delayed by rock slides from railroad construction at Hell's Gate.
1912	Heavy pre-spawning mortalities for sockeye delayed by Seton hatchery weir.
1914	Hell's Gate slide impeded or blocked salmon runs to Seton system; less than 100 Gates Creek sockeye returned; all were taken by the hatchery.
1915	Hell's Gate slide cleared but still blocked fish; Seton hatchery closed due to lack of fish.
1927	Drilling of first 5 km tunnel through Mission Ridge commenced.
1931	Construction of first tunnel completed.
1934	First Bridge River diversion of 0.85 m^3 per sec into Seton Lake.
1945	Construction of fishways at Hell's Gate allowed upstream migration.
1946	Bridge River Powerhouse No. 1 (BR1) construction commenced.
1948	Construction of La Joie Dam initiated; construction of Mission Dam (now known as Terzaghi); BR1 power intake completed and Unit 1 operational. Construction of a low temporary dam 15 km upstream of the Bridge-Yalakom confluence to divert Bridge River flow to the Shalath Powerhouse No. 1 at Seton Lake. This diversion dam completely blocked spawning salmon bound for the Upper Bridge River – some (mostly Tyaughton Creek) chinook were cultured by Dept. of Fisheries using planting cylinders in Gates and Portage Creeks; between 1949 through 1953, Bridge R. chinook salmon delayed their migration at the Seton tailrace in response to the Seton-Bridge and Yalakom-Bridge water mixtures.
1949	Bridge River diversion into Seton Lake increased to 28.3 m^3 per sec; Units 2 and 3 at BR1 operational.
1950	Between 1950-52, Dept. of Fisheries constructed an eyeing station, salvaged Bridge R. chinook at the diversion dam, and planted eyed eggs into Gates Creek, Portage Creek and the Yalakom River.

[61] The assistance of P.Higgins, BC Hydro to prepare this chronology is gratefully acknowledged.

1951	IPSFC transplanted Adams River sockeye eggs into Portage Creek; construction of La Joie Dam completed to El. 736.1 m.; La Joie Dam in service.
1952	Height of La Joie Dam increased to El. 753.5 m.
1953	B.C. Electric obtains conditional water license to divert 3.2 billion m^3 annually.
1954	BR1 Unit 4 operational; Bridge River diversion increased to 62.3 m^3 per sec; construction of Seton power generation facility, dam, canal, and penstocks commenced.
1955	Cayoosh Creek diversion dam and tunnel to Seton Lake completed.
1956	Construction of Seton power generation facility, dam and penstock completed; Seton project completed and in-service.
1957	La Joie powerhouse completed.
	A blockage at the Bridge River Rapids in the Fraser River caused back-up of migrant sockeye into the lower Bridge River.
1958	Andrew and Geen (1958)[62] reported delay of pink salmon at Seton tailrace; excavation of second tunnel for Bridge River Project commenced.
1959	Units 5 and 6 at BR2 operational.
1960	Excavation of second tunnel for Bridge River Project completed; construction of larger Mission Dam (now called Terzagi Dam) completed; BR2 power intake completed; Units 7 and 8 at BR2 operational; Bridge River diversion increased to final rate of 147 m^3 per sec.
1961	Upper Seton Creek spawning channel constructed for pink salmon; Geen and Andrew (1961)[63] reported limnological changes in Seton Lake.
1964	One thousand sockeye and a few chinook spawned below Terzhagi Dam during a spill, but the seeded areas dried completely during the incubation period.
1967	Lower Seton Creek pink salmon spawning channel constructed.
1968	Cayoosh Creek diversion dam breached and abandoned; Gates Creek spawning channel constructed for sockeye salmon.
1972	Delay of sockeye salmon at tailrace noted by IPSFC.

[62] Andrew,F.J. and G.H. Geen, 1958. Sockeye and pink salmon investigations at the Seton Creek hydroelectric installation. Progr. Rep. Int. Pacif. Salm. Fish. Comm. Monogr. Ser. No. 42. 78 pp.

[63] Geen, G.H. and F.J. Andrew. 1961. Limnological changes in Seton Lake resulting from hydroelectric diversions. Int. Pacific Salmon Comm. Progress Rept. 8

1975 A mid-late August run of about 100 chinook and an October run of about 100 coho were noted in the Bridge River in the "Horseshoe Bend" area (1 km downstream of the Yalakom confluence) and near the Yalakom confluence.

1977 The Horsehoe Bend area was cleared of debris.

1976 IPSFC first report on tailrace delay and mortality of sockeye salmon.

1977 Original turbine runner in Seton powerhouse replaced.

1978 First in a series of annual studies by IPSFC (funded by BCH and authored by Fretwell) on both juvenile and adult salmonid mortalities at Seton Dam; Eight spawning platforms were constructed on the Bridge R. between km 39-44 (upstream of the Yalakom confluence) as a joint project between DFO, BCFW, and Dept. of Highways during road-widening. The platforms were utilized by coho, chinook, and steelhead until a spill release flood washed them out in 1982.

1979 Second year of IPSFC salmon studies; tailrace delay studies identify Cayoosh Creek flows masking Seton Creek flows; Cayoosh Creek diverted on a seasonal basis (until 1992) for fish migration requirements.

1980 Third year of IPSFC salmon studies; BCH monitors adult fish passage at dam (Rowland 1981)[64].

1981 Fourth year of IPSFC salmon studies; IPSFC requested BCH to minimize frequency of plant shutdowns during smolt migration; electronic counter installed in fish ladder to enumerate returning spawners.

Preliminary proposal developed by the Bridge River Band to build and operate a hatchery either 200 m or 1 km downstream of Applespring Creek.

1982 Last of five IPSFC salmon studies.

Central Interior Tribal Council (CITC) studied Bridge River salmon enhancement opportunities and recommended that the Applespring Creek hatchery proposal be discarded and replaced by several alternative sites with better access and water supply.

BCH undertook a spillway test at Terzaghi Dam which was terminated at 140 m^3 per sec (planned for 280 m^3 per sec) after roads, bridges and spawning gravels were washed out, including spawning platforms placed in 1978.

1983 CITC produced a report recommending the Portage Creek area as a central chinook/coho facility due to excellent groundwater potential and support from the

[64] Rowland, D.E. 1981. Monitoring fish passage at Seton Powerhouse and Dam. BC Hydro Rept. No. ESS-17.

	Seton Lake Band. The Band proposed a site located on reserve land for an incubation and intermediate rearing facility (final rearing would occur in pens situated in Anderson or Seton Lake. The facility would also include Bridge and Yalakom stocks).
1983	Yalakom River chute obstruction at km 48 was reduced by blasting undertaken jointly by DFO, BCFW, and the Lillooet Rod and Gun Club.
1987	BCH and DFO undertook a control test release at Terzaghi Dam to assess feasibility of continuous flow release from drainage gallery needle valve.
1990	BCH studied engineering feasibility of juvenile fish bypass options.
1991	Three spills occurred from Carpenter Lake to prevent an uncontrolled freecrest spill at Terzaghi Dam. Resulted in Fisheries Act charges.
1992	Spill occurred from Carpenter Lake to prevent an uncontrolled freecrest spill at Terzaghi Dam (Higgins 1994)[65]. In addition to causing a 5 ^{o}C increase in Bridge River water temperature and a pulse of suspended sediment, the spill washed out 3 gravel spawning and rearing platforms that were installed several weeks prior to the spill (Fotiou 1993)[66]. Resulted in Fisheries Act Charges
1992-94	BC Hydro mitigative chinook fry releases in the Bridge/Yalakom system.
1993	Additional spawning platforms constructed in Reach 3 of Lower Bridge R.
1993	Permanent Cayoosh Creek Diversion Dam and diversion tunnel constructed, linking tailrace of Walden North (now Fortis) to Seton Lake; Walden North Dam and Generating Station constructed just upstream of the Cayoosh Creek Diversion Dam.
1993	BCH conducted an operations study and established a 2.2 m maximum reservoir elevation buffer in Carpenter Reservoir to reduce spill frequency/magnitude into the Lower Bridge River.
1993-1995	BCH conducted instream flow assessment studies for Lower Bridge River.
1993	Downton Reservoir drawdown. Resulted in 3 yr program to evaluate impacts of operations on fish populations in Downton Reservoir.
1996	Lower Bridge R. Aquatic Monitoring Program initiated to characterize physical and biological conditions prior to continuous flow releases from Terzaghi Dam.

[65] Higgins, P.S. 1994. An assessment of the 1992 Bridge River flow ramping and fish salvage program. BC Hydro Rept. ER-94-04.

[66] Fotiou, D. 1993. Bridge River spawning platforms: impact of 1992 spill and assessment of alternative design options. BC Hydro Rept. No. H2773.

	Program is ongoing and integrated into WUP monitoring. St'át'imc Nation Hydro begins operations.
1997	Controlled spill implemented at Terzaghi Dam from Carpenter Reservoir. Maximum releases 20 m^3/sec.
1998	Out-of-court settlement for 1991 and 1992 Fisheries Act violations. Settlement included a shaped annual water budget of 3 m^3/sec/year, modification of the dam to allow low-level continuous flow releases, and channel restoration/gravel addition below Terzaghi Dam. Settlement expired after completion of the WUP in 2011.
1999-2001	Testing of louvers for guidance of sockeye smolts past Seton Dam. Louvers proved to be ineffective to protect migrating smolts from power canal entrainment.
1999	Modification of Terzaghi Dam Low Level Outlet to permit controlled low- level releases (part of the out-of-court settlement).
1999	Bridge/Seton Water Use Plan initiated.
1999	DFO restoration program for the 2 km reach of the Bridge River below Terzaghi Dam damaged by natural debris flow, placer mining and erosion events from irregular dam releases (part of the out-of-court settlement).
2000	Continuous flow releases (3 m^3/sec/year) from Terzaghi Dam initiated (part of the out-of-court settlement).
2003	Draft Bridge-Seton Water Use Plan submitted to BC Water Comptroller.The WUP would eventually be finalized in 2012.
2006	St'át'imc Nation Hydro (SNH) and BC Hydro initiate a collaborative program to test the effectiveness of 6-hour duration nightly closures of the Seton Plant in order to protect sockeye smolts from Powerhouse entrainment. The program has since been carried out annually since 2006 and is effective at reducing smolt mortality to less than 5% in most years.
2007-2010	Northern St'át'imc signed a Fisheries Framework Agreement with DFO and create Northern St'át'imc Fisheries (NSF) which was funded under an AAROM agreement.
2007-2010	NSF undertook fisheries project work with funding from BCRP and Fraser Salmon Watersheds Program (FSWP) and worked collaboratively with DFO to: 1) replace sockeye spawning gravel in the Gates Creek spawning channel, 2) construct off-channel spawning and rearing habitat at Applespring in the Lower Bridge River, 3) conduct a mid-Fraser sockeye fisheries assessment pilot project with Nlaka'pamux Nation Tribal Council, 4) prepare annual fisheries management plans for the St'át'imc fishery in the Fraser River, and 5) identify fisheries restoration opportunities in St'át'imc Territory.

2008-2009	Bridge River Flow Technical Working Group recommended a 6 cms flow hydrograph selected using a Structured Decision Making (SDM) approach which is adopted in the revised WUP for the subsequent flow trial.
2011	Bridge WUP is accepted by the Water Comptroller on March 17, 2011. The Settlement Agreement with BC Hydro is signed on May 10, 2011 containing various fisheries provisions and which will provide annual funds for fisheries enhancement and mitigation.
2012	SNH dissolves and becomes part of St'át'imc Government Services. SGS via St'át'imc Eco Resources (SER) forms an unincorporated joint venture with Crane Creek Enterprises to deliver fisheries and environmental mitigation and monitoring services. BC Hydro engages SER to undertake 17 WUP monitoring projects between 2012 - 2021.

Appendix 3. Fisheries Restoration in Northern St'át'imc Territory [30]

St'át'imc Fisheries Projects • Low priority - L • Med priority - M • High priority - H • Work in progress - W • Completed - C	Seton Power Canal, Intake & Tailrace	Seton River	Cayoosh Creek	Seton Lake	Portage Creek	Anderson Lake	Gates Creek	D'Arcy Creek	Blackwater Creek	Lower BR reach 1 & 2	Yalakom River	Lower BR reach 3 & 4	Carpenter lake	Middle Bridge River	Downton Lake	Hurley & Cadwallader Rivers	Upper Bridge River	Fraser River	Infrastructure
Fish diversion options	H																		
Assess fish passage delay	H	H																	
Assess diversion mixing flows	M																		
Assess fallback and velocities	H																		
Coho/Chinook hatchery		M	M							M	M	NA							
Wildlife crossing fence	H																		
Side channel enhancement		H	M				H			H		NA							
Spawning channel inventory	M	H																	
Upland/riparian restoration		H																	
Spawning assessment: Kokanee													H	H					
Spawning assessment: Bull trout		H		H	H	H	H	H	H	H		H	H	H	H	H	H		
Spawning assessment: Coho		H			W		H	H	H	W		W							
Spawning assessment: Chinook		H			W		H	H	H	W		W							
Spawning assessment: Gwenish				H		H													
Spawning assessment: Rainbow							M						M	M	M	M	M		
Spawning assessment: Sockeye					H		H	W	W	W		W							

[30] St'at'imc Nation Fisheries Projects. Watersheds and Infrastructure, 2011 Summary Report. Prepared for Fraser Salmon & Watersheds Program by Lillooet Tribal Council and Crane Creek Enterprises.

St'át'imc Fisheries Projects • Low priority - L • Med priority - M • High priority - H • Work in progress - W • Completed - C	**Seton Power Canal, Intake & Tailrace**	**Seton River**	**Cayoosh creek**	**Seton Lake**	**Portage Creek**	**Anderson Lake**	**Gates Creek**	**D'Arcy Creek**	**Blackwater Creek**	**Lower BR reach 1 & 2**	**Yalakom River**	**Lower BR reach 3 & 4**	**Carpenter lake**	**Middle Bridge River**	**Downton Lake**	**Hurley & Cadwallader Rivers**	**Upper Bridge River**	**Fraser River**	**Infrastructure**
Spawning assessment: Steelhead		H			H	H		H	H	W		W							
Spawning assessment: Whitefish		H			H									W		W			
Winter habitat studies		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
Habitat enhancement: LWD		M	M		L		L	L	L	M	M	NA		M		L	L		
Ground water studies		L	L		L		L	L	L	L	L	L						L	
Smolt outmigration: Sockeye		W		W	H	H	H												
Stream & riparian debris clean up		H	H	H	H	H		H	H	H	L	H	H	H		H		H	
Gravel placement		M	H		M														
Riparian planting					M														
Lake Fertilization				L		L							M						
Stream Fertilization										L	L	NA							
Tributary assessment and enhancement				H	H	H						NA					H		
Cayoosh Creek influence on fish production				L															
Sturgeon studies				H														H	
Fish inventory of all tributaries				H		H		H											
Enhance reservoir fish population				M		L							L						
BR sedimentation Studies				H									L						
New Sockeye spawning channel					H														

St'át'imc Fisheries Projects • Low priority - L • Med priority - M • High priority - H • Work in progress – W • Completed - C	**Seton Power Canal, Intake & Tailrace**	**Seton River**	**Cayoosh creek**	**Seton Lake**	**Portage Creek**	**Anderson Lake**	**Gates Creek**	**D'Arcy Creek**	**Blackwater Creek**	**Lower BR reach 1 & 2**	**Yalakom River**	**Lower BR reach 3 & 4**	**Carpenter lake**	**Middle Bridge River**	**Downton Lake**	**Hurley & Cadwallader Rivers**	**Upper Bridge River**	**Fraser River**	**Infrastructure**
Marshland development							H												
Identify future restoration projects							C			H	L	L	L			L			
Rejuvenate Gates Creek Spawning channel							C												
Habitat enhancement and complexing			H				H												
Construct acceleration pools									M										
Weed control at Apple Springs										H									
Barrier removal											H								
Gravel assessment		L								C	M	M							
Fish counter or fence												H							
Fish entrainment studies	H												H		H				
Monitor fish stranding													L		L				
Habitat enhancement: debris platform													H		H				
Re-establish outlets												H							
Dam removal in Cadwallader CR																H			
Food fishery enhancement and protection																		H	
Smolt entrainment studies	H																		

St'át'imc Fisheries Projects • Low priority - L • Med priority - M • High priority - H • Work in progress – W • Completed - C	**Seton Power Canal, Intake & Tailrace**	**Seton River**	**Cayoosh creek**	**Seton Lake**	**Portage Creek**	**Anderson Lake**	**Gates Creek**	**D'Arcy Creek**	**Blackwater Creek**	**Lower BR reach 1 & 2**	**Yalakom River**	**Lower BR reach 3 & 4**	**Carpenter lake**	**Middle Bridge River**	**Downton Lake**	**Hurley & Cadwallader Rivers**	**Upper Bridge River**	**Fraser River**	**Infrastructure**
Management and monitoring of agency activities																			L
Transfer Seton spawning channels to Sewk'elw'as																			H
Provide ongoing training in fisheries assessment																			H
Management and monitoring of prescribed burns																			L
Monitor species re-introduction																			L
Replanting of culturally significant trees and plants																			L
Hand clearing of ROW vegetation																			M
Salmon ownership																			H
Public awareness			M																M
Land for purchase identification																			H
Monitor water quality throughout																			H
Monitor fish health throughout																			H
Stream fertilization throughout																			L
Assessment of spawning utilization		H	H		W														

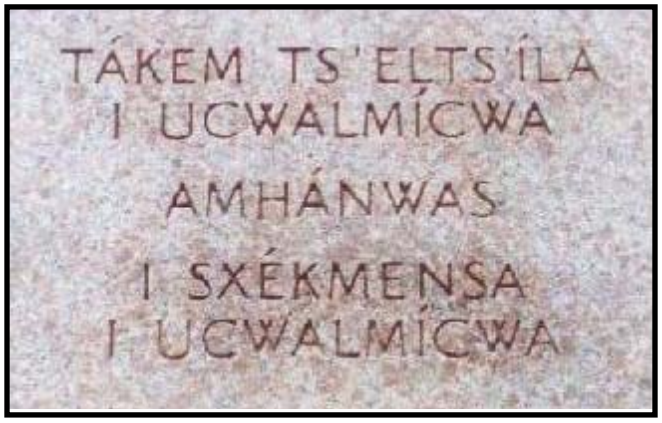
St'át'imc Fisheries Projects • Low priority - L • Med priority - M • High priority - H • Work in progress – W • Completed - C	**Seton Power Canal, Intake & Tailrace**	**Seton River**	**Cayoosh creek**	**Seton Lake**	**Portage Creek**	**Anderson Lake**	**Gates Creek**	**D'Arcy Creek**	**Blackwater Creek**	**Lower BR reach 1 & 2**	**Yalakom River**	**Lower BR reach 3 & 4**	**Carpenter lake**	**Middle Bridge River**	**Downton Lake**	**Hurley & Cadwallader Rivers**	**Upper Bridge River**	**Fraser River**	**Infrastructure**
Feasibility of side channel development					H								M						
Restoration projects					H								L						
Identification of fish utilization in river			H								W								
Re-establish spawning platforms												NA							
Stream side restoration														W					
Grass seeding drawdown areas													W	W					
Establish internship program																			H
Initiation of Stream Keepers program throughout watershed					H														H
Partnering with neighbours along the Fraser River towards a common goal: restore and maintain salmon populations in the Fraser River																			H
Fish counter above North Thompson River																		L	
Assessment of options to support/enhance Chinook production												H							
Beaver Dam Flats											L								
Urban issues								H											
Placer Claims										H									

Appendix 4: SGS Fisheries Project Opportunities

Application of St'át'imc Knowledge for Fisheries Management

The application of St'át'imc Knowledge and integration with scientific information will be invaluable for fisheries management within the Territory. A previous workshop undertaken as part of the WUP process documented St'át'imc Knowledge in relation to gwenish. Similar information is required for sockeye and chinook salmon as priority species.

Relevant information is available via Lillooet Tribal Council which previously conducted interviews with elders that considered fisheries. While the information is not specific to fisheries and includes all aspects of St'át'imc culture and ways of life, SGS will work co-operatively with LTC to analyse this valuable information. Upon completion, there may be other aspects of St'át'imc Knowledge that require documentation and additional interviews may be required. Verification of the results would be possible at Elder Forums.



"All the people are the same"

"To feel good about oneself"

"The ways/laws of the people"

Capacity Building in Fisheries Management

Formal training options for different types of Fisheries Personnel are listed below:

High School Diploma: graduate can serve as an Assistant Fisheries Technician carrying out field work, fish and environmental monitoring, catch monitoring, laboratory and office work under the close supervision of a Fisheries Technician.

Certified Fisheries Technician Level 1: A 5-week course is offered by Vancouver Island University, "First Nations' Fisheries Technologist Diploma Program" which is an accredited fisheries diploma program designed to be delivered in First Nations' communities. St'át'imc Fisheries Technicians have previously received training in Lillooet under this program. Recently in 2012, Sekw'el'was organized a fisheries training course for 14 technicians and Xwisten have similar training course planned for the near future.

Certified Fisheries Technician Level 2: A two-year duration program offered by Vancouver Island University is designed to provide skills training to First Nations and current field technicians wishing to update and expand their skills and abilities. Training is provided at Vancouver Island University (Nanaimo).

Certified Fisheries Technician Level 3: A two-year program provided by the BC Institute of Technology, Burnaby in the Renewable Resources Program. The program (Fish, Wildlife and Recreation) covers the management of fish, wildlife and wild land recreation and includes habitat ecology, environmental inventory techniques and environmental law with respect to these resources.

Fisheries Co-ordinator – graduate of a University BA or BSc program. Numerous universities can provide training (TRU, UBC, SFU, Univ. of Victoria, etc.). This individual would manage projects and become involved in fisheries management.

Senior Fisheries Biologist – post-graduate of a University M.Sc. or Ph.D program. In 1997, University of BC developed the **Aboriginal Fisheries Initiative** in response to the scarcity of Aboriginal people with Masters or PhD degrees in fisheries. This Graduate Program trains highly-qualified Aboriginal fisheries scientists to make a major contribution to future management combining Aboriginal perspectives with fisheries science. A Senior Fisheries Biologist would develop programs, undertake fisheries policy analysis, provide support to the St'át'imc Council of Chiefs, and represent the Nation during negotiation processes.

There is no shortage of Fisheries Technicians within the St'át'imc Nation. Both on-the-job training and the development of skills related to project planning, management and report writing need to be developed. These skills can learned through formal training programs and enhanced during the execution of actual fisheries projects, by applying the approach of "learn by doing". Skill sets can be enhanced rapidly by "job-shadowing" whereby trainees work closely with Senior Technicians on a consistent basis to rapidly acquire understanding and experience.

The following qualifications provide a basis for working on SGS Fisheries Projects:

1. First Nations' Fisheries Technologist Diploma (Vancouver Island University)
2. Swiftwater training
3. Wilderness first aid training
4. First aid transportation endorsement

Water Quality and Fish Health Monitoring

There are ongoing concerns about water quality and fish health in the Territory. In certain years, sockeye salmon can have lesions or other abnormalities. This project will be initiated by analysing existing water quality information from government sources and then preparing a SGS database. Siska First Nation completed a highly relevant study of salmon contaminants including heavy metals, PCBs, dioxins and furans, pesticides and poisons that impact hormones and genetic make-up[67] that will be referenced. A water quality specialist will be contracted to prepare the necessary background analysis to inform subsequent field monitoring. New water quality and fish health assessments will be undertaken by sampling water, sediments and fish tissues at a strategic location in the Fraser River close to Sxetl over a 12 month period. In successive years, assessments will be refocused elsewhere in St'át'imc Territory.

Fisheries Assessment and Monitoring

This project will be undertaken to document the distribution and abundance of fisheries resources in the Traditional Territory. The sampling program will be designed so that the status of fish resources can be monitored over time.

N'Quatqua Fisheries Technician setting fish trap in Gates Creek.

It will include the results from existing fisheries monitoring programs, e.g. DFO salmon escapement programs and WUP monitoring results. A database will be established that will

[67] Siska Salmon and Indigenous Peoples' Life Work.

allow future fisheries assessments to determine fish population trends within St'át'imc Territory. Part of the activity will involve new data collection from lakes, streams and other waterbodies within St'át'imc Territory. Adult salmon populations not presently monitored by stream counts in rivers and creeks will be enumerated. Sampling will be co-ordinated with WUP monitoring activities and future FWCP project field activities.

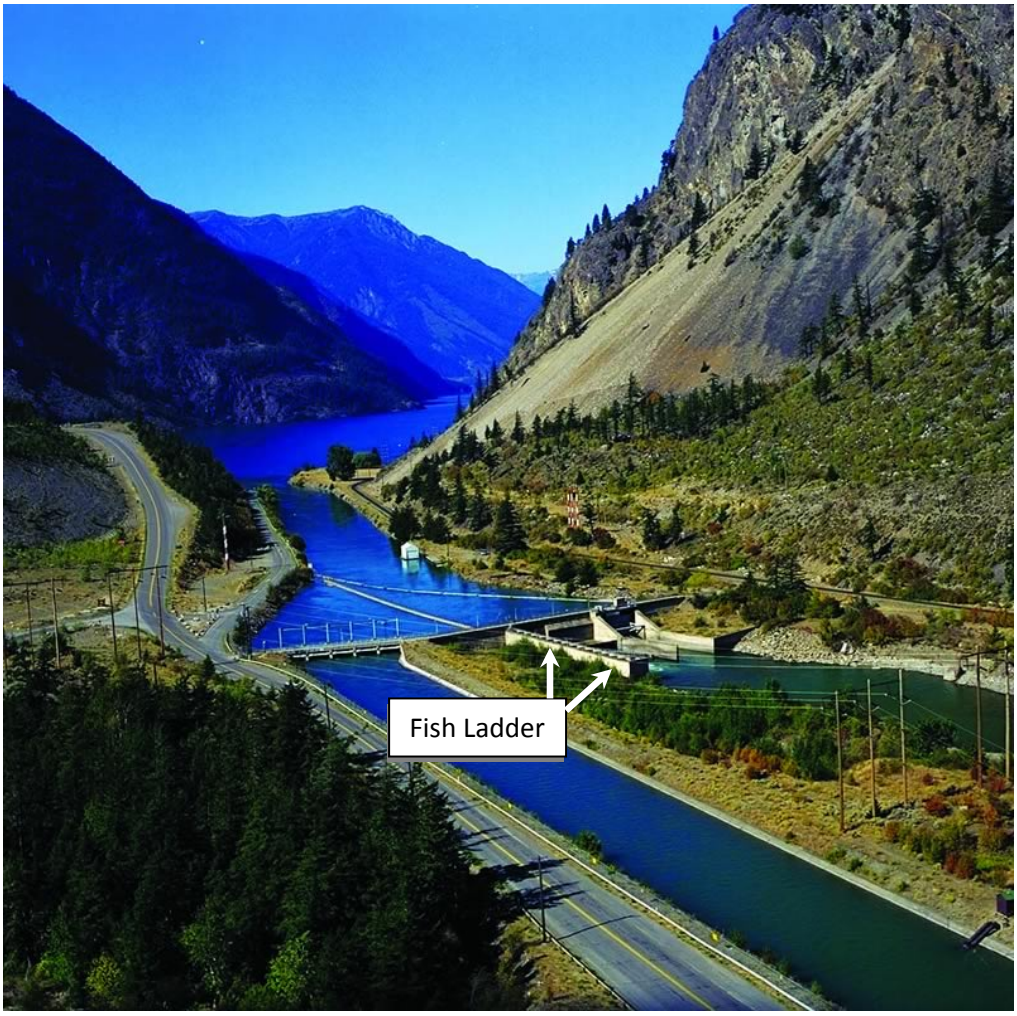
Harvesting of Gates and Portage Sockeye

Although Gates Creek and Portage Creek sockeye are important salmon runs that originate in St'át'imc Territory, they are not harvested to any significant extent. Recent actions by St'át'imc, BC Hydro and DFO including the renovation of the Gates Creek Spawning Channel and the reduction of entrainment mortality during smolt downstream migration may yield higher sockeye returns.

Harvesting could take place in either Seton River or Portage Creek and the BC Hydro fish counter that operates at the Seton Dam could provide a useful tool for managing the fishery.

Salmon Weir at Outlet of Seton Lake in 1911 (BC Archives)

During the initial development of this fishery, it would be most practical to obtain access to the Seton Dam Fish Ladder from BC Hydro and to employ a number of fishers that would dip net sockeye in a communal fishery. If the fishery proved to be successful over several years, construction of a new weir in the Seton River and/or Portage Creek could be considered.



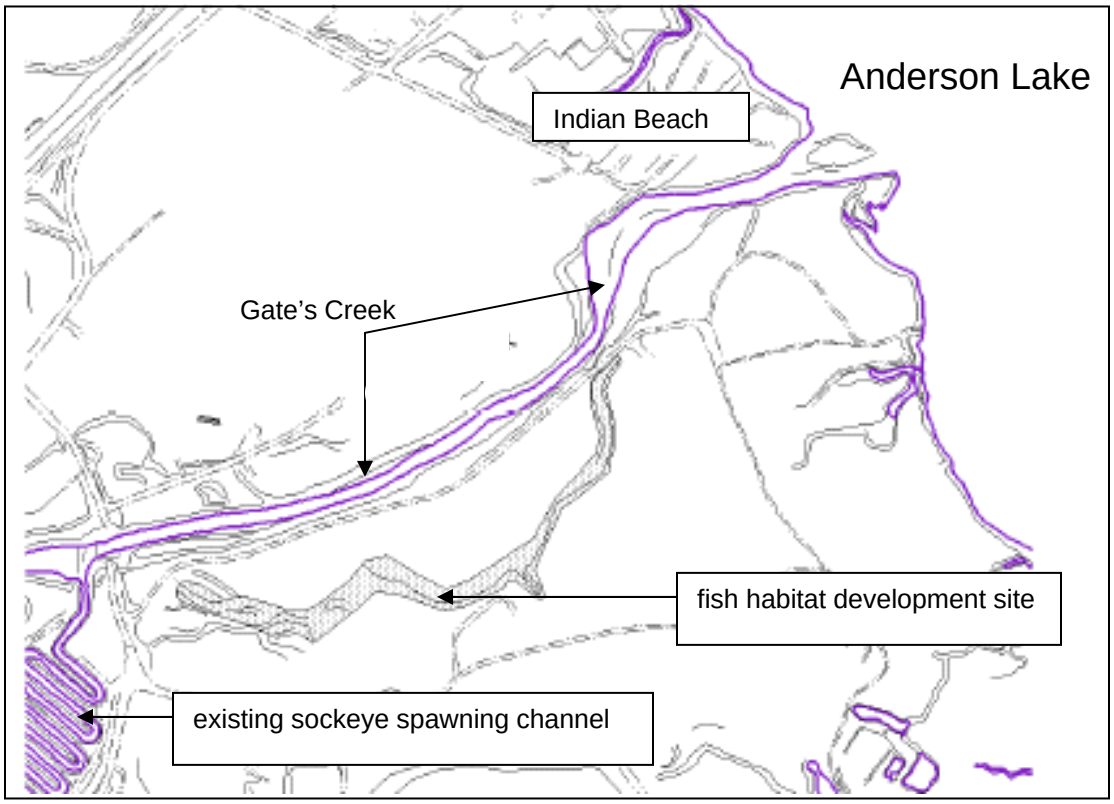
Habitat Enhancement Adjacent to Gates Creek

Gates Creek flows into the head of Anderson Lake adjacent to the community of N'Quatqua and has a stream length of 15 km of which 14 km are potentially accessible to salmon. It is one of the most important salmon tributaries within Northern St'át'imc Territory supporting a major sockeye run and a sizable coho population, along with bull trout and rainbow trout.

During 2003, N'Quatqua undertook a feasibility project for fish habitat restoration in Gates Creek[68]. Juvenile fish (bull trout, Dolly Varden, rainbow trout, coho) were sampled by means of

[68] Threvarge, C. 2004. Gates Creek fish habitat restoration project: feasibility and fencing. Final Report prepared for N'Quatqua and BCRP.

minnow trap. The project identified an area with excellent fish habitat potential, however local landowners at the time of the study did not support the project.

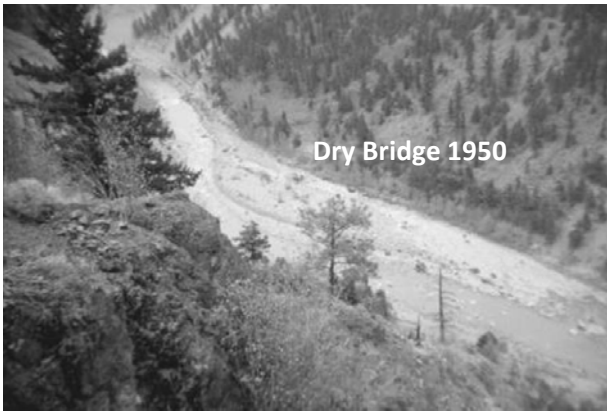


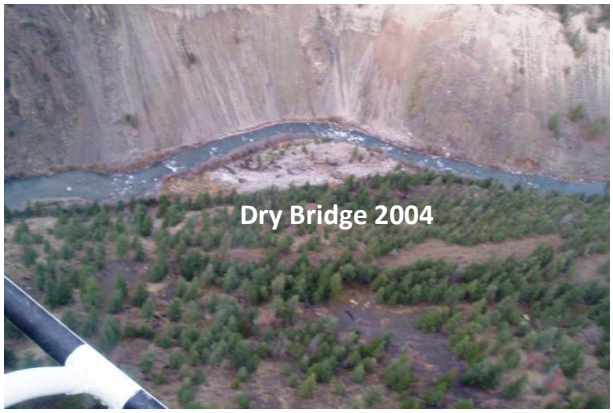
Location of the Indian Beach in N'Quatqua IR No. 1 and the potential off-channel fish habitat.

Habitat Enhancement in the Lower Bridge River

The Lower Bridge River (LBR) is one of the most important salmon habitats within St'át'imc Territory. One consequence of Terzhagi Dam construction has been the lack of recruitment of upstream gravel and trees that provide important habitat for juvenile fish. To date, enhancement of the LBR upstream of the Yalakom confluence has been deferred as it would provide a confounding influence on the adaptive flow management experiment that is part of the WUP. However, there are downstream habitat construction opportunities in the lower portion of the river that have either been completed (Applespring) or have been initiated (Horseshoe Bend). These projects have been carried out by Xwisten which holds a Registration Reserve Lease at Horseshoe Bend, effectively protecting the area from further mining activity. DFO Kamloops

have partnered on the projects and have provided significant engineering expertise. There is an additional potential habitat enhancement site at Dry Bridge[69] (lower photos), however there are access issues that could make implementation challenging at this site. The best prospect for habitat development in the short term is to excavate a channel and install a flow control device at Horseshoe Bend.





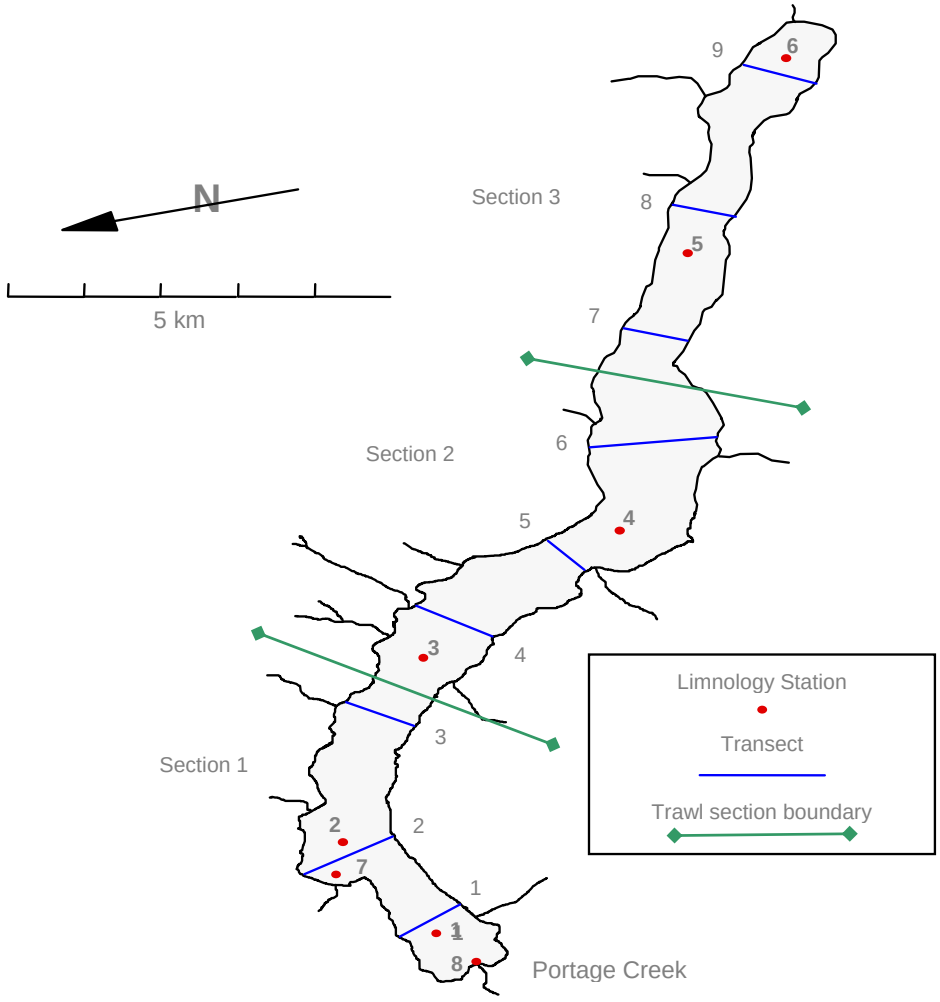
[69] Lower photos of Dry Bridge courtesy of Gerald Michell, Xwisten

Horseshoe Bend in August, 2009 showing excavations associated with mining activity.

Other approaches that could be considered include the establishment of gravel spawning platforms in the LBR above the Yalakom River confluence and/or the placement of large woody debris and boulder clusters. Consideration of these potential projects needs to be deferred, however, until after the WUP flow trial and the establishment of a permanent hydrograph for the LBR.

Seton/Anderson Lake Limnology Evaluation and Monitoring

This project would monitor standard limnological parameters including temperature, light transparency, conductivity, zooplankton abundance, fish abundance, chlorophyll concentration, and nutrient concentrations.

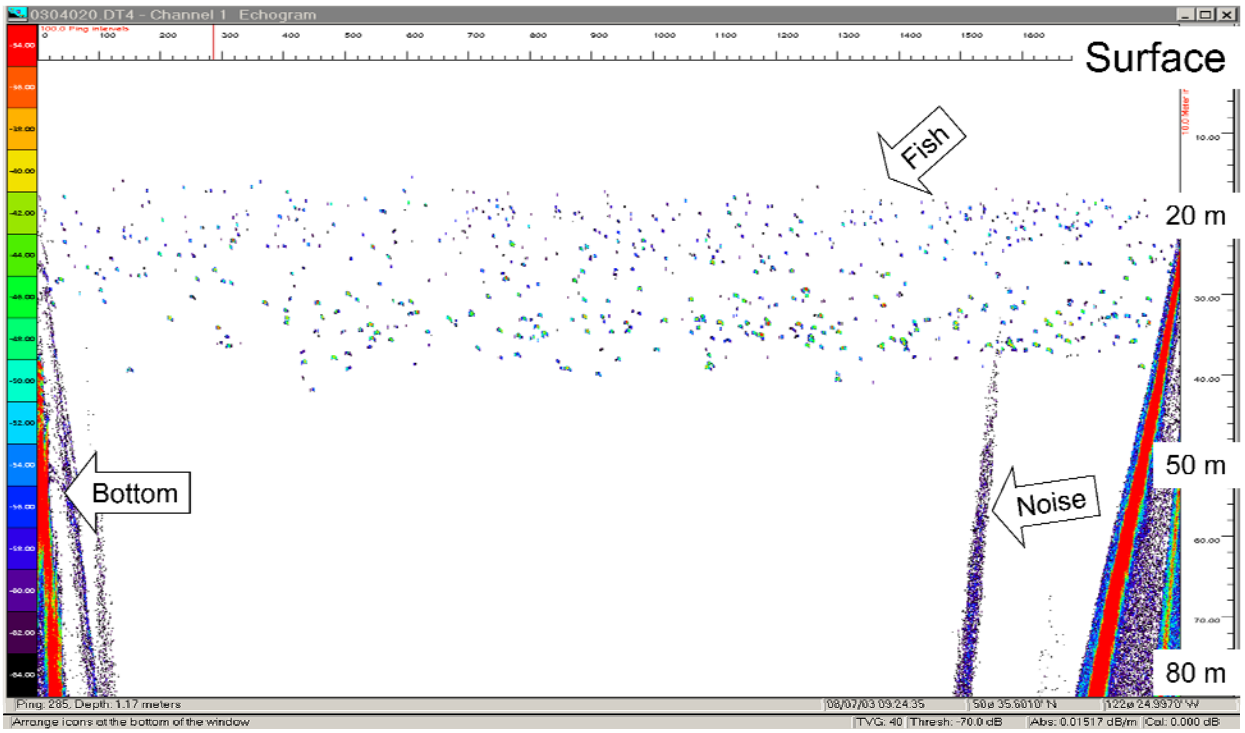


Seton Lake showing DFO sampling points

The project would take measurements and collect data at a series of monitoring sites located in Seton Lake and Anderson Lake. It is recommended that this project be undertaken in partnership with DFO or BC MOE which have the necessary equipment and expertise to carry out the surveys. Previous limnological sampling sites in Seton Lake are shown as red dots above.

Gwenish Ecology

Gwenish have declined over the past few decades, and there are only a few studies documenting the unique behavior and life history of this culturally- and ecologically-important fish species. This project would carry out applied research using both scientific approaches and St'át'imc Knowledge to evaluate the status of gwenish. Basic information on gwenish would be collected to assess and monitor population status and ecological conditions in Seton and Anderson Lakes. There are existing data on gwenish that were collected by DFO (Cultus Lake Laboratory) between 2000-2003 that have never been fully analyzed and compiled into a technical report.



Nighttime echogram transect across Anderson Lake. Most of the fish targets are gwenish

Shalalth and N'Quatqua would be engaged to carry out winter shoreline surveys. Both DFO and BC MOE have boats and SONAR equipment that can be utilized for juvenile gwenish population assessment. Rather than acquire this expensive and technically complex equipment, it would be preferable to enter into collaborative arrangements with either MOE or DFO for 1-2 years until the utility of the information can be assessed.

Coho Enhancement in Seton Spawning Channels

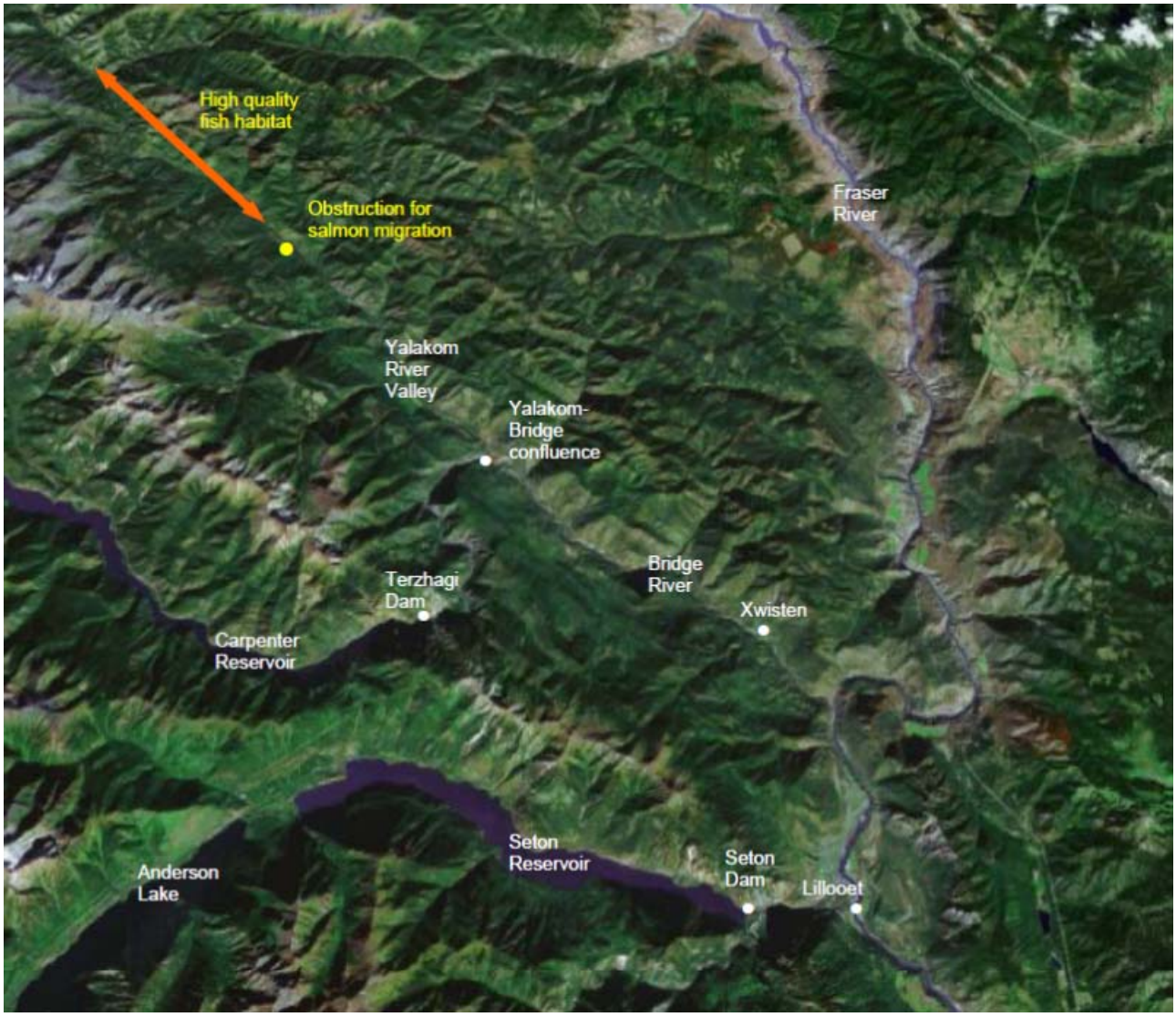
Lower Seton Spawning Channel

The two Seton spawning channels were initially designed for pink salmon production and were dewatered annually following pink fry emergence in the spring. With the financial assistance of BCRP and others, Sekw'el'was converted the channels into multispecies habitats by complexing them with trees and boulders and establishing continuous flows. The two channels contain 5000 m^2 (upper channel) and 17,500 m^2 (lower channel) of fish habitat.

It may be possible to utilize the N'Quatqua rainbow trout hatchery to produce coho fry for release into the channels for spring/summer/winter rearing. Adult coho brood stock would be taken from Gates Creek.

Improved Fish Passage in the Yalakom River

There is a barrier on the Yalakom River 4 km above the Bridge River confluence that impedes the upstream migration of salmon in most years. There have been previous attempts, largely ineffective, to remove the barrier. There is a large amount of excellent fish habitat upstream of the barrier. This project would remove the barrier and construct a weir (simple fish ladder) to improve fish access to the Yalakom River watershed.



DFO initiated enhancement in the Yalakom in 1948 with a blasting attempt designed to improve salmon access. During 1984, additional blasting to improve fish passage undertaken by the Lillooet Rod and Gun Club and other partners was largely ineffective; boulders did not shatter but remained in place in the channel bed. Attempts to remove the obstruction have thus far been unsuccessful and further efforts are warranted to improve conditions for salmon passage. Blasting designed to eliminate boulders and create a series of pools in the stream bed provides

the most feasible method of barrier removal. To eliminate the boulders, large numbers of holes need to be drilled into the soft serpentine rock so that they will disintegrate during blasting. Mr. Tom Illidge of Gold Bridge undertook the previous blasting work and is confident that the barrier could be removed with additional effort.

A feasibility analysis, including a geotechnical component, would be required to ensure that there are no adverse impacts associated with the project. This proposal was submitted previously to BCRP but was rejected by the province due to concerns about enhancing chinook salmon at the expense of bull trout. Those concerns are unfounded since the historical record shows historical chinook presence in the Yalakom (Figure 7, p. 15). Bull trout are more at risk from climate change than they are from chinook competition[70].

Fountain Lake Fishery Rehabilitation

Xaxlip community members have observed reductions in fish quality in Fountain and Cinquefoil Lakes. Although stocked with rainbow trout annually by BC Province, the fishery has declined for unknown reasons. This project would monitor water quality in Fountain and Cinquefoil Lakes and assess the impacts on rainbow trout. The project could be undertaken jointly with a university partner and could also be undertaken as a training project for St'át'imc Fisheries Technicians.

[70] http://www.thinksalmon.com/reports/BullTroutHabitatOutlook_090314.pdf

Fisheries Projects Identified during the LTC/Crane Creek Evaluation

During 2010, LTC and Crane Creek identified fisheries restoration opportunities in Northern St'át'imc Territory[71]. The projects were broken down by waterbody and are listed in Appendix 3. Potential projects were prioritized according to suitability for addressing data gaps, the inherent value of the information or restoration work and/or the consideration of relative costs and benefits. Projects were ranked as either low, medium or high priority, work in progress, or completed. The high priority projects that are not currently being implemented follows below. Some of these activities will be undertaken as WUP monitoring projects.

Seton Power Canal, Intake & Tailrace

- Fish diversion options
- Assess fish passage delay
- Assess fallback and velocities
- Wildlife crossing fence
- Fish entrainment studies
- Smolt entrainment studies

Seton River

- Assess fish passage delay
- Side channel enhancement
- Spawning channel inventory
- Upland/riparian restoration
- Spawning assessment: bull trout, coho chinook, steelhead, whitefish
- Stream & riparian debris clean up

Cayoosh Creek

- Stream & riparian debris clean up
- Gravel placement
- Habitat enhancement and complexing
- Assessment of spawning utilization
- Identification of fish utilization in river

Seton Lake

- Spawning assessment: bull trout, gwenish
- Stream & riparian debris clean up
- Sturgeon studies

[71] St'at'imc Nation Fisheries Projects. Watersheds and Infrastructure, 2011 Summary Report. Prepared for Fraser Salmon & Watersheds Program by Lillooet Tribal Council and Crane Creek Enterprises.

Portage Creek

- Spawning assessment: bull trout, sockeye, steelhead, whitefish
- Tributary assessment and enhancement
- New sockeye spawning channel
- Feasibility of side channel development
- Restoration projects
- Initiation of Stream Keepers program throughout watershed

Anderson Lake

- Spawning assessment: bull trout, gwenish, steelhead, whitefish
- Sockeye smolt outmigration
- Stream & riparian debris clean up
- Tributary assessment and enhancement
- Fish inventory of all tributaries

Gates Creek

- Side channel enhancement
- Spawning assessment: bull trout, coho, chinook, sockeye
- Sockeye smolt outmigration
- Marshland development
- Habitat enhancement and complexing

D'Arcy Creek

- Spawning assessment: bull trout, coho, chinook, sockeye, steelhead
- Stream & riparian debris clean up
- Fish inventory of all tributaries

Blackwater Creek

- Spawning assessment: bull trout, coho, chinook, steelhead
- Stream & riparian debris clean up

Lower Bridge River: Reaches 1 and 2

- Side channel enhancement
- Spawning assessment: bull trout
- Stream & riparian debris clean up
- Identify future restoration projects
- Weed control at Apple Springs
- Placer claims

Lower Bridge River: Reaches 3 and 4

- Spawning assessment: bull trout
- Stream & riparian debris clean up
- Fish counter or fence
- Re-establish outlets
- Assessment of options to support/enhance chinook production

Yalakom River

- Barrier removal

Carpenter Reservoir

- Spawning assessment: kokanee, bull trout
- Stream & riparian debris clean up
- Fish entrainment studies
- Habitat enhancement: debris platform

Middle Bridge River

- Spawning assessment: kokanee, bull trout
- Stream & riparian debris clean up

Downton Reservoir

- Spawning assessment: bull trout
- Fish entrainment studies
- Habitat enhancement: debris platform

Hurley & Cadwallader Rivers

- Spawning assessment: bull trout
- Stream & riparian debris clean up
- Dam removal in Cadwallader Creek

Upper Bridge River

- Spawning assessment: bull trout
- Tributary assessment and enhancement

Fraser River

- Stream & riparian debris clean up
- Sturgeon studies
- Food fishery enhancement and protection

Infrastructure

- Transfer Seton spawning channels to Sewk'elw'as
- Provide ongoing training in fisheries assessment
- Salmon ownership
- Land for purchase identification
- Monitor water quality and fish health throughout
- Establish internship program
- Initiation of Stream Keepers program throughout watershed
- Partnering with neighbours along the Fraser River towards a common goal: restore and maintain salmon populations in the Fraser River