



FISH PASSAGE AND REINTRODUCTION INTO THE U.S. & CANADIAN UPPER COLUMBIA RIVER

An Interim Joint Paper
of the
U.S. Columbia Basin Tribes and Canadian First Nations

February 14, 2014



Canadian
Columbia River
Inter-Tribal
Fisheries
Commission



Columbia
River Inter-
Tribal Fish
Commission



Confederated
Salish and
Kootenai
Tribes



Cowlitz
Indian
Tribe



Okanagan Nation
Alliance



Upper Columbia
United Tribes



Upper Snake
River Tribes

EXECUTIVE SUMMARY

U.S. Native American Tribes and Canadian First Nations jointly propose reintroducing and restoring habitat and life history connectivity for native anadromous salmon and resident fish into and within the upper Columbia River pursuant to a modernized Columbia River Treaty. Restoring fish passage should be investigated and implemented as a key element of integrating the ecosystem into the Treaty. Anadromous fish reintroduction is critical to restoring indigenous peoples' cultural, harvest, and spiritual values, and first foods taken through bilateral river development for power and flood risk management. Reintroduction is also an important facet for ecosystem function adaptation to climate change as updated research indicates that only the Canadian portion of the basin will be snowmelt-dominated in the future; conditions to which salmon are adapted.

This trans-boundary reintroduction proposal focuses on adult and juvenile fish passage at Chief Joseph and Grand Coulee dams in the U.S. and at Hugh Keenleyside, Brilliant, and Waneta dams in Canada. Reintroduction would occur incrementally, beginning with a series of preliminary planning, research, and experimental pilot studies designed to inform subsequent reintroduction and passage strategies. Long-term elements of salmon reintroduction would be adaptable and include permanent passage facilities, complemented by habitat improvement, artificial propagation, monitoring, and evaluation. Beneficiaries of the five projects and Treaty operations should be financially obligated to fund planning, construction, and operations as mitigation for their respective benefits received.

The bilateral damming and management of the upper Columbia River, initiated with the construction of Grand Coulee Dam, is responsible for the loss of over 1,100 miles (1,770 km) of salmon and steelhead habitat above Chief Joseph Dam and the loss of about 3 million salmon harvested and consumed by indigenous peoples throughout the basin annually.

I. INTRODUCTION

Initial damming of the Columbia River occurred with Rock Island (1933, with fish passage) and Grand Coulee (1942, without fish passage) dams. In 1964 further damming of the Columbia River by the United States and Canada was accelerated with ratification of the Columbia River Treaty. The Treaty was designed with two primary purposes: reducing flood risk and increasing hydropower generation. Impassable dams constructed pursuant to the Treaty blocked fish migrations and operation of large storage reservoirs significantly altered the river's natural flow regime to optimize flood risk and power benefits. With this altered flow regime, additional dam and powerhouse construction was undertaken in the U.S. for more power generation. Little, if any, consideration and accommodation was planned for ecosystem values and the rights and needs of indigenous peoples. While the construction and operation of Treaty dams did not cause the initial extirpation of upper Columbia River salmon populations, they have significantly harmed the viability of downstream salmon populations and the dams have made the task of up-river salmon restoration into Canada far more challenging.

Since that time, however, both countries have increasingly recognized and valued the importance of the basin ecosystems and the role of rivers and the anadromous fish in those ecosystems. For

example, in the U.S., the federal government requires fish passage facilities for non-federal hydroelectric projects in the Pacific Northwest in most instances. Similarly, since the early 1960's, both countries have come to realize obligations to their indigenous peoples. For these peoples, their subsistence, economy, culture, and spirituality depend upon a healthy and functioning ecosystem.

In the process of optimizing the river for flood risk management and low-cost power generation prior and subsequent to the Treaty, substantial habitat for salmon, steelhead and other fish species was inundated or blocked (see Appendix 1). Major anadromous fish runs were eliminated or decimated and along with them, the many benefits they brought to the region's native peoples (see Appendix 2). Recreational and commercial fishing economies, extending out to the Pacific Ocean in both countries, were sacrificed for other economic values.

Today, Native American Tribes in the U.S. and First Nations in Canada are participating in their respective countries' reconsideration of the Columbia River Treaty. The Tribes and First Nations are seeking to integrate ecosystem function as a co-equal Treaty objective, including a watershed approach to restoring fish passage into historical habitats blocked by dam construction. Through Treaty reconsideration, native peoples are encouraging their communities and governments to restore fish passage at Chief Joseph and Grand Coulee dams in the U.S. and at Hugh Keenleyside, Brilliant and Waneta dams in Canada. Together, substantial habitats for salmon and other aquatic species could be restored to levels where fish production would benefit the entire Pacific Northwest. There are significant ecological and economic benefits to be gained, as well as restoration and revitalization of cultural, spiritual, and nutritional values for basin residents.

Reintroduction of salmon and other species is proposed through a pragmatic and phased approach to fish passage planning, research, testing, and design/construction and would be followed by monitoring, evaluation, and adaptive management. Each phase of this ecosystem recovery program would be pursued based on the knowledge gained and successful outcomes from previous phases. With recent and significant advancements in transboundary collaboration and legal and technical knowledge, Columbia River Treaty reconsideration is the appropriate opportunity to reconcile the consequences of past, narrowly focused decisions on river development and operations.

II. FISH PASSAGE AND REINTRODUCTION PROPOSAL

This proposal is based on four initial objectives:

Objective 1: Restore naturally spawning and hatchery-based runs of sockeye and Chinook salmon into the upper Columbia basin above Chief Joseph, Grand Coulee and Canadian dams to restore indigenous peoples' cultural and spiritual values and subsistence harvest opportunities.

Objective 2: Determine contribution of reintroductions to salmon recovery, ecosystem health, and long-term sustainability of salmon and other fish species in light of expected climate change.

Objective 3: Establish and increase subsistence, sport, and commercial fish harvest opportunities for all communities and citizens along the Columbia River.

Objective 4: Restore access and population structure of resident bull trout, sturgeon, and other native fish species to historical habitats.

The Tribes and First Nations propose that fish reintroduction should proceed initially with passage planning and experimental trials with sockeye and chinook salmon, the species that were once numerous in the upper Columbia and essential to indigenous subsistence and cultures. These species are also more likely to successfully propagate and migrate from the streams and reservoirs in the blocked areas. Donor populations for experimental trials, passage testing, and initial reintroduction would be from stocks not listed under the Endangered Species Act to avoid regulatory hurdles and conflicts with current land and water uses. Reintroduction of coho salmon, steelhead trout, lamprey and passage for resident fish species could be subsequently considered.

Restoring fish passage into the upper Columbia River has been the subject of past investigations (Heinith and Karr 1997) and more recently was the subject of a workshop and report, "Scoping Document to Assess the Feasibility, Impacts, and Benefits (FIBs) of Restoring Anadromous Salmon to the Canadian Reaches of the Upper Columbia River," April 12, 2007. The workshop and report considered a broad range of restoration issues across economic, social, and environmental objectives. The report summarizes the issues and options for fish passage. The workshop and report concluded with a recommendation that passage should proceed by implementing "...a systematic, phased approach with iterative re-assessments." The report made specific recommendations on priority issues that could be resolved in the initial phase, lasting 1-3 years:

1. Investigate upstream and downstream passage options and design experimental reintroduction past upper Columbia River dams and reservoirs.
 - Passage options for adults at Chief Joseph, Grand Coulee, and Canadian dams.
 - Alternative technologies for guiding and transporting smolts through Lake Roosevelt and around Grand Coulee Dam (and other projects).
 - Behavior studies of smolts in Lake Roosevelt (and other reservoirs).
 - Radio-track adult salmon.
2. Investigate potential donor stocks.
 - Identify potential donor stocks.
 - Determine disease prevalence of donor stocks.
 - Evaluate role and use of artificial propagation (hatcheries).
3. Evaluate existing quantity, quality, and capacity of salmon habitat in the upper Columbia River.
 - Baseline field assessments of reservoir, mainstem, and tributary habitat quantity, quality and capacity for various life stages in the US and Canada.
4. Simulate hydrosystem operating changes potentially required for successful upstream/downstream migrations.
 - Assess travel time of hypothetical fish stocks to reach the estuary in the critical survival window.

- Assess juvenile and adult migration survivals to and from Chief Joseph Dam.
5. Assess socio-economic implications of alternative hydrograph scenarios.
 6. Develop a comprehensive understanding of salmon's impact on the cultures and health of the First Nations and Tribes.
 7. Formulate support for passage.
 8. Develop a communications plan.

The Tribes and First Nations' proposal for restoration of fish passage into the upper Columbia River would proceed in an incremental approach with work progressing through phases only after successful conclusions or outcomes from the previous phase.

- Phase I: See 8 steps above (some steps would proceed concurrently).
- Phase II: Experimental, pilot-scale salmon reintroductions and interim passage facilities.
- Phase III: Construct permanent juvenile and adult passage facilities and supporting propagation facilities. Implement priority habitat improvements.
- Phase IV: Monitoring, evaluation, and adaptive management. Continue needed habitat improvements.

Investigations in Phases I and II would determine the long-term requirements for salmon passage and restoration in later phases. Initial experimental reintroductions would likely occur at least during Phase II, guided by the information gathered and experiments designed in Phase I. Experimental reintroductions could, however, also be undertaken in Phase I if necessary to gathering critical information before proceeding to Phase II.

Passage investigations should proceed with an understanding that anadromous fish runs from above Grand Coulee may need to be initiated and supported with appropriate hatchery programs to counter effects of cumulative fish passage losses at mainstem hydroelectric dams and fisheries and to minimize impacts to donor populations. The need for, and extent of, long-term use of artificial propagation with hatcheries can only be determined based on M&E programs, future scientific findings, and adaptive management.

Tribes and First Nations propose that initial phases need to be conducted bilaterally by the U.S. and Canada to ensure fiscal efficiency and integration of key planning and research information developed in a coordinated and comprehensive manner. Phase I would include the necessary strategic scoping for subsequent experiments and include the creation of a decision tree to guide testing and adaptation based on results. Additionally, Phase II testing of interim juvenile passage facilities could be accomplished in a sequential manner with adult and juvenile fish collectors shared between US and Canadian projects. The extensive transboundary coordination necessary for a successful program would build on the existing partnership between the countries and their native peoples.

This proposal anticipates U.S. and Canadian beneficiaries of the Treaty and Treaty dams would fund Phases I and II activities. Such investigations should be initiated after 2014 when both the U.S. and Canada agree on an approach to pursue Treaty reconsideration. Upon adoption of this proposal, detailed work plans and schedules would be prepared and thoroughly reviewed in a transboundary forum. Emphasis would be on the work necessary for Phases I and II.

III. CULTURAL SIGNIFICANCE OF SALMON TO INDIGENOUS PEOPLES

The importance of salmon and other fish species to Tribes and First Nations is paramount to their culture and being. The loss of the salmon and other fish species irreparably harmed indigenous peoples in many ways and dimensions. For many, the loss of salmon translated to an emotional and spiritual loss, a loss of connection, confidence, spiritual guidance and sense of self-worth. Research indicates that the loss of fresh salmon as a major part of their daily diet relates directly to a reduction of tribal health, higher mortality rates, and increased poverty (Meyer Resources, 1997). Without salmon runs, tribal members lost economic activity, fishing related jobs, and trading opportunities. The loss of salmon has had societal impacts to the tribes, including social exchanges, family activities, and community cohesion and unity. Without an opportunity to catch salmon, traditional skills and knowledge associated with the harvest, preparation, and use of the fish that was passed through the generations is being lost. Finally, the loss of salmon interrupted the ecological integrity and health of the land that defines the self-identity of the region's Tribes and First Nations.

Evaluating the path towards salmon reintroduction as proposed by the Tribes and First Nations must be done relative to the values of and needs for salmon within the cultures and the values of communities of the indigenous peoples.

IV. INDIGENOUS RIGHTS AND PRIOR LACK OF INFORMED CONSENT, COORDINATION, CONSIDERATION, AND ACCOMMODATION

Recognition and protection of the rights of indigenous peoples is an established principle of the domestic legal systems of both Canada and the U.S., as well as a recognized principle of international law. Within Canada, aboriginal rights enjoy constitutional protection under s. 35 of the *Constitution Act, 1982*, which recognizes and affirms existing aboriginal and treaty rights of the aboriginal peoples of Canada. Canadian courts have interpreted this provision as protecting traditional aboriginal practices – most notably, salmon fisheries practiced for food, social and ceremonial purposes – from unjustified government interference. Courts have further imposed an obligation on governments to meaningfully consult with aboriginal peoples before taking any actions that may adversely affect aboriginal rights and practices.

In the U.S., Columbia Basin Tribes' natural and cultural resources related to the Columbia River are protected through treaties, executive orders, and federal trust responsibilities. For several Columbia Basin Tribes, treaties were signed that created reservations and reserved hunting and fishing rights in usual and accustomed places in common with citizens of the states. Federal court decisions have upheld these rights, and interpreted them to ensure that fish and wildlife are sufficiently abundant to make the rights meaningful and not an empty promise. For tribes with reservations established by executive orders, tribal fisheries and access to traditional fishing

areas were specifically reserved. In addition, stream flows sufficient to preserve the tribal fisheries, wildlife, and plant habitat were reserved and are to be protected. In the case of the Colville Tribes for example, these expressed reserved rights were “not to be abridged in any way.”

The trust responsibility is a primary cornerstone of U.S. federal Indian law and policy. It recognizes a substantive federal duty to protect treaty rights, reserved rights, lands, and resources retained by Indian tribes by their treaties and reservations. Through federal court decisions, the federal government is required to restore the natural resources on which the tribes depend. Internationally, the U.N. General Assembly adopted the Declaration on the Rights of Indigenous Peoples (UNDRIP) on September 13, 2007. UNDRIP recognizes and affirms the cultural, political, legal, and social rights of indigenous peoples, including a right to full and informed participation in decisions affecting their traditional lands.

Regrettably, these principles were not honored at the time the U.S. and Canadian governments built the dams that have so fundamentally altered the flows of the Columbia River system and the abundant salmon runs they once supported. Canada did not consult with Columbia River First Nations that Grand Coulee Dam would eliminate aboriginal salmon fisheries in the Upper Columbia before advising the U.S. that it had no objections to the construction of the dam. Neither Canada nor the Province of British Columbia consulted with First Nations prior to negotiating the Columbia River Treaty and expanding the dam system northwards into the Upper Columbia. The result of these omissions has been the elimination of centuries old fisheries, the loss of a valued food source, and the erosion of the deeply rooted cultural, social, and spiritual values aboriginal peoples hold for those fisheries.

Similarly, in the U.S., the Columbia River Treaty was negotiated and enacted without tribal informed consent, consultation, consideration, or accommodation of tribes’ reserved rights for cultural and natural resources as now understood through subsequent federal court decisions.

V. FUNDING AND COST ALLOCATION

Several options exist for funding the planning, testing, construction, and implementation of fish passage facilities and reintroduction actions. Funding avenues should be the subject of negotiations between the U.S. and Canada during Treaty reconsideration.

The Tribes and First Nations recognize opportunities to achieve cost efficiencies in the planning and experimental phases by sequencing and sharing the use of scientific equipment, personnel, and interim passage facilities for testing. These cost efficiencies might best be achieved from a bilateral fund or, alternatively, from bilateral coordination and oversight of separate funds.

Actual construction and operation of fish passage facilities could 1) follow normal mitigation practices of each country at its own projects, or 2) proceed through a new, bilateral arrangement that recognizes a holistic approach to water and fish management. Under the current mitigation practice in the U.S., project beneficiaries have been identified and cost allocation formulas enplaced for Chief Joseph and Grand Coulee dams that could apply to fish passage mitigation.

The U.S. also has flexibility with funding, i.e. via Congressional funding or regional payment procedures for fish mitigation facilities per the Northwest Power Act.

VI. BIBLIOGRAPHY

- Dalton, M.M, P.W. Mote and A.K. Snover. 2013a. Climate Change in the Northwest: Implications for Our Landscapes, Waters and Communities. Washington, DC: Island Press. Available at <http://occri.net/wp-content/uploads/2013/11/ClimateChangeInTheNorthwest.pdf>
- Heinith, R. and M. Karr. 1997. Restoration of anadromous salmon to the Canadian Columbia River Basin. Initial Assessment. Report to the Canadian Columbia River Inter-Tribal Fisheries Commission. Unpublished report. 73p.
- Meyer, P. 1997. Tribal Circumstances and Impacts from the Lower Snake River Project on the Nez Perce, Yakama, Umatilla, Warm Springs and Shoshone Bannock Tribes. Prepared by Meyer Resources, Inc. for the Columbia River Inter-Tribal Fish Commission. Portland, Oregon.
- Nelitz, M., M. Porter and D.R. Marmorek. 2007. Scoping Document to Assess the Feasibility, Impacts, and Benefits (FIBs) of Restoring Anadromous Salmon to the Canadian Reaches of the Upper Columbia River. Prepared for Upper Columbia Aquatic Management Partnership (UCAMP) by ESSA Technologies, Ltd., Vancouver, BC. 86 pp.
- Northwest Power Planning Council. 1986. Compilation of Information on Salmon and Steelhead Losses in the Columbia River Basin. 252 pgs.
- Green, William. 2012. Personal communication.
- Scholz, Allan et al. 1985. Compilation of Information on Salmon and Steelhead Total Run Size, Catch and Hydropower Related Losses in the Upper Columbia River Basin, above Grand Coulee Dam. Eastern Washington University. 165 pgs.
- Wade, A.A. et al. 2013. Steelhead vulnerability to climate change in the Pacific Northwest. *Journal of Applied Ecology*. 50:1093-1104.

APPENDIX 1. HISTORICAL HABITAT OF ANADROMOUS FISH IN THE UPPER COLUMBIA RIVER

Prior to construction of dams on the Columbia River and its tributaries, the distribution of salmon and other fishes varied through time. Historical habitats of salmon are known from oral accounts of indigenous peoples, journals of early European immigrants, and later by more detailed recordings of naturalists and scientists. A brief synopsis of the habitats of salmon and steelhead in the upper Columbia River above the present blockage at Chief Joseph Dam is as follows:

Sockeye Salmon:

Prior to blockage by Grand Coulee Dam in 1939, sockeye salmon inhabited the following Canadian lakes: Upper Arrow (51,904 acres/21,000 hectares), Lower Arrow (37,504 acres/15,200 hectares) Whatshan (4,004 acres/1,620 hectares) and Slocan (16,738 acres/6,775 hectares). Sockeye salmon also used many of the tributaries to these lakes. Sockeye may have also used Kinbasket, Windermere and Columbia lakes. (NPPC, 1986), (W. Green, 2012).

Chinook Salmon:

Historically, fall chinook salmon inhabited the Pend Oreille River below Metaline Falls, the lower 50 miles (80 km) of the Kootenay River below Bonnington Falls, in the Salmo River, in the lower Slocan River, in the Columbia River intermittently below the Columbia/Kootenay confluence, and in the Columbia River downstream of lower Arrow Lake. Chinook salmon also inhabited the lower 74 miles (119 km) of the Spokane River, the Little Spokane River, the lower 55 miles (88 km) of Hangman (Latah) Creek, all 75 miles (120 km) of the Sanpoil River, the lower 4 miles (6 km) of the Colville River, and the Kettle River into Canada, (NPPC, 1986) (W. Green, 2012).

In Canada, summer chinook spawned below the confluence of the Columbia and Kootenay rivers; in the Slocan River below Slocan Lake; downstream of Bonnington Falls on the Kootenay River; in the Columbia River between the Arrow Lakes; intermittently in the Columbia River from the top end of Upper Arrow Lake to near Radium; heavily in the Columbia River downstream of Lake Windermere, in the Columbia River between Windermere and Columbia Lakes, and in accessible parts of some tributaries of the uppermost Columbia River.

Coho Salmon:

Historically, coho salmon spawned in the lower 74 miles (119 km) of the Spokane River, Little Spokane River, the lower 55 miles (88 km) of Hangman (Latah) Creek, all 75 miles (120 km) of the Sanpoil River, and the lower 4-5 miles (6-8 km) of Hall Creek (NPPC, 1986). There is no knowledge of coho salmon spawning in Canada.

Steelhead:

Historically, steelhead habited the lower 74 miles (119 km) of the Spokane River, Little Spokane River, the lower 55 miles (88 km) of Hangman (Latah) Creek, all 75 miles (120 km) of the Sanpoil River, the lower 4 miles (6 km) of the Colville River, the Kettle River into Canada, the Pend Oreille River below Metaline Falls, and the lower Kootenai River below Bonnington Falls (NPPC, 1986) (Scholz, 1985).

Historical salmon and steelhead runs above Grand Coulee were estimated at 1.1 million fish with a tribal harvest of 644,500. These runs and associated tribal harvest were totally lost, with 90% of this loss attributed to multi-purpose hydroelectric dams (Scholz, et al, 1985). Another estimate, (NPPC, 1986) of the salmon and steelhead runs above Chief Joseph Dam is nearly 3.2 million fish.

Sockeye and chinook salmon were the primary anadromous species that migrated into the upper Columbia River in Canada (NPCC, 1986)

The pre-1850 distribution of all Columbia Basin salmon and steelhead above Chief Joseph Dam was estimated at 14.7% for spring chinook, 16.6% for summer chinook, 14.0% for fall chinook, 17.3% for coho, 10.5% for steelhead, and 64.7% for sockeye (NPPC, 1986)

Table 1. Pre-1850 Salmon and Steelhead in Columbia Basin Originating above Chief Joseph Dam (from NPCC, 1986).

Metric	Spring Chinook	Summer Chinook	Fall Chinook	Coho	Sockeye	Steelhead
% Basin Total	14.7	16.6	14.0	17.3	64.7	10.5
# Adults ¹ (1,000s)	213	592	276	232	1,761	101

¹ Based on an all species estimated total of Columbia River runs of 12.0 million; other estimates in the NPCC's Report place the range of the total of all runs at 8 to 35 million salmon.

APPENDIX 2. HISTORICAL HARVEST OF ANADROMOUS FISH BY INDIGENOUS PEOPLES

Upper Columbia River salmon runs were largely depleted in the 1880s and 1890s by commercial fisheries and the advent of salmon canning in the lower Columbia (Scholz, 1985). Scholz, et. al, (1985) estimated harvest and consumption of U.S. tribes located in the upper Columbia, as follows:

Spokane Tribe

Spokane Tribe fished salmon principally in the Spokane River and its tributaries including Latah Creek and the Little Spokane River, and along the Columbia River upstream to Kettle Falls. They relied heavily on salmon for most of their diet. Tribal members are estimated to have consumed 1.4 million to 2.4 million pounds of salmon annually, or about 132,000 fish.

Coeur d'Alene Tribe

Coeur d'Alene Tribe fished on the upper Spokane River and occasionally at Kettle Falls, in the Clearwater River and at the mouth of the Palouse River. Tribal members are estimated to have consumed 1.3 million to 2.3 million lbs. (635,000 to 1 million kg) of salmon and steelhead annually, or about 124,000 fish.

Kalispel Tribe

Kalispel Tribe fished on the lower Pend Oreille River and joined other tribes at Kettle Falls and on the Spokane River. Tribal members consumed 790,000 to 980,000 lbs. (358,000 to 445,000 kg) of salmon annually, or about 43,000 to 54,000 fish.

Kootenai Tribe of Idaho

Kootenai Tribe of Idaho relied more heavily on resident fish species, but fished salmon on the lower Kootenai River and with other tribes at Arrow Lakes, at Kettle Falls and at Lake Windermere and Columbia Lakes. Tribal members consumed about 360,000 lbs. (163,000 kg) of salmon annually, or about 44,000 fish. All Kootenai tribes (US and Canada) are estimated to have consumed 2.4 million to 3.8 million lbs. (1 million to 1.7 million kg) of salmon annually, or about 130,000 to 208,000 fish.

Colville Confederated Tribes - Kettle Falls Fishery

The fishery at Kettle Falls, located at river mile 703 on the Columbia River, was thought to be the second largest salmon fishery on the Columbia River. It was managed by the Colville Tribe and used by several tribes, including the Lakes, San Poil, and Nez Perce tribes. Catch at the falls and nearby vicinity has been estimated at 90,000 to 120,000 fish annually.

Summary

In all, an estimated 4,000 to 5,600 tribal fishers congregated at key fishing sites in the U.S. portion of the upper Columbia Basin to fish salmon. Total annual consumption of salmon and steelhead by these tribes was estimated at about 6.8 million to 13.1 million lbs. (3.1 million to 5.9 million kg). Catch is estimated at about 644,000 chinook, coho, and sockeye salmon and steelhead. Estimates of the total run of salmon and steelhead above Grand Coulee Dam ranges from about 980,000 to 3.2 million fish; some estimates provide higher historical total run sizes.

Bill Green of the Canadian Columbia River Inter-tribal Fisheries Commission conducted an extensive review of the historical literature on salmon harvest by First Nations in Canada. The summary of his review is as follows:

Table 2. Estimated harvest by Canadian First Nations of Columbia River Salmon and Steelhead

Indigenous People	Species	Minimum Estimate ¹	Maximum Estimate ²
Okanagan/Lakes	Chinook	27,500	157,000
	Sockeye	20,000	114,000
	Steelhead	41,000	233,000
Ktunaxa	Chinook	11,000	75,000
	Sockeye	8,000	55,000
	Steelhead	17,000	112,000
Total		124,500	746,000

¹ Based on Hewes' estimates of tribal salmon consumption

² Based on UCUT estimates of tribal salmon consumption

Lower Columbia River tribal harvest of salmon and steelhead that originated from above Chief Joseph Dam can be approximated from the data from Table 1, above, and estimates of total lower river harvest (NPCC, 1986; Table 12). It appears that salmon and steelhead populations arising from the blocked areas of the upper Columbia River may have accounted for an average of about 2 million fish harvested by tribes in the lower Columbia River.

Table 3. Estimated Average Harvest of Upper Columbia River Salmon and Steelhead by Indigenous Peoples of the Lower Columbia River

Species	Aboriginal Catch # Fish	Percent of Run from above Chief Joseph Dam	Catch from above Chief Joseph Dam
Spring Chinook	226,000	14.7%	33,000
Summer Chinook	610,000	16.6%	101,000
Fall Chinook	350,000	14.0%	49,000
Coho	469,000	17.3%	81,000
Sockeye	2,744,000	64.7%	1,775,000
Steelhead	400,000	10.5%	42,000
Total	4,799,000		2,081,000