Tsal'alhmec (Lake People)
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August 18, 2010

Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River
Attn: Dr. David Levy

Please consider this my submission, on behalf of the Seton Lake Indian Band, re: the above noted inquiry on the decline of Sockeye Salmon in the Fraser River. In reference to the five questions, here's my point of view on some of the questions:

1) My vision for the sustainability of Fraser River Sockeye
   - true partnership of co-management between the Aboriginal people/tribes, and the federal government/communities. As the natural stewards or caretakers of the resources within our territory, we have much to teach the non-natives regarding the care and respect of Mother Earth, and all that this entails.
2) What is required to secure the future of Fraser River Sockeye?
   - cities, municipalities and towns must not be permitted to allow sewage or toxic landfill emissions into the Fraser River, as these are negative impacts to the migrating smolts or returning wild salmon stocks. This should include a partnership or joint effort amongst the relevant communities.
   - fishing methods of sports/recreation fisheries must be regulated to ensure herring plug method, in which baiting results in the fish swallowing much of the hook within its body and thus higher mortality as the hook is dislodged, is prohibited in "catch and release" system
   - Data held by fish farms needs to be released or provided to the Cohen Commission to properly study the impacts of fish farms on wild salmon stock. In addition, to reduce the effects of predation and sea lice on salmon smolts, fish farms should be regulated and obligated to phase in enclosed pens if they want to continue to operate as a business. I'm very concerned of a conflict of interest when the Dept. of Fisheries and Oceans is both responsible for regulating these operations as well as ensuring the survival of the Fraser River wild salmon stock. I'm concerned that economics has a higher priority here.
3) Major habitat issues for Fraser Sockeye and how these can be mitigated?
   - more salmon enhancement work to ensure spawning areas are not affected by dewatering or streams drying up, which destroys eggs that are spawned in these areas.

In addition to the above, I have provided a survey that I have personally conducted with Seton Lake Band households/members. This survey can be summarized by the following:

Of the approximate 310 members on reserve, I was successful in getting a response from approximately 72 of 95 households or 75%. Within this, I collected 36/46 (78%) responses in Shalalth, 12/17 (70%) from Skil mt. residents, and 24/32 (75%) from Seton Portage area residents. My survey question was 1) How many salmon did they receive in 2009? (this includes salmon given to them or harvested by their household) and 2) How many salmon (traveling up the Fraser River) do they normally (or ideally) try to get (in a given year)? The results showed that in 2009, the year of wildfires and loss of the salmon fishery, the residents of Shalalth received about 278+- or 10% of what they normally try and achieve; Skil mt. residents received approximately 120 or 34% of their desired result, with Seton Portage area people receiving 268 or 16% of their needed fishery. The answer to the second question showed that almost all households, of those questioned, expect to receive some salmon from the Fraser River in every year. The total amount of salmon expected for the Shalalth people was approx. 2,722., the Skil mt. residents 355, and the Seton Portage people 1681. The final tally shows that on reserve Seton Lake Band members, which is approximately ½ of our total population, only received approx. 666/4758 or 14% of their salmon needs in 2009. This is a great concern to me as this survey indicates the very high dependency that our members, as Tsal'álhmecs or St'át'imc have on the Fraser River fishery. We cannot afford any more years such as 2009, and I sincerely hope that this Commission will be taken seriously by the federal and provincial governments, and pro-active changes will be made. All my relations.

Sincerely,

Chief Larry Casper jr.

cc. Seton Lake Band Council
St'át'imc Fisheries

1.4 The Fish

The St'át'imc territory contains four major river systems, the Lillooet, Seton-Anderson, Bridge, and Fraser, each with numerous tributaries. Many kinds of fish live in these river systems, and have always been an integral part of the St'át'imc way of life.

The Lillooet River system. The Lillooet River system flows into the lower Fraser River through Harrison Lake and has no substantial physical barriers to fish passage. The Lillooet River is therefore accessible to all species of anadromous salmonids. Early accounts of the St'át'imc indicate that:

> "all five species of Pacific salmon frequent the waters of the Mount Currie people [upper Lillooet River], although the pink salmon run, which ascends the Harrison River in late August, is very scarce. The inland extent of the run of pink salmon is the head of Lillooet Lake; they seldom enter the Birkenhead [a large tributary of the upper Lillooet River] or Lillooet Rivers. The chum salmon run at the same time as the pink salmon. During September and October, coho salmon are seen migrating upstream through the Birkenhead River. Sockeye salmon, which are considered to be the choicest species to preserve for winter, are first seen in the Birkenhead River around August 15th, followed by the run one week later. Only male sockeye salmon are red in colour by the time they reach Mount Currie."
>
> (Kennedy and Bouchard, 1975)

The St'át'imc also report that sturgeon were present in the Lillooet River system, including Harrison and Lillooet Lakes (St'át'imc Oral Testimony).

The Seton-Anderson system. The Seton-Anderson system was dominated by spectacular runs of sockeye and pink salmon. The sockeye spawned predominantly in Gates and Portage Creeks and the juvenile fish utilized Seton and Anderson lakes for rearing. Pink salmon spawned predominantly in the Seton River. The abundance of salmon typically varies considerably from one year to the next. For example, sockeye runs today show pronounced cycles, with a strong run every fourth year and much smaller runs each of the three years following. Runs may be more than 100 times higher in peak years than in low years (Burgner 1991). The causes of the population cycles remain a mystery, and it is not known whether this is a recent phenomenon. Pink salmon and chum salmon often show similar two-year cycles.

Throughout the watershed there were also healthy stocks of resident and other anadromous fish species, including coho and spring salmon, kokanee (*g'wenis*), steelhead, rainbow trout, Dolly Varden char, burbot, whitefish, sturgeon, sculpin,

northern pike minnow, peamouth chub (red-sided shiner), and sucker (St'át'imc Oral Testimony).

The Bridge River. The Bridge River and its tributaries above La Joie Falls were likely inaccessible to anadromous fish species (British Columbia Ministry of Fisheries et al. 2000). Resident species such as rainbow trout, bull trout, Dolly Varden char, and mountain whitefish would nevertheless have been widespread.

The middle Bridge River and its tributaries would have represented the largest area of fish habitat in the watershed. This section of the river had abundant rearing habitat for resident and anadromous species of fish (British Columbia Ministry of Fisheries et al. 2000). Although the source of water was cold, turbid, and nutrient poor, the many side channels, wetlands, and ox bow lakes would have provided conditions for rearing fish that were more favourable than the upper Bridge. Resident species of fish would have been widespread, as would have anadromous species. The anadromous fish utilizing the middle Bridge were strong swimming species (e.g., chinook, coho, steelhead), because weaker fish (e.g., pink salmon) would have had difficulty ascending the fast-flowing lower Bridge River.

Rearing habitat for fish would have been sparse in the lower Bridge River and its tributaries given the morphology of the river there. High velocities in the mainstem, combined with a restricted floodplain, would have provided scarce refuge during periods of high flows. The importance of the lower Bridge River for fish would primarily have been as a migration corridor to the spawning and rearing habitats in the middle Bridge. The St'át'imc obtained excellent access to migrating fish as they passed through the constricted sections of the lower Bridge River.

The St'át'imc report they caught coho, sockeye, spring, and pink salmon in the Bridge River, as well as steelhead, Dolly Varden char, lamprey eels, burbot, and sturgeon (St'át'imc Oral Testimony).

The Fraser River. The Fraser River is recognized as one of the world's most important salmon producing rivers. Some of the most important fishing sites for the St'át'imc are on the Fraser River, particularly at the confluence of the Bridge River and the Fraser River, where large eddies occur in the fast moving waters. The St'át'imc report they caught all types of salmon, as well as burbot and sturgeon in the Fraser River (St'át'imc Oral Testimony).

1.1.5 Resource Activities and Uses

For many generations, the St'át'imc relied on the natural resources of their territory to meet their day-to-day needs. In many cases, fish, animals, and plants were used directly for food, tools, clothing, medicine, and ceremonial purposes. After personal needs were met, extra quantities of food and goods were used for trading among individuals, communities, and other First Nations groups.

The St'át'imc routinely traveled throughout their territory hunting, fishing, and gathering plants. Some places were preferred over others for certain resources because of better productivity, or landscape features that made hunting or fishing easier. Some areas were managed to increase plant production by controlled burns. The following descriptions about specific resources are based on the St'át'imc Oral Testimony undertaken for this study, and on descriptions of St'át'imc resource use found in published reports.

Fishing

Salmon fishing was a central part of the St'át'imc way of life. Salmon returning to spawn enter the Fraser River and either continue upstream or enter Harrison Lake and the Lillooet River system. The first salmon fishing began in February with the Fraser River Spring runs, but the most significant salmon fishing occurred in July and August.

The warm, dry summer climate in the northern territory created excellent conditions for drying fish. The St'át'imc dried fish for their own nutrition and for trade between individuals, families, other communities, and with neighbouring First Nations. In the north, areas subject to dry, hot, winds were preferred for salmon drying. In the southern St'át'imc territory, fish were usually smoked in plank houses due to a lack of windy sites suitable for drying fish. The southern St'át'imc also depended heavily on preserved salmon for food and trade.

Each community had preferred fishing spots in the territory, although representatives or 'ambassadors' from each community went to other fishing places within the territory. The Samahquam had a place in Chalalth, people from Mount Currie fished in the Samahquam area, and other communities practiced this sharing as well. Many St'át'imc communities came together near the confluence of the Bridge River and the Fraser River during the late summer to fish (while respecting the host community laws) and to trade (St'át'imc Oral Testimony).

The story "Fishing in the Lillooet Area", told by Sam Mitchell (Bouchard and Kennedy 1977) describes activities associated with the arrival of salmon at the Bridge River rapids,

and reveals the social relations and complexity of technology developed to exploit this resource:

> "When the salmon arrive here at Lillooet, the people come and camp overnight. This is during the summer and early fall. At the Bridge River rapids [north of Lillooet; where the Bridge River meets the Fraser River], called *Sh-HIT-tl*, there is a drop in the river; the water is very swift. All summer the people stay here and fish. There are enough fish-drying racks for everyone.
>
> The racks on which the fish are dried face the river, so that they catch the wind at the correct angle. In about two or three days, depending on the weather conditions, the fish are dried by the wind; after about six or seven days they are dried completely and are ready to be out away for the winter. It is very windy here in the summer.
>
> Long before the white people came to this area, our ancestors made the twine used for fish nets. It [the Indian hemp plant] was picked during the fall and was hung up in bundles to dry. In the winter, when it was dry, they took it down, pounded the stalks to remove the outer covering, and wove the fibres into threads. It was then ready to make into fish nets. The large dip-nets [used at *Sh-HIT-tl*] hold about a dozen salmon, depending on the size and shape of the fish. The net was fastened onto a hoop by means of mountain goat horn rings and was able to close when the fish got into it.
>
> Where the Bridge River meets the Fraser, there are names for the fishing spots. One of these fishing rocks, on the east shore of the Fraser River here, is called *Tlik-O-la-wh*, "a brace or prop in the land". Sometimes the water is so swift here that rocks get into the net. Another fishing place is *Min-MAN-alch*, "shady rock", and there is a spot called *Ho-shi-SHOOSH*, "foamy place", and another called *Shi-HAH*, the name of the person who owned that fishing rock. Another place named after a person is where the fish are found when the water is very low. As the water level at *Sh-HIT-tl* raises and lowers, different fishing rocks are used.
>
> Some dip-net fishing places at *Sh-HIT-tl* were owned by individuals, and the use of such spots was limited to the immediate members of that person's family. However, after that particular family had obtained enough salmon, then anybody could use that fishing rock.
>
> Our ancestors constructed storage caches, raised on stilts, in which to store the dried salmon after it was taken from the drying racks. There was no stealing in those days, for everyone had everything they needed.
>
> Some of the salmon was boiled right there at *Sh-HIT-tl*. The hollow-topped rocks on the beach are large and smooth, so that our people were able to dam up one end of a rock depression and use it to boil the fish in. A fire was built to heat small rocks which were added to the boiling water and this mixture cooked for several hours. When it was cooled down, the oil was skimmed off the top and place in special containers made from salmon skin. I have seen containers made from a large spring salmon. These were watertight. In the old

> days, there weren't any bottles, so these salmon skin containers were also used to hold water.
>
> Some salmon oil and Saskatoon berries mixed in with sockeye salmon flesh that has been roasted, dried, and pounded makes a delicious meal. The people also preserved salmon roe. A container, made from birch bark, was filled with roe and sealed tightly. Then it was buried in the ground until the eggs became tainted and were ready to be eaten."
>
> (Sam Mitchell, in Bouchard and Kennedy, 1977)

Although the St'át'imc relied heavily on salmon, many other species of fish also were used. Local lakes and streams provided ling cod and sturgeon in early spring, rainbow trout, brook trout, and Dolly Varden all year round, and steelhead during May, June and July. A significant source of food during the winter months for Tsalalh (Seton Lake) and N'Quatqua (Anderson Lake) came from *gwen'is* or "floaters" – spawned-out Kokanee that drifted to shore on Seton and Anderson Lakes. A description of gathering "waneesh" is included in Deva (1998):

> "My first winter up in Anderson, the first South wind, [my mother in law] would tell us to get a bucket of waneesh, and cook some right away...the waneesh was about 3 feet high, it was piled up along the shore, there was so much....we picked the white ones, some of them were still kicking. People used to camp up there when it was like that. They made big fires, and sticks cooking waneesh, and hollering at each other, and picking and choosing, and some of them were drying them right there, when the north wind blew it went to the other end. That is what we used to live on, for a couple of months at that time. [In Seton Lake] they would come up in the early part of October, beginning of November.
>
> (St'át'imc member, in Deva, 1998 p. 35)

Hunting and Trapping

Each St'át'imc community had its own hunting and trapping grounds, which were regulated by individual members, but were considered to be the common property of the entire community. The St'át'imc allowed their members to use the land; individuals from other tribal groups caught trapping, hunting or gathering within traditional territory were driven away or killed (Alexander 1992:142-3). Alexander notes that:

> "The regulation of hunting in a specific location would prevent the over-depletion of resources in that areas, while habitual use by a specific family would keep a band's members dispersed throughout the territory."
>
> (Alexander 1992:143)

3.1.4 The Fish

Profound changes have occurred in the amount and distribution of fish in St'át'imc territory during the Twentieth Century. The changes have multiple causes that vary throughout the region.

The commercial fishery at the mouth of the Fraser River expanded rapidly between 1871 and 1903, and stock depletion occurred, particularly of sockeye. By 1903, measures were being taken by the provincial government to manage fish stocks in the St'át'imc territory as a means of maintaining the commercial fisheries.

A provincial fish hatchery was constructed on Seton River in 1903. Geen and Andrew (1961) report that the hatchery actually caused a decline in sockeye in the Seton system. Weirs to collect brood stock in Portage Creek and at the outlet of Seton Lake blocked adult migration, and high water temperatures in holding pens led to high fish mortality. In 1909, no sockeye returned to Gates Creek at the west end of Anderson Lake. The lack of sockeye was thought to be due to very high mortality at the Seton hatchery in 1905, despite an escapement of 200,000 fish (Summit 1999).

In 1905, a second hatchery was established at Owl Creek, just north of the head of Lillooet Lake. Hatchery operations caused increasing hardships for the Pemberton, Douglas, and Samahquam bands. A report for the Pacific Salmon Commission describes the situation in the Pemberton and Lillooet River region:

> "The Indians were told of ... plan[s] of curtailing the fishery at which the Indians sent in a petition in 1911 which stated the necessity for them to be allowed to take salmon whenever and wherever they desired, in order to keep from starving. It was also pointed out that the Indians believed that it was the hatchery which was destroying the run since the runs have been steadily growing smaller from 1905 when the hatchery was first established."
>
> (Pacific Salmon Commission 1940:1)

To protect shrinking numbers of returning salmon, the government stopped Pemberton, Douglas, and Samahquam Bands from fishing in salmon-bearing streams until the Spring and sockeye had spawned. After spawning, the hatchery managers distributed spawned fish to the native men who gathered at the gates, even though the men had protested about the quality of such fish. Salt for curing the fish was also distributed in an attempt to reduce spoilage and thereby reduce the number of fish required from 500 to 250 per family. Native fishing was also curtailed in Lillooet Lake, allowing only Spring salmon to be taken with nets (Pacific Salmon Commission, no date).

In the meantime, commercial fisheries were taking an increasing number of sockeye salmon from the Fraser River. Until 1910, sockeye made up 78 percent of the canned pack in British Columbia, and 80 percent of those sockeye came from the Fraser River. On average, between 1903 and 1913, 700,000 cases of Fraser sockeye were produced every year (Gold Seal Seafoods website, May 2001).

In 1913, the sockeye run had been estimated at more than 37 million fish, yielding a catch of 25 million. In 1914, construction practices on the Canadian Pacific Railway along the east bank of the Fraser River resulted in a landslide that completely blocked the river, causing a catastrophic impact on returning salmon populations (Thompson 1945) and creating a significant barrier to fish until permanent fishways were built between 1944 and 1947[32] (British Columbia Ministry of Fisheries 2000). Abundance of many anadromous species remained depressed for decades and some species still appear to be recovering (British Columbia Ministry of Fisheries 2000). The Hells Gate slides likely had no effect on salmon abundance in the Lillooet River system, since access to Harrison Lake is well downstream of Hells Gate. The slides had no direct effect on resident species, but may have influenced them indirectly through declines in marine-derived nutrients (Cedarholm et al. 1999, 2000).

Another important influence on fish distribution and numbers is the effect of hydropower development in the Bridge and Seton watersheds between 1948 and 1960. A history and description of the developments are given in Section xx, and a detailed description of the impacts to fish and aquatic resources is presented in the Stage 2 Report. Briefly, the impact of hydropower development was the flooding of two large sections of the Bridge River valley, introduction of cold turbid water into the Seton system, and restriction of upstream and downstream passage of anadromous fish in both the Bridge and Seton Rivers.

Since 1961, salmon enhancement measures have been undertaken downstream of both the Seton and Terzaghi Dams. On the Seton River, a spawning channel (now known as the upper spawning channel) was constructed and has been operating every other year since 1961 (Redan 1994). A second channel, now known as the lower spawning channel, was constructed in 1967, specifically for pink salmon. The lower channel also operates only in alternate years. Water has routinely been diverted from Cayoosh Creek into Seton Lake during spawning times since 1979 in order to aid with migration.

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[32] In 1937, the International Pacific Salmon Fisheries Commission (IPSFC) was created jointly by Canada and the United States. The Commission was charged with restoring the Fraser River sockeye fishery that was still seriously depleted by the effects of the Hell's Gate slide. In 1942, temporary passages were built (IPSFC Annual Report 1942). Fishways became fully operational in 1945, and by 1955 thousands of spawning fish were reported in both Seton Creek and the Thompson River.

Between 1991 and 1993, on the Bridge River, side channels have been developed, blockages of natural tributaries to the Bridge River have been removed, and gravel has been redistributed for increasing spawning habitat on the Bridge River below Terzaghi Dam, at the request of fisheries officials and local stakeholders. In addition, a tunnel has been added to the Terzaghi Dam allowing a steady release of water to the channel downstream, beginning in 2001.

Commercial fisheries have continued to put pressure on salmon stocks. Technological improvements in fishing equipment has led to substantial increases in efficiency, to the point that open fishing weeks have been cut down to days on many runs. Some fisheries are shut down completely for years in order to conserve the stock (Gold Seal Seafoods website, May 2001).

In summary, changes in fish numbers and distribution in the Bridge, Seton-Anderson, and Lillooet watersheds have occurred against a backdrop of local, regional, and global influences. These factors interact to affect fish populations in ways that are complex and usually unpredictable. Regional and global negative influences include, but are not limited to:

- the Hells Gate slide (Thompson 1945)
- hydropower development (British Columbia Ministry of Fisheries et al. 2000)
- declines in marine survival (Walters and Ward 1998; Smith and Ward 2000)
- climate change (Pyper and Peterman 1999; Welch et al. 1998)
- potential sub-lethal effects of heavy metals (Sherwood et al. 2000)
- declines in marine derived nutrients (Cedarholm et al. 1999, 2000)
- human harvest pressure (Bradford and Irvine 2000)
- changes in land use (Bradford and Irvine 2000).

Other influences may be positive, such as habitat restoration initiatives (Slaney and Martin 1997) and artificial spawning channels.

3.1.5 Resource Use and Activities

Today, many St'át'imc rely on cash income to support themselves and their families, rather than on traditional activities and gardening. Nonetheless, many still hunt and fish, and the ability and opportunity to hunt, fish, and gather is highly valued. Resource use areas, although they may not be visited as often as in the last century, remain important to the St'át'imc. If the resource areas are lost or degraded, not only will there be little opportunity for the St'át'imc to practice traditional ways, but the opportunity for teaching young St'át'imc about their heritage and culture will also suffer.

Fishing

Fishing was important to the St'át'imc in 1900, and it continues to be important today. Increasing competition from non-natives and damage from industrial development has had a deleterious effect on both the salmon and St'át'imc culture.

In 1911, IPSC reported that the St'át'imc each took 500 salmon per year for family use (IPSC Annual Report. 1911). This estimate is consistent with estimates made by St'át'imc that between 500 and 1,000 salmon per year were taken for each family's food and trade requirements (St'át'imc Oral Testimony).

Drying Fish near Lillooet in 1954
BC Archive photo I-29074

While salmon fishing on the Fraser, Bridge, Seton and Lillooet Rivers was of prime importance, the St'át'imc also fished in smaller streams and lakes. One St'át'imc respondent recalls taking enough spring salmon from Tyaughton Creek to fill a 45gallon barrel, which was enough to last the whole winter (St'át'imc Oral Testimony). Tremper (1940) notes that in 1931, the Pemberton, Douglas, and Skatin (Skookumchuk) communities took 3,000 Lake trout, 2,000 Dolly Varden, and 1,000 rainbow trout from Lillooet Lake. In addition, St'át'imc harvested 'waneesh' (kokanee) in great numbers on Seton and Anderson Lakes in October and November. The fish provided food for 'a couple months at a time' (Deva 1997:35).

Today, the St'át'imc report that fishing remains a highly valued activity and all remaining traditional fishing sites and fish species are still important, although traditional activities are conducted less extensively now due to BC Hydro impacts, commercial fisheries pressure, and government regulations. The numbers of fish available to the St'át'imc have declined. In the northern territory fishing pressure is very high at the confluence of the Bridge and Fraser Rivers due to the lack of fish at other traditional fishing sites. Some St'át'imc estimate that only 240 salmon at most are taken in any one fishing season (3 or 4 fishing trips per year, each resulting in 40 to 60 salmon) by a single person for family

use. Even with declining fish stocks, St'át'imc in both the southern and northern territory report eating local fish at least once per week all year, and as often as every day during the summer, especially during July and August (St'át'imc Oral Testimony).

Hunting and Trapping

The St'át'imc place a high value on the ability to hunt and trap. Prior to 1960, St'át'imc hunters, traveling on horseback in groups, usually took three or four deer per hunting expedition, and shared the meat with family and community members. Women traveled with the hunters and gathered plants and helped process meat at hunting sites. Pavilion community members estimate that 12 deer per household per year were taken on average. Given that a typical family had 6 people, 2 deer per person per year was the general consumption level. Members of the Seton Lake community report taking 13 deer for six adults and six children in the 1950s (St'át'imc Oral Testimony). Snowshoe hare and grouse were also important food sources for all St'át'imc communities, and many other animals were routinely hunted for food, medicine, and for materials to be used for clothing and tools (St'át'imc Oral Testimony).

De Hullu (1967) notes that in the Bridge River Valley, trapping was, for many years, the "most reliable means of livelihood" and that one of the earliest recorded trappers was an "Indian, [known as] Hunter Jack" who trapped beaver on the Upper Bridge River. In the 1950s, St'át'imc trappers in the Bridge River Valley could make about $2,000 per month (about $300 per month in 1955 dollars) between October and April, typically taking five beaver, several muskrat, lots of squirrel, and up to 10 marten (St'át'imc Oral Testimony). In the southern territory, one St'át'imc person reported earning over $30,000 (1999 dollars, or about $3,000 in 1945 dollars) near Billygoat Creek during the 1940s, when fur prices were extremely high. After World War II, fur prices dropped by about one-third, but trapping was still worthwhile as it provided money to use at local stores for sugar, flour, butter and other non-native goods (St'át'imc Oral Testimony).

Since the 1960s, traditional hunting and trapping activities have changed. Most St'át'imc report that little or no trapping has taken place since the 1960s, in part due to the loss of trapping areas to industrial development. In particular, the Bridge River valley offered prime trapping until it was flooded by the construction of BC Hydro dams. Access roads, transmission line rights-of-way, and all-terrain vehicles have made it much easier for non-native people to hunt and trap in the remaining traditional areas that have not been degraded by industrial development. The St'át'imc have noted a decline in the number of animals throughout the territory. Deer is the major species used today due to over hunting in general, lack of hunting areas, and St'át'imc concerns about the conservation of other species. Rather than traveling in groups of men and women, most hunting is now

4.15 Fishing Impact: Overall Reduction in Salmon Harvest

Conditions before Hydroelectric Development

Salmon have always been a significant resource to the St'át'imc. Archaeological evidence shows that, prior to European contact, about 65 percent of the protein consumed by First Nations in the Lillooet area was of marine origin – presumably salmon.[182] Salmon not only provided food, but had many other uses. Over many centuries, the patterns of use for fishing sites and the system of rights associated with those sites have been key components of St'át'imc culture. Fishing sites near to communities were highly valued, as people could easily get fish without having to spend much time away from home. Individuals relied on being able to obtain enough salmon from their own specific areas to meet family and community needs.[183]

Other sites with particularly high numbers of salmon were also recognized as assets for the region. Where the Bridge River joins the Fraser, fast currents and strong eddies are created in the Fraser Canyon, as it is only about 30 m wide at this point. People can get close to the water, especially when migrating salmon concentrate in high numbers during July and August. *Scet*, one of several fishing areas at the confluence, is considered a 'public' site and has attracted St'át'imc from many communities, as well as members of other nearby First Nations.[184] During the fishing season, many St'át'imc and members of neighbouring communities camped on the banks of the Fraser, fished, traded, and socialized.[185] In the early 1800s, Hudson's Bay traders took advantage of the annual gathering at *Scet* to trade with the St'át'imc.[186] *Scet* remains a significant regional fishing site today.[187]

Although the exact number of salmon harvested annually by the St'át'imc prior to hydroelectric development is not recorded, St'át'imc Oral Testimony and additional published studies provide estimates of total harvest, amount consumed, and amount used for sharing and bartering, presented in Table 4-30. Up to 1911, the average estimate of salmon harvest by First Nations is approximately 151 salmon per person per year, of which 87 were consumed (fresh or dried) and 64 were used for sharing and bartering. St'át'imc Oral Testimony estimates that before hydroelectric development, annual harvest averaged 146 salmon, of which 55 were eaten and 91 were used for sharing and barter. In the opinion of the authors, it is unlikely that sharing and bartering of salmon circa 1940 - 1950 exceeded levels estimated for 1911, and so for this study, a

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182 Kew 1992. in Hayden, B. (editor) 1992. A Complex Culture of the British Columbia Plateau: Traditional Stl'atl'imx Resource Use. UBC Press, Vancouver, British Columbia.

183 St'át'imc Oral Testimony.

184 St'át'imc Oral Testimony.

185 Kennedy, D. and R. Bouchard. 1992. Stl'átl'imx (Fraser River Lillooet) Fishing, in A Complex Culture of the British Columbia Plateau. Ed. B. Hayden. UBC Press. Vancouver, British Columbia.

186 Teit, J. 1906. "The Lilooet Indians" in The Jesup Expedition Vol. 2. Part 5. Memoirs of the American Museum of Natural History.

187 St'át'imc Oral Testimony.

harvest estimate of 120 salmon (55 eaten and 65 shared or bartered) is used for any following analyses. Appendix 4-C contains additional details regarding the harvest estimate, source information, and assumptions.

Table 4-30
Estimates of Annual Salmon Harvest and Use

	Total Harvest (A) number of salmon	Direct Use - Food (B) number of salmon	Share and Barter (A – B) number of salmon
Precontact to 1911 Estimate sources noted in parentheses	120[188]	66[189]	
	182 [190]	56[191]	
		109[192]	
		92[193]	
		91[194]	
		106[195]	
Average	**151**	**87**	**64**
1940 - 1950 (pre-hydro) all estimates are based on St'át'imc Oral Testimony	167	65	
	150	44	
	167		
	100		
Average	**146**	**55**	**91**
Harvest Estimate	**120**	**55**	**65**

It is important to note that the entire population of the northern St'át'imc communities was about 700 people in 1940 - 1950, and therefore the total annual harvest would have been about 84,000 salmon based on the estimate above. Although Hell's Gate slide had a significant negative effect on salmon populations in the Fraser River after 1914 and until 1945, some salmon did manage to

188 Hayden, B. (editor) 1992. A Complex Culture of the British Columbia Plateau: Traditional Stl'atl'imx Resource Use. UBC Press, Vancouver, British Columbia. p.530.

189 Hewes, G.W. 1973. "Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area", *in* Northwest Anthropological Research Notes. Vol. 7 No. 2, Fall 1973.

190 Hewes, G.W. 1973. "Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area", *in* Northwest Anthropological Research Notes. Vol. 7 No. 2, Fall 1973.

191 Hewes, G.W. 1973. "Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area", *in* Northwest Anthropological Research Notes. Vol. 7 No. 2, Fall 1973.

192 Hewes, G.W. 1973. "Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area", *in* Northwest Anthropological Research Notes. Vol. 7 No. 2, Fall 1973.

193 Argue, S. et al. 1990. Internal Report. Department of Fisheries, Canada.

194 Argue, S. et al. 1990. Internal Report. Department of Fisheries, Canada.

195 Hewes, G.W. 1973. "Indian Fisheries Productivity in Pre-Contact Times in the Pacific Salmon Area", *in* Northwest Anthropological Research Notes. Vol. 7 No. 2, Fall 1973.

migrate past the blockage, and it is not unrealistic that the St'át'imc harvested an average of 84,000 fish each year in the decade between 1940 and 1950.[196]

Impact Description

Since hydroelectric development, St'át'imc report that salmon harvest levels have decreased roughly by 50 percent, and this level of decrease is similar in the consumption of fresh salmon, the consumption of dried salmon, and the amount of salmon used for sharing and bartering. Table 4-31 provides a comparison of harvest levels for 1940 – 1950 and for 2000. Excerpts from St'át'imc Oral Testimony regarding harvest levels are provided in Appendix 4-C, as is a detailed estimate of the level of consumption versus sharing and bartering.

Table 4-31
Comparison of Salmon Harvest Levels 1940 – 1950 and 2000[197]

1940 – 1950	**fresh salmon***	**dried salmon***
average serving size	300g @ 1.5 c/g***	250g @ 7.5 c/g
calories per serving	450	1875
servings per year	150	75
annual calories from each food source	67,500	140,625
percent of annual calories**	9	20
Consumed (kg, fresh and dried)	45	19
	(18 salmon)	**(38 salmon)**
Surplus - barter and share (fresh kg)	161	
	(65 salmon)	
Total Harvested (fresh kg)	300	
	(120 salmon)	
2000	**fresh salmon***	**dried salmon***
average serving size	300g @ 1.5 c/g	250g @ 1.5 c/g
calories per serving	450	1875
servings per year	75	40
annual calories from each food source	33,750	75,000
percent of annual calories**	5	10
Consumed (kg fresh and dried)	23	10
	(9 salmon)	**(20 salmon)**
Surplus - barter and share (fresh kg)	65	
	(26 salmon)	
Total Harvested (fresh kg)	138	
	(55 salmon)	

Assuming all salmon are sockeye, providing 2.5 kg of edible fresh meat; 0.5 kg of dried meat per fish.
Based on an average annual consumption of 1,970 calories per person.
c/g = calories per gram

[196] Todd Hatfield, study team member, fisheries biologist.
[197] See Appendix 4-C for complete details and information sources.

The decrease in the amount of salmon harvested is due to a number of factors:

- Hydroelectric development, causing loss of fishing areas, increased travel time to remaining fishing areas, and increased crowding at remaining fishing sites.
- Natural variation of salmon population in the Fraser River.
- Federal and provincial regulations, while not observed by all St'át'imc, may deter some from harvesting as many fish as desired.
- Full time work away from fishing areas may keep some St'át'imc from fishing at the height of the salmon runs, however, many who do work take annual holidays at this time in order to participate in the key fishing season.[198]
- Effects of forestry on fish populations.
- Personal choice and convenience.
- Other factors including environmental change and urbanization.

Hydroelectric development. Important community fishing areas in the northern study area have been lost due to BC Hydro activities. Before hydroelectric development, N'Quatqua (Anderson Lake), Tsalalh (Seton Lake), Sekw'elw'as and Kikíytn (Cayoosh Creek), and T'it'q'et (Lillooet) all relied heavily on the salmon and resident fish in the Seton – Anderson system. Members of Nxwisten (Bridge River) fished all along the Bridge River from it's confluence with the Fraser north to the Bridge River canyon. Since hydroelectric development, fish populations in the Seton – Anderson and Bridge River systems have changed, and community members report they no longer harvest any significant levels of salmon in these areas.[199]

St'át'imc Oral Testimony reports that immediately prior to hydroelectric development, community members could fish 'right at home' and did not have to travel any great distance to meet their requirements for salmon or other freshwater fish.[200] [201] Since hydroelectric development, N'Quatqua (Anderson Lake), Tsalalh (Seton Lake), Sekw'elw'as and Kikíytn (Cayoosh Creek), T'it'q'et (Lillooet) and Nxwisten (Bridge River) members report they now travel to *Scet* to obtain salmon. Increased travel time to remaining fish area leaves less time for fishing, and keeps some less mobile people from fishing at all. In particular, N'Quatqua (Anderson Lake) and Tsalalh (Seton Lake) have been most affected, as travel distances are as high as 80 km and 50 km respectively along difficult roads. Table 4-32 gives the average distance from each community to *Scet*.

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198 St'át'imc Oral Testimony.

199 St'át'imc Oral Testimony.

200 St'át'imc Oral Testimony.

201 Although a number of factors influenced salmon availability in the study area prior to hydroelectric development (e.g., mining in the 1860s to 1900; provincial fish hatcheries in the Seton – Anderson system in the early 1900s; Hell's Gate slide in 1914, etc.), St'át'imc Oral Testimony regarding the amount of salmon harvested prior to hydroelectric development suggests these effects were relatively short lived or did not present significant negative impacts on salmon harvesting in the 1940 – 1950 period.

Table 4-34 gives the estimated total loss in kilograms of sockeye for the five affected communities. Detailed calculations are presented in Appendix 4-E. Ranges are based on the author's professional opinion regarding the percentage of the reduction that could be attributed to BC Hydro activities.

Table 4-34
Total Kilograms of Lost Sockeye per Community
(cumulative loss by community, based on population and harvest estimate)
(1948 / 1955* to 1999)

Percent Attributed to BC Hydro	N'Quatqua (Anderson Lake)	Tsalalh (Seton Lake)	Sekw'elw'as and Kikíytn (Cayoosh Creek)	T'it'q'et (Lillooet)	Nxwisten (Bridge River)
	Kilograms of Lost Sockeye				
10			68,753	106,774	
20			137,506	213,548	
30	160,097	818,667	206,258	320,323	
40	213,463	1,091,556			619,347
50					774,184

* Loss for Nxwisten (Bridge River) calculated from 1984 onward (completion of Mission Dam); all other losses calculated from 1955 onward (completion of Seton Dam)

Data Quality This estimate is based on the reduction in salmon harvest as describe in the St'át'imc Oral Testimony. Appendix 4-C contains detailed information on the method used to develop the harvest estimate.

Cultural Interpretation

Fishing locations are at the centre of the traditional St'át'imc economic and social system. Villages were and are located at or adjacent to key fishing places, and village identity is referenced to those locations. In essence the fishing places are the primary reference points on the land for resource use in watersheds. The loss of fishing places constitutes a major economic and social change. Fishing sites are "bundles of meanings," connecting ecological knowledge (when and where the fish are available, connections between fish and other resources, such as ripening plant foods), mythology (Coyote stories about how salmon and other creatures were brought into the St'át'imc world), and historical references (reserves were often established at the fishing locations because that is where the villages were and most still are). The logic of St'át'imc placement on the land connects to fishing and associated village locations. Fishing locations serve as aids in remembering past people and events (e.g., the St'át'imc recalled who

fished at what places). Fishing locations are places of stability, where one can go for food. The various fishing locations played vital roles in the St'át'imc economy. In addition, the network of social relations among villages located in different watersheds (usually having different fisheries regimes) meant that cyclical fluctuations or losses in one place could be offset by shifting to another, either directly through catching fish or through trade.

In terms of cultural learning and transfer, fishing sites are where the landscape emerges, where Coyote stopped, and where children learn from parents and grandparents. Often, the language of kinship relations was used to refer to the land. In this regard, calling a fishing site a 'brother' means that there is a reciprocal obligation between the land and the people, a statement of mutual interdependency. Fish are well integrated into St'át'imc mythology, and fish stories read like chapters in a book of knowledge about the land. The loss of any of these places represents a loss of key reference points for knowledge and meaning. Much of St'át'imc ecological knowledge is site specific, dealing with which fish species are available, where, and when. Plants, fish, and humans are intertwined in a "story landscape." Woven through the broad cultural context is the economic importance, even today, of salmon fisheries and, to a lesser extent, lake fisheries.

Four main culture changes emerge from the study of fisheries impacts:

1. loss of species diversity, especially the loss of spring salmon;
2. shift in fishing locations, especially a concentration of fishing activity at the Bridge River fisheries as other locations were reduced or eliminated as fisheries locations;
3. the loss of salmon spawning habitats, especially in the Bridge River and Seton-Anderson Lake systems; and
4. an increased importance of other foods, but not a displacement of salmon as a key resource for domestic consumption, use in feasts and ceremonies, and for trade.

Any shift away from the nutritionally important salmon fisheries into other foods may have health consequences. Other foods could not replace salmon, partly because of limited opportunities to expand other food sources (e.g., expanded hunting was not necessarily possible because of pressures on game resources, limiting regulations, and reduced habitat resulting from hydroelectric and other industrial development), and store bought foods represented a high-cost, nutritionally inferior option.

A pattern identified in the mid 1800s became quite important by the early 1900s – growing one's own farm produce. In the 1950s and 1960s, wage labour provided some options for food production, but never enough to replace salmon. Salmon fishing remains at the centre of the land economy and at the center of discussions about preferred foods. It is not exclusive though, as restaurant food, game, store food, etc., are also integrated into the contemporary economy. The continued high level of fishing activity at *Scet* shows the importance of fishing. Part of the

reason is of course economic; another is cultural in that fishing is an exercise of aboriginal rights and the continuity of such rights.

Economic Valuation of Impacts on Fishing

Some 15 environmental and sustenance impacts on fishing were identified in the environmental analysis. As noted in Section 2.5, the western economic value of an impact relates only to its effect on human welfare. From a human welfare perspective these 15 impacts together result in a decrease in the salmon harvest (as quantified in Table 4-34), with consequent effects on nutrition, income, recreation and other activities. It is these effects that western economics can attempt to measure.

Review of the literature indicates that impact studies have traditionally estimated (1) the cost of substitute food and (2) lost revenues from commercial fishing as the bases for valuing the impacts of declines in fish catch on First Nations people. In this study, an attempt is made to go beyond these standard values to account for some of the cultural elements inherent in St'át'imc salmon fishing.

This assessment is based on the assumption that in the absence of BC Hydro facilities and activities, the St'át'imc would have continued fishing as they did before BC Hydro. According to the Oral Testimony, fishing effort has not changed since pre-BC Hydro conditions, but the catch has been reduced.

Confidence in these valuation estimates is as follows:

Impact Category	Methodology	Data Quality	Quality of Value Estimate
Nutrition	Accepted Standard	Good	Good
Sharing and Bartering	Accepted Standard	Fair	Fair
Fishing Activity	Accepted Standard	Poor	Indicative Only

Impact of Decreased Harvest on Nutrition

The decrease in salmon harvest by the St'át'imc has resulted in a decrease in the nutrition once provided by salmon. The St'át'imc have compensated for this reduced nutritional intake by purchasing salmon or other substitute foods.

Salmon possess a unique combination of nutritional attributes. Nevertheless, individuals faced with allocating limited household budgets may choose to purchase a combination of nutritionally equivalent but less expensive foods and food supplements rather than salmon. The present

St'át'imc diet still contains a significant amount of salmon (23 kg of fresh salmon and 10 kg of dried salmon annually per person, about half of the pre-BC Hydro quantity – see Table 4-31).

In the case of salmon, this study assumes that roughly equivalent nutrition can be obtained from a basket of selected foods and food supplements (acknowledging that salmon has particular nutritional properties that are rated highly by nutritionists and the St'át'imc).

Lost nutritional value is estimated as:

- the decrease in salmon consumption per person
  multiplied by
- the population
  multiplied by
- the retail price of the basket[218] of nutritionally equivalent foods and food supplements.

The real cost of obtaining the food from a store is higher than the retail price because of travel time and transportation expenses involved, which must be added to the retail price. However, this cost is assumed to be offset by the decrease in time and other costs needed to process the reduced catch of wild fish.

These estimates are prepared for every year from 1948 through 1999 and are shown in Appendix 4-F. Estimates are provided for both low and high estimates of harvest decrease attributable to BC Hydro.

As noted above, this estimate is based on a standard methodology accepted by economists, and the data available to support the analysis is acceptable. Hence, confidence in this estimate is good. BC Hydro activities are estimated to have resulted in lost nutritional value to the St'át'imc of between $6.4 million and $9.3 million over the period 1948–1999. This estimate includes interest from the year of impact.[219] Without interest, the financial impact ranges between $1.8 million and $2.6 million.

Impact on Sharing and Barter

The information presented in Table 4-31 indicates that the reduced salmon harvest has resulted in a decrease in sharing and barter of salmon by the St'át'imc by some 96 kg per person per year.

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[218] Based on advertised supermarket prices, September, 2001 comprising equal amounts fish, beef and chicken plus cod liver oil and vitamin supplements.

[219] Totals include compound interest applied from the year of impact up to 1999 using the bank rate for June of every year as set by the Bank of Canada; where prices have been inflated or deflated, the Consumer Price Index for all items for Canada was used per Statistics Canada Reports 62-001-xpb and 62-010.

This total includes both fresh salmon and dried salmon, the latter measured in terms of fresh salmon equivalent. No information is available on the proportion shared vs. used for barter.

This loss is measured by valuing the decrease in the sharing and barter quantity by its wholesale or landed value[220] (i.e., the price at which salmon is sold by commercial fishers). Although dried salmon is more expensive by a factor of 3 to 4 times over fresh salmon on a weight basis, each sockeye will produce on average 5 times as much fresh salmon for sale as dried by weight, thereby canceling out the difference in market prices for dried versus fresh salmon. Thus, the reduced quantities available for sharing and barter are valued in terms of fresh salmon.

The estimated value of this impact is shown on a year by year basis in Appendix 4-F. Estimates are provided for both low and high estimates of harvest decrease attributable to BC Hydro. As noted above, this estimate is based on standard accepted methodology and the data set is fair. Hence, confidence in this estimate is fair. In summary, BC Hydro activities are estimated to have resulted in lost sharing and barter value to the St'át'imc of between $9.2 million and $13.5 million over the period 1948–1999 with interest from the year of impact. The loss is valued at between $3.2 million and $4.7 million without interest.

Impact on the Cultural Value of the Fishing Activity

Fishing for salmon plays a central role in the St'át'imc calendar. Because of the centrality of salmon in the life and culture of the people, the fishing activity is key to traditional lifestyles.

For non-native consumers, it would be desirable to conduct a willingness-to-pay survey of the impacted population with regard to the fishing activity. However, because fishing is not an activity that is valued in market terms by the St'át'imc; indeed, because it is the central activity in their cultural lives, such a survey would provide little useful data.

Therefore, in order to provide the BC Hydro and St'át'imc negotiators with an indicative measure of the cultural value of St'át'imc fishing, a province-wide estimate of the value of non-commercial licensed fishing has been used as a proxy for the value that the St'át'imc attach to the salmon fishing activity. This value - $139 per person per year[221] - is described as follows:

> "Measuring the economic value of nature-related activities presents a formidable challenge..... Most nature-related activities are organized by the

[220] Data sources: 1997 – 1999 from "The 1999 BC Seafood Industry Year in Review", BC Fisheries; 1985-1996 from "Fisheries Production Statistics of BC, 1996", BC Fisheries; 1973-1984 from data received from the Seafood Branch, BC Fisheries. In all cases, prices for sockeye for all of BC were used. For pre-1973 prices, no similar data were found and so prices were calculated based on "Index of Prices Received by BC Fishermen" from Statistics Canada Catalogue No. 11-516-xie, Historical Statistics of Canada, Section N: Fisheries.

[221] Environment Canada. The Importance of Nature to Canadians: The Economic Significance of Nature-Related Activities. Ottawa. 2000. Page 35.

> participants themselves, who generally do not have to pay a market price for these activities. Hence, there is little or no information readily available on the economic value of these nature-related activities. For these reasons, participants in the 1996 Nature Survey were asked about their willingness to pay for nature-related tourism and recreation so that an economic value could be derived – an economic value that is comparable with that of goods and services readily available in the marketplace to meet human needs. The resulting dollar amounts for natural areas and wildlife reflect direct benefits that occur outside the marketplace." [222]

This estimate does not take account of the traditional and spiritual uses involved in St'át'imc fishing activities and does not adequately address social and community impacts.

It is assumed that because harvests have decreased and some fishing locations have been lost, the fishing activity is not as satisfactory as it was before BC Hydro activities. Yet the value of the fishing activity has not been lost completely to the St'át'imc. The percentage loss in value of the fishing activity per person is assumed to be equal to the percentage decline in salmon harvest attributable to BC Hydro. The loss in the value of the fishing activity to the St'át'imc is therefore estimated as follows:

- the provincial per person fishing activity value of $139 (adjusted for inflation for each year)

  multiplied by
- the population affected in each year

  multiplied by
- the percentage decrease in harvest attributable to BC Hydro (see Appendix 4-E).

Under these assumptions, BC Hydro activities have resulted in St'át'imc lost cultural value of the fishing activity of between $3.3 million to $4.8 million including interest over the period 1948–1999. Without interest, the loss equals $0.9 million to $1.3 million. Detailed calculations are presented in Appendix 4-F.

As noted above, while the methodology used (willingness-to-pay) to generate this estimate is the accepted standard, the data set used is based on a survey of all British Columbians, not just the St'át'imc. Hence, the estimate is only indicative but can be used as a starting point for discussion between BC Hydro and the SNH.

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[222] Environment Canada. The Importance of Nature to Canadians: The Economic Significance of Nature-Related Activities. Ottawa. 2000. Page 14.