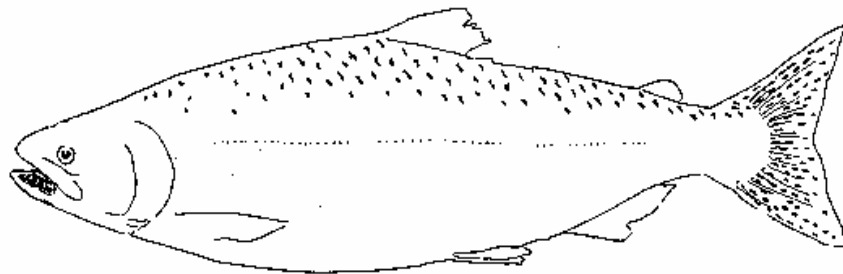


2011

**Information Document to Assist
Development of a**

Fraser Chinook Management Plan



DRAFT FOR DISCUSSION PURPOSES



RECORD OF REVISIONS

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1. Introduction

Fraser River Chinook salmon are an important part of the ecology of the Fraser River watershed. They are the largest of seven species of Pacific salmon returning to the Fraser (including Steelhead and anadromous cutthroat) and enjoy the widest distribution. Some stocks migrate distances of over 900 km from the mouth of the Fraser to systems near the headwaters. Fraser River Chinook have sustained First Nations for thousands of years and currently provide important recreational harvesting opportunities. Furthermore, they were an important part of the colonization of British Columbia and the development of the commercial fishing industry in the province.

The information presented in this document is intended for use in planning the Chinook fisheries throughout the Fraser River and approach areas which generally begin in the lower Fraser River and approach in early March. The information is also intended to complement the Southern BC Integrated Fisheries Management Plan for salmon which is generally finalized in June or July of each year.

Fisheries and Oceans Canada is engaged in on-going consultations with First Nations, recreational, and commercial fishers to co-ordinate Chinook fishing plans for 2011. Further consultation will occur as First Nations and sector specific plans are finalized.

2. Lifecycle

Chinook salmon spawn in numerous tributary systems throughout the Fraser River watershed, from just above the tidal limits in the Lower Fraser to the upper tributaries of the Stuart drainage and Tete Jaune Cache near Mount Robson. Fry emerge from the gravel in the spring, after spawning and rear as juveniles in fresh water for varying periods of time. The time the juveniles spend in freshwater is an important characteristic of the life history exhibited by the population. In the Fraser River, there are several distinctly different life histories exhibited by Chinook salmon.

Chinook life history can be categorized into two distinct behavioural forms: stream-type and ocean-type¹.

Stream-type Chinook spend one or more years as juveniles in fresh water before migrating to sea. Another way of saying this is that, as juveniles they over-winter in freshwater and then enter the ocean in the second spring of their life². Stream-type Chinook generally exhibit an extensive off-shore ocean migration and return to the Fraser

¹ Healey, M.C. 1991. The life history of Chinook salmon (*Oncorhynchus tshawytscha*). Pages 311-393 in C. Groot and L. Margolis, editors. Pacific salmon life histories. UBC Press, Vancouver.

² Fraser, F.J., P.J. Starr, and A.Y. Fedorenko. 1982. A review of the Chinook and Coho salmon of the Fraser River. Can. Tech. Rep. Fish. Aquat. Sci. 1126: 130p

River in the spring or summer, several months before spawning. Juveniles of this type are sometimes referred to as *yearlings* or *1+ smolts*.

Ocean-type Chinook migrate to sea during their first year of life, generally after spending two to five months in fresh water³. Ocean-type Chinook spend most of their ocean life in coastal waters and generally return to the Fraser River in the fall, a few days or weeks before spawning. Juveniles of this type are sometimes referred to as *underyearlings* or *0+ fry*.

Of importance to Fraser River Chinook, is a variation of the ocean-type life history. Harrison River Chinook (and their transplants), exhibit an immediate fry migration pattern. That is, upon emergence from the gravel, they migrate immediately downstream to the estuary. They rear in the estuary for three to six weeks before moving off-shore. This unique ocean-type life history is sometimes referred to as an *immediate-type* or *immediate fry migrant* life history.

Chinook smolts adapt to salt water in the Fraser River estuary before migrating into marine waters. While the majority of Lower Fraser stocks rear off the south-west coast of Vancouver Island (Harrison and Chilliwack fall stocks), coded wire tag (CWT) information has shown that other stocks may be found over a wide geographic area with many spring and summer run populations⁴ utilizing offshore marine waters. Some populations migrate and reside at least as far north as Southeast Alaska. During their ocean residence, and depending on their ocean rearing location and return migrations, Chinook may be subject to numerous fisheries. Current CWT data indicates that offshore migrants, such as the Interior spring and summer yearlings, are less vulnerable to coastal fisheries than are the Lower Fraser fall and South Thompson summer stocks.

After one to three years spent feeding at sea, Chinook return to the Fraser River from February to November, primarily as three, four and five year old fish (or as two year old jacks for ocean-types). They migrate back to their natal streams where spawning activity commences from early August until mid-November depending on the system. The following spring, these returning fish-fry emerge from the gravel and the lifecycle begins anew.

2.1. Nomenclature

In many documents, age and life history type are expressed as a group of numbers such as **4₂** (Gilbert and Rich format) or **1.2** (European format). These notations can be confusing and an attempt is made here to clarify what they represent.

In the Gilbert-Rich (G-R) format the large number **4** represents the age of the fish on its *next birthday* or the number of winters from its deposition in the gravel as an egg to the

³ **Department of Fisheries and Oceans (DFO). 1995.** Fraser River Chinook. Prepared for DFO by Fraser River Action Plan. Vancouver, BC.

⁴ see section 5.1 Stock Assessment – Management Units, for a definition of spring and summer-run

time of sampling.⁵ The subscript number **2** represents the year in which the fish migrated to the ocean (i.e. it migrated as a one year-old in its second year of life). The subscript number can also be interpreted as the number of winters spent in freshwater from the egg stage. The 4_2 age format can also be expressed as 4sub2. To obtain the parental brood-year, simply subtract the first number from the sample year.

A 1.2 fish in the European format is the same as a 4_2 fish in the G-R format. Here, the number **1** represents the total number of complete years the fish spent in freshwater (or the number of winters *since hatching* the fish spent in fresh water), and the number **2** represents the total number of complete years spent in the ocean (or the number of winters the fish spent in the ocean). To obtain the parental brood-year, add 1 to the sum of the two numbers and subtract from the sample year.

3. General Context

3.1. Policy Framework for the Management of Pacific Salmon Fisheries

Salmon management programs continue to be guided by policy and operational initiatives adopted over the past several years. These include; *Canada's Policy for Conservation of Wild Pacific Salmon* (WSP), *An Allocation Policy for Pacific Salmon*, Pacific Fisheries Reform, *A Policy for Selective Fishing*, *A Framework for Improved Decision Making in the Pacific Salmon Fishery*, the Integrated Harvest Planning Committee and Pacific Region Fishery Monitoring and Reporting Framework.

Canada's Policy for Conservation of Wild Pacific Salmon (also called the Wild Salmon Policy) sets out the vision regarding the importance and role of Pacific Wild salmon as well as a strategy for their protection. More information can be found on the internet at <http://www.pac.dfo-mpo.gc.ca/publications/pdfs/wsp-eng.pdf>.

An Allocation Policy for Pacific Salmon, announced in 1999, contains principles to guide the management and allocation of the Pacific salmon resource between First Nations, commercial and recreational harvesters. It forms the basis for general decision guidelines outlined in Section 5.1 of this plan.

Pacific Fisheries Reform, announced by the Department in April of 2005, provides a vision of a sustainable fishery where:

- the full potential of the resource is realized,
- Aboriginal rights and title are respected,
- there is certainty and stability for all,
- fishery participants share in the responsibility of management
- future First Nations treaties are contemplated, in addition to the need to be adaptive and responsive to change.

⁵ Note: a common mistake is the belief that the first G-R number represents age; however, this is not the case in most situations. A fish sampled in the marine areas that is aged 4_2 is not a 4 year-old fish, it is in fact a 3 year-old fish in its 4th year of life. The exception would be aged samples from spawning ground carcasses where the fish would have just had its 4th "birthday"

This policy direction provides a framework for improving the economic viability of commercial fisheries, and to addressing First Nations aspirations with respect to FSC and commercial access and involvement in management. The "Vision for Recreational Fisheries in BC" was approved January 2010 by DFO, the Sport Fishing Advisory Board (SFAB) and the Province of B.C. Guided by this Vision, an action and implementation plan will be developed to build upon the collaborative process established by the Federal and Provincial Governments and the SFAB. The document can be found on the DFO Pacific Region website at <http://www.pac.dfo-mpo.gc.ca/consultation/fisheries-peche/smon/sfab-ccps/docs/rec-vision.pdf>.

In May 1999, the Department released *A Policy for Selective Fishing in Canada's Pacific Fisheries*. Under the Department's selective fishing initiative, harvester groups have experimented with a variety of methods to reduce the impact of fisheries on non-target species, with a number of measures reaching implementation in fisheries.

Consultative elements of an Improved Decision Making discussion paper have been implemented through establishment of the Consultation Secretariat, which works to improve the flow of information between stakeholders and the Department. Up-to-date information pertaining to on-going consultations can be found on the Secretariat's website at: <http://www.pac.dfo-mpo.gc.ca/consultation/index-eng.htm>.

The Integrated Harvest Planning Committee (IHPC) for salmon is comprised of First Nations, recreational and commercial interests (as represented by the Sport Fishing Advisory Board and the Commercial Salmon Advisory Board) and the Marine Conservation Caucus (representing a coalition of 'environmental' organizations). This committee is recognized to be the primary source of stakeholder input into Salmon Integrated Fisheries Management Plans.

Further information on salmon consultations, including terms of reference, membership, meeting dates and records of consultation can be found on the Salmon Consultation website at: <http://www.pac.dfo-mpo.gc.ca/consultation/fisheries-peche/smon/ihpc-cpip/index-eng.htm>.

In 2002, the Department released the Pacific Region Fishery Monitoring and Reporting Framework. This framework will be used as the main reference tool during coast-wide consultations to identify necessary improvements in fishery monitoring and catch reporting systems. The framework outlines the department's goals, objectives and requirements in catch monitoring. The Department is currently consulting on a draft *Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries*. The deadline for submitting comments on the draft *Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries* is **May 6, 2011**. (for an online form to submit comments: <http://www.pac.dfo-mpo.gc.ca/consultation/picfi-ipcip/monrep-survdecl/index-eng.htm>).

3.2. Pacific Salmon Treaty

In March 1985, the United States and Canada agreed to co-operate in the management, research and enhancement of Pacific salmon stocks of mutual concern by ratifying the Pacific Salmon Treaty (PST).

The Pacific Salmon Commission (PSC), established under the PST, provides regulatory and policy advice as well as recommendations to Canada and the United States (US) with respect to interception salmon fisheries. The chapters in Annex IV outline the joint conservation and harvest sharing arrangements between Canada and the US for key stocks and fisheries subject to the Treaty. Five of these chapters, set to expire at the end of 2008, were recently renewed and ratified by the Parties: Chapter 1 (Transboundary Rivers); Chapter 2 (Northern Boundary); Chapter 3 (Chinook); Chapter 5 (Coho); and Chapter 6 (Chum). [See section on *PST Renewal - 2009* below]. Chapter 4, which covers Fraser River Sockeye and Pink salmon, is scheduled to expire at the end of 2010.

Under the terms of the Treaty, the responsibility for in-season management of all species rests with the Parties to the agreement. The only exception is the in-season management of Fraser River Sockeye and Pink salmon. The Fraser River Panel (FRP) is specifically delegated the responsibility for in-season management, with assistance from the PSC.

To properly account for the full impact of fishing on Chinook and Coho stocks, the PST specifies that all parties develop monitoring programs to identify sources of fishing related mortality on for these two species. Catch monitoring programs are being modified to include estimates of encounters of all legal and sub-legal Chinook and Coho, as well as other salmon species, in all fisheries.

Coded-wire tag (CWT) data are essential to the management of Chinook and Coho salmon stocks under the PST. In 1985, the United States and Canada entered into a Memorandum of Understanding on August 13, 1985. The MOU stipulates “the Parties agree to maintain a coded-wire tagging and recapture program designed to provide statistically reliable data for stock assessments and fishery evaluations”. Both countries recognize the importance of the CWT program to provide the data required to evaluate the effectiveness of bilateral conservation and fishing agreements. An expert panel review concluded the CWT system is the only technology currently capable of providing the data required for PST management regimes for Chinook and Coho salmon, thus confirming the approach being employed.

3.2.1. PST Renewal

On December 23, 2008, Canada and the US ratified new provisions for five chapters under Annex IV of the PST. These new chapters came into effect on January 1, 2009 and the new management regimes continue to be implemented by DFO and US agencies for the 2010 season (including this draft IFMP). Significant changes from the previous Chinook chapter are highlighted, below:

Chapter 3 (Chinook): The new Chinook regime includes significant changes from the previous agreement. Building on changes made in 1999, the Parties have agreed to maintain the current abundance-based management regime for Chinook. Included, is the

existing aggregate abundance based management (AABM) fisheries and individual stock based management (ISBM) fisheries. The most significant aspects of the new Chinook chapter include harvest reductions in Canadian and US fisheries to address conservation concerns in both countries: the previous catch ceilings for the Southeast Alaskan (SEAK) AABM fishery have been reduced by 15%, while the catch ceilings for the Canadian WCVI AABM fishery have been reduced by 30% from previous levels.

In addition, the chapter includes new, additional provisions to protect weak stocks. This includes the potential for further harvest reductions in the SEAK and Northern BC AABM fisheries, as well as the individual stock-based management (ISBM) fisheries in both countries (should certain stocks fail to meet escapement objectives outlined in the agreement).

The agreement also includes provisions for a bilateral funding framework to support implementation of the new Chinook chapter. The fund will be endowed by both Canada and the US, with the following key elements:

- (i) \$30M which Canada can access to help mitigate the impacts of harvest reductions in Canada;
- (ii) \$15M (\$7.5M from each country) over five years to support the coast-wide coded-wire tag (CWT) program;
- (iii) \$10M from the Northern and Southern Endowment Funds for a "Sentinel Stocks Program";
- (iv) up to \$3M which Canada can access to support pilot projects and the evaluation of mass-marking and mark-selective fisheries in Canada; and
- (v) \$1M from the US to improve the analytical models to implement the Chinook agreement.

3.3. Special Concerns for 2011

Many Pacific salmon stocks in southern British Columbia have experienced depressed production in recent brood years, especially those that entered the ocean in 2005 and 2007. Although Chinook returns associated with the poor 2005 and 2007 ocean entry years were depressed, the overall summer returns for the 4₁ stocks of the South Thompson and Shuswap were much stronger than for the stream type aggregates (4₂ and 5₂ spring, 5₂ summer).

Over the past seven years, Fraser River stream-type Chinook escapements have declined, in some cases steeply, especially the 5₂ spring and 5₂ summer aggregates. Combined, the escapements of those aggregates have declined from almost 92,000 in 2003 to a low of just under 23,000 in 2007. Escapement numbers improved marginally in 2010. However, they continued to be less than those of the parent generations for the 5₂ spring aggregate and approximately at parental levels for the 4₂ spring and 5₂ summer aggregates.

Fraser River 4₂ spring Chinook continue to be a *stock of concern* in 2011. The parental brood escapements in 2007 were very depressed. The aggregated total escapement (2,453 including Bonaparte) was the lowest on record since 1975. Escapements to individual populations were the lowest in over ten years for all streams except Spius Creek, where it

was the second lowest. Those spawners were the survivors from 2005 ocean entry. The combination of very low parental escapements combined with continuing unfavourable marine conditions may result in very low pre-fishery abundances in 2011.

Outlooks for all stream-type Chinook in 2011 suggest that returns are likely to continue to be poor. Abundances of Fraser Chinook stream-type Chinook returning in the spring and summer are fluctuating around 20 year lows. Of particular concern is the decline in parent brood abundances. Many of the stream-type Chinook population escapements are at a small fraction of the estimated habitat capacity (e.g. <10%) that would maximize the harvestable surplus (see Appendix B: 1993-2010 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser).

4. Management Objectives

The objective for Fraser spring 4₂ Chinook in 2010 is to conserve the populations by continuing to minimize incidental harvests in Canadian ocean fisheries. For directed fisheries in the Fraser River, the objective is to minimize directed harvests of Spring 4₂ Chinook until July 15th. Fisheries beginning July 15th will be managed, consistent with the management zone identified for spring 5₂ and summer 5₂ Fraser Chinook (see section 5.1), given timing overlaps between these populations for much of the adult migration period.

The objective for spring and summer (age 5₂) Fraser Chinook is to continue rebuilding the populations, consistent with the management zones outlined below.

4.1. Conservation

Conservation of Chinook is the primary objective and will take precedence in managing the resource.

Given the importance of Pacific salmon to the cultural and socio-economic fabric of Canada, conservation of these stocks is of the utmost importance. In order to achieve this, specific actions are taken, not only to ensure protection of fish stocks, but also freshwater and marine habitats. Protecting a broad range of stocks is the most prudent way of maintaining biodiversity and genetic integrity.

Management of a natural resource like salmon has a number of inherent risks. Uncertain forecasting, environmental and biological variability as well as changes in harvester behaviour all add risks that can threaten conservation. Accordingly, management actions will be precautionary and risks will be specifically evaluated. Conservation of salmon stocks is the best approach to reduce risk of long term negative impacts to these stocks, and the social and economic values that are derived from them.

The Department manages fisheries with the objective of ensuring that stocks are returning at sustainable levels. When escapements decline below sustainable levels, management

actions are taken which may include reducing the impacts of fisheries on specific stocks, strategic enhancement and habitat restoration.

4.2. First Nations Objectives

The objective is to manage fisheries to ensure that, after conservation needs are met, First Nations' food, social and ceremonial requirements and treaty obligations to First Nations have first priority in salmon allocation in accordance with the *Allocation Policy for Pacific Salmon*.

The ability to measure the success of providing first priority to First Nations (fishing opportunities for FSC purposes and any treaty obligations) relies on feedback from consultation sessions.

4.3. International Objectives

The objective is to manage Canadian treaty fisheries to ensure that obligations within the Pacific Salmon Treaty (PST) are achieved.

Details can be found at the Pacific Salmon Commission (PSC) website at:
<http://www.psc.org/Index.htm>.

Review of the performance of the PST provisions occurs annually at two bilateral meetings of the Southern and Fraser Panels of the PSC; the results are published post-season.

4.4. Domestic Allocation Objectives

The objective is to manage fisheries in a manner that is consistent with the *Allocation Policy for Pacific Salmon* and the 2011 Pacific Salmon Allocation Implementation Plan.

An Allocation Policy for Pacific Salmon can be found on-line at:
<http://www.dfo-mpo.gc.ca/Library/240366.htm>

The Salmon Allocation Policy contains a Salmon Allocation Framework, which sets out seven overarching principles for the allocation of salmon:

(1) Conservation – Conservation of Pacific salmon stocks is the primary objective and will take precedence in managing the resource – conservation will not be compromised to achieve salmon allocation targets.

(2) First Nations – After conservation needs are met, First Nations' food, social and ceremonial requirements and treaty obligations to First Nations have first priority in salmon allocation.

(3) Common Property Resource – Salmon is a common property resource that is managed by the federal government on behalf of all Canadians, both present

and future. Common property does not imply open access, nor does it imply equal access.

(4) Recreational Allocation – After conservation needs are met, and priority access for First Nations as set out in Principle 2 is addressed, recreational anglers will be provided:

- a. Priority to directed fisheries on chinook and coho salmon; and
- b. Predictable and stable fishing opportunities for sockeye, pink and chum salmon.

(5) Commercial Allocation – After conservation needs are met, and priority access for First Nations as set out in Principle 2 is addressed:

- a. The commercial sector will be allocated at least 95 per cent of combined commercial and recreational harvest of sockeye, pink and chum salmon; and
- b. The commercial harvest of Chinook and coho will occur when abundance permits.

(6) Selective Fishing – To encourage selective fishing:

- a. A portion of the total available commercial catch will be set aside for existing commercial licence holders to test alternative, more selective harvesting gear and technology; and,
- b. Over time, commercial allocations will favour those that can demonstrate their ability to fish selectively.

(7) Gear Allocations – Target allocations for the commercial sector will be:

- a. Established on a coast-wide basis by gear, with the catch of all species expressed on a sockeye equivalent basis; and,
- b. Subject to adjustments over time to account for conservation needs, including selective fishing, and possible changes resulting from the

5. Stock Assessment

5.1. Management Units

Historically, Chinook salmon in the Fraser River have been divided into management units based on geography and run timing. Following a science-based review of Chinook stock structure in 2002, they have been grouped based on life history (i.e. ocean-type vs. stream-type) and run timing in the lower Fraser River. These groupings are the ones used to report escapements to the Chinook Technical Committee of the Pacific Salmon Commission. Recently, conservation units (CU's) have been developed for use under the Wild Salmon Policy (WSP). Management of Fraser River Chinook will continue to be undertaken at the level of the PSC MU's; management actions developed to conserve MU's are intended to conserve CU's.

Run timing is indicated by the words, spring, summer and fall, and refers to the time where the peak of entry occur for the individual stocks, as they migrate into the lower Fraser River.⁶ While the peaks of migration occur within certain ranges annually, migrations of any stock may occur over a broad time span. Spring-run populations peak into the Fraser before July 15th. Peak migrations for summer-run populations entering the Fraser fall between July 15th and August 31st. The peak passage for fall-run populations occurs from September 1st onward.⁷ Run timing past the Albion test fishery has been investigated using information from coded-wire tags along with DNA-based methods.

The PSC management units and the associated WSP CUs and some representative spawning streams are outlined in Table 1. Long term escapement trends for each management unit are illustrated in Appendices B and C.

There are a few stocks that may cross alignments between MU and CU allocations. A number of stocks that are assigned to one CU are not included in the corresponding PSC MU because those MUs are indicator groups and not all like stocks are surveyed annually. Within the 4₂ spring Chinook, Bonaparte has not been included in the PSC MU because the population increased in abundance after the construction of the fishway in the early 1990's. Similarly, while the lower Fraser summer Chinook are not surveyed annually for the summer 5₂ MU, biologically, they belong to that grouping.

Assignments to individual CU's may still be subject to minor alterations. Eagle River and Salmon River in the South Thompson are both likely spring stocks.

Table 1. Relationship between current Pacific Salmon Treaty escapement reporting units, Wild Salmon Policy (WSP) conservation units (CUs) and spawning locations

PST Unit	C U #	CU Name	Spawning Locations
Spring 4 ₂ Chinook	16	STh Bessette Creek	Bessette Creek;
	17	LTHOM spring	Bonaparte River; <i>Coldwater River</i> ; Deadman River; <i>Louis Creek</i> ; Nicola River; <i>Spius Creek</i> ;
Spring 5 ₂ Chinook	4	LFR springs	<i>Birkenhead River</i>
	5	LFR Upper Pitt	Pitt River-upper
	8	FR Canyon-	Nahatlatch River

⁶ Fraser, F.J., P.J. Starr, and A.Y. Fedorenko. 1982. A review of the Chinook and Coho salmon of the Fraser River. Can. Tech. Rep. Fish. Aquat. Sci. 1126: 130p

⁷ Department of Fisheries and Oceans (DFO). 1995. Fraser River Chinook. Prepared for DFO by Fraser River Action Plan. Vancouver, BC

		Nahatlatch	
	10	MFR springs	Cariboo River-upper; <i>Chilako River; Chilcotin River upper</i> ; Chilcotin River-lower; <i>Cottonwood River</i> ; Horsefly River; Narcosli Creek; Naver Creek; West Road River
	12	UFR springs	Bowron River; Dome Creek; East Twin Creek; Fraser River-above Tete Jaune; Forgetmenot Creek; Goat River; Holliday Creek; Holmes River; Horsey Creek; Humbug Creek; Kenneth Creek; McGregor River; McKale River; Morkill River; Nevin Creek; Ptarmigan Creek; Slim Creek; Small Creek; Snowshoe Creek; Swift Creek; Torpy River; Walker Creek; Wansa Creek; West Twin Creek; Willow River
	18	NTHOM spring	Blue River; Finn Creek; Raft River
Summer 5 ₂ Chinook	6	LFR summers	Big Silver Creek; Chilliwack/Vedder River; Cogburn Creek; Douglas Creek; Green River; Lillooet River; Lillooet River-lower; Lillooet River-upper; Sloquet Creek; Weaver Creek
	9	MFR Portage	Portage Creek
	11	MFR summers	Bridge River; Cariboo River lower; Chilko River; Endako River; Kazchek Creek; Kuzkwa River; Nechako River; Quesnel River; Seton River; Stellako River; Stuart River;
	14	STh summer age	Eagle River; Salmon River;
	19	NTHOM summer age	Barriere River; Clearwater River; Mahood River; North Thompson River
Summer 4 ₁ Chinook	7	Maria Slough	Maria Slough
	13	STh summer age	Adams River; Little River; South Thompson River; Lower Thompson River;
	15	Shuswap River summer age	Shuswap River-lower; Shuswap River-middle
Fraser Late	3	LFR fall white	Harrison River

Notes:

- 1) 7 Early Timed Chinook stocks shown in italics.
- 2) Chilcotin River upper not part of PST spring 5₂ aggregate due to short time series.

- 3) Salmon River (Salmon Arm), Eagle, Bridge River and Endako River currently included with PST spring 5₂ aggregate. STh summer age CU could be changed to STh spring age CU. Bridge and Endako suggest for MFR Spring CU.
- 4) Raft River may belong with North Thompson Summers based on timing. Currently included with PST summer 5₂ aggregate.

5.2. Geographical Distribution of Fraser Chinook

5.2.1. Lower Fraser River Stocks

The lower Fraser River supports a number of relatively small, unique populations of spring and summer-run Chinook. These are either red or white-fleshed stocks that typically exhibit a stream-type life history. Birkenhead, upper Pitt, Big Silver, and Sloquet are examples of lower Fraser River spring and summer-run populations that exhibit this life history. Chinook returning to Maria Slough are distinct in the lower Fraser River as they are a summer-run population that exhibit an ocean-type life history pattern.

Lower Fraser River Chinook stocks are numerically dominated by the fall returning, white-flesh Harrison River stock group, also known as the Fraser fall-run (or Fraser lates). The Fraser fall-run stock group includes the original natural population of fall returning Chinook to the Harrison River, and transplanted Harrison origin populations returning to the Chilliwack, Stave, and various other smaller rivers. Fall-run returns to these systems continue to be supported, to varying degrees, by enhancement. As discussed earlier, the Fraser fall-run stock group exhibits an ocean-type life history. It is however, unusual, as upon emergence from the gravel, the fry immediately migrate to the estuary where they rear for three to six weeks before moving offshore (instead of staying 60 to 150 days in freshwater as is typical of most stocks with an ocean-type life history.)

5.2.2. Other Populations/Watersheds of Note in the lower Fraser River

The Chilliwack River watershed supports three distinct stock groups:

- a spring-run population that spawns between Slesse Creek and the Chilliwack Lake outlet; this population is indigenous to the Chilliwack River and is very small in abundance;
- a summer-run population that predominately spawns in the upper reaches of the lower Chilliwack River above Slesse Creek; this population's origin is from transplants of mid/upper Fraser River summer-run populations and is supported by enhancement; and,
- a transplanted Harrison-origin fall-run population that predominately spawns downstream of the Slesse Creek confluence; this population is significantly supported by enhancement efforts.

Birkenhead River Chinook are a very unique early timed spring-run population that are believed to begin returning to the Fraser River as early as February, with peak migration into the lower Fraser River believed to occur in early April. Data is extremely limited.

DNA analysis of Albion Test Fishery catch data indicates Birkenhead Chinook continue to be present in the lower Fraser River until mid-May.

Birkenhead River Chinook are subject to First Nations fisheries in the Fraser mainstream and to First Nation fisheries and a non-retention recreational fishery in the Birkenhead and Lillooet Rivers. In recent years, recreational fishing for salmon was prohibited in the portion of the Birkenhead River from the Birkenhead Bridge on Portage Road to the canyon; approximately 10 km upstream of the bridge from August 1st to September 15th each year. This closure protected the Chinook prior to and during their critical spawning time. Beginning on April 1, 2011, fishing for salmon will be prohibited year round in this area. In addition, Birkenhead Chinook migrate into the far north during their ocean residency and are exploited in Alaskan and northern troll fisheries and northern marine recreational fisheries. A comprehensive report on the status of the Birkenhead River Chinook has been published⁸.

5.2.3. Interior Fraser River Stocks

Chinook salmon in the interior Fraser River (above Hope) comprise a large and complex group of spawning populations. Again, these populations are either red or white fleshed and frequently both flesh colours occur in a population. Interior Fraser Chinook have historically been divided into three major geographical regions:

- the upper Fraser (those returning upstream of Prince George and including Nechako),
- middle Fraser (downstream of Prince George but excluding the Thompson), and
- Thompson (which are divided into lower Thompson/Nicola, North Thompson, and South Thompson/Shuswap).

Within these regions, two migration times are recognized: early or spring-run, and summer-run. Parken et al. (2008) identified further temporal segregation and suggested dividing the spring run into spring and early summer components, depending on peak passage times past Albion. Currently, Interior Fraser stocks are assessed in the four spring and summer aggregates listed previously. No true fall-run Chinook populations have been identified to date in the Interior Fraser.

As illustrated in Table 1, most Interior Chinook stocks are stream-type life history, with the notable exceptions of the South Thompson and Lower Thompson summer Chinooks which exhibit an ocean-type life history. They migrate as smolts typically after 90-150 days of freshwater residence.

5.3. Stock Assessment Methods

Assessments of the lower Fraser River Chinook spawning stocks rely on:

⁸ Schubert, N.D., J.R. Candy, R. Cook, J. Greenbank, D. Lofthouse, R. McNicol, C.K. Parken, D. Sneddon, J.A. Tadey, K. Wilson. 2007. Status of Birkenhead River Chinook salmon (*Oncorhynchus tshawytscha*). Canadian Science Advisory Secretariate Research Document 2007/019.

- visual surveys,
- a calibrated dead-pitch project (Chilliwack River fall Chinook)
- a mark-recapture project (Harrison River), and
- coded-wire tagging of hatchery produced fish to provide harvest and survival information.

The Harrison River is the only lower Fraser River system where Chinook spawner abundance is estimated by mark-recapture methods. This project has been conducted annually since 1984. Since 1985, the Fraser-fall run component returning to the Chilliwack River population has been estimated with an extensive dead-pitch program. Additionally, visual surveys of a suite of smaller stocks including Birkenhead, Big Silver and upper Pitt Rivers, as well as Maria Slough, provide some information on escapements to those systems.

In the BC Interior, assessment of the four large PST stock aggregates is principally carried out using estimates of escapement from aerial surveys, mark-recapture studies (Nicola River and lower Shuswap River), and electronic counters (Deadman and Bonaparte Rivers). Trends in these spawning escapements, comparisons of spawning abundance to Wild Salmon Policy benchmarks, and the relative distribution of spawners amongst rivers are all used to assess stock status. Hatchery-origin Nicola River and Lower Shuswap River smolts are also coded wire tagged

Additional technical information on stock assessment as it relates to exploitation rates can be found in Appendix H.

5.4. Forecasts

Forecasts of the next year's pre-fishery ocean abundance and expected escapement of Fraser fall-run (Harrison and Chilliwack rivers) Chinook are developed for use in the Chinook Technical Committee's coastwide modeling work. This is the only stock group in the Fraser River, and only one of two Canadian Chinook stocks, for which a formal forecast is currently prepared. Additional technical information on the Harrison River Chinook stock assessment and forecasting can be found in Appendix H. Quantitative forecasts for most Fraser River Chinook are not prepared by DFO.

The Chinook Technical Committee coastwide model calculates a forecast of ocean abundance for certain Chinook stocks as represented in the model. This number is used to manage the AABM fisheries described in Section 7. A forecast for 2011 will be available by late March. Forecasts remain unadjusted in-season, since there is insufficient information for updates (e.g. CWT recoveries in southern U.S. fisheries are not reported in-season).

Although quantitative forecasts are not done for stocks managed under the Individual Stock Based Management Regime, the Science Branch of DFO does create a qualitative assessment of expectations for the upcoming year called "The Salmon Outlook". It is available in a draft format by mid-November each year. The Salmon Outlook assigns a

categorical value of between one and four to the various salmon stocks. The category reflects interpretation of various available quantitative and qualitative information and forecasts as well as expert opinion of status.

Table 2. Definitions of Salmon Outlook categories and criteria

Status Category	Category Definition	Criteria
1	Stock of Concern	Stock is (or is forecast to be) less than 25% of target or is declining rapidly
2	Low	Stock is (or is forecast to be) well below target or below target and declining
3	Near Target	Stock is (or is forecast to be) within 25% of target and stable or increasing.
4	Abundant	Stock is (or is forecast to be) well above target.

Table 3: 2011 Outlook Status Summary for Fraser River Chinook

Outlook Group	WSP CU's	Outlook Status	Commentary
30. Early spring – mid-Fraser	10	1	Escapements in 2010 continue to be low. This is the fourth successive year where aggregate escapement has failed to replace parental spawning abundance. Populations of concern continue to include the Cottonwood, and Chilako rivers, although escapements improved over brood at Westroad and Upper Chilcotin... Expectations are for continued low escapements in 2011, related to persisting unfavorable marine conditions. There is no exploitation rate indicator stock for this group. (2010 Outlook status: 1)
31. Late summer – South Thompson	13, 15	4	Aggregate escapement in 2010 exceeded brood year escapement levels. Record escapements occurred at Adams (~10,000) and Lower Shuswap (~80,000). Abundance should continue to be favourably affected by marine conditions experienced by the 2011 return. Very poor jack returns at Lower Shuswap may signal concerns for 2012 and on. Indicator stock is Lower Shuswap (2010 Outlook status: 3/4)
32. Spring – upper & mid-Fraser, North Thompson	8, 10, 12, 18	1	Escapements in 2010 continue to be low. This is the fourth successive year where aggregate escapement has failed to replace parental spawning abundance. Expectations are for continued low escapements in 2011, related to persisting unfavorable marine conditions. There is no exploitation rate indicator stock for this group. (2010 Outlook status: 1)
33. Summer – upper & mid-Fraser, North Thompson	9, 11, 14	1	Escapements observed in 2010 continue to be low, although the Nechako and Cariboo exceeded brood abundance. Expectations are for continued low escapements in 2011 related to persisting unfavorable marine conditions. Of particular concern was Clearwater River (~1,100) There is no exploitation rate indicator stock for this group. (2010 Outlook status: 1)
34. Spring – lower Thompson	16, 17	1	Escapement trends in 2010 were mixed; some stocks improved over brood levels; others, including Spius and Coldwater failed to reach brood levels. Expectations for 2011 are for continued very low abundance levels, the result of low parental escapements in 2007 and continued poor marine survival rates. Exploitation rate indicator for this group is Nicola River. (2010 Outlook status: 1)
35. Fall – lower Fraser natural	3	3	Average returns expected in 2011. 2010 adult escapements at Harrison were better than expected (~105,000). Formal forecast will be available in late winter. (2010 Outlook status: 2)
36. Fall – lower Fraser hatchery	n/a	3	Although there are significant hatchery releases of Harrison fall-run Chinook stock into the Harrison & Stave Rivers, lower Fraser River fall-run hatchery Chinook consists mainly of Chilliwack Hatchery releases. 2010 adult spawning escapement estimate at Chilliwack was ~75,000. Average returns expected in 2011. Forecasts will be prepared for late-winter release. (2010 Outlook status: 2/3)
37. Early spring – lower Fraser	4,5	2	Preliminary Birkenhead River escapement indicates improved abundance in 2010, similar to brood year (2005) escapement of 1,425 adults. While the brood for the 2011 return was also strong, without an indicator program for this stock group, freshwater and marine survival trends remain uncertain. (2010 Outlook status: 1/2)
38. Summer – lower Fraser	6, 7	1/2	Expectations are for abundance levels in 2011 similar to those seen in 2010. Very little is known about the productivity of these small populations. Maria Slough escapement in 2010 was similar to that seen in recent years, however the escapement to Big Silver was very low. The small size of these populations increases their vulnerability. Without an indicator, their freshwater and marine survival trends remain uncertain. (2010 Outlook status: 1/2)

5.5. Escapement Objectives

With the exception of the Harrison River fall-run population (escapement goal range: 75,100 to 98,500), the escapement goals currently being used were set in 1986 following negotiation of the original Pacific Salmon Treaty in 1985. While there were a variety of methodologies that could have been used to determine escapement goals, it was agreed to establish the goals at twice the average escapement observed during the period 1979 to 1982. This strategy was to be used until 1998 at which time the goals were to be reviewed. Scientists are currently evaluating the most recent information. *Wild Salmon Policy* lower (conservation) and upper (target) benchmarks have not yet been completed for Fraser Chinook. Recent work by Carrie Holt et al of DFO Science Branch has focussed on development of methods to determine biologically based benchmarks. Benchmarks for Fraser Chinook are expected as part of an assessment of stock status in the near future.

More information on setting future escapement goals for Fraser River Chinook populations can be found in Appendix H.

5.6. Albion Test Fishery

DFO has conducted a Chinook test fishery on the lower Fraser River at Albion (near Fort Langley) from early April to late-October, since 1981. The test fishery is conducted with a drifted gill net at a specific site near the old Albion ferry crossing.

For every day the Chinook test fishery operates, two 30-minute sets are conducted. The sets are timed to occur just prior to and just after daylight high tide. The Chinook test fishery is scheduled to fish every day from April 1st through August 31st. During this period, the test boat uses two different nets which fish on alternating days: the *standard* Chinook net, which is constructed using eight-inch mesh; and a *multi-panel* net, which consists of panels of six, seven, eight, and nine inch mesh. The purpose of the multi-panel net is to ensure representative sampling of Chinook stocks passing through the lower Fraser River. There are a wide range of body sizes observed in Fraser River Chinook stocks. Use of the multi-panel net began in 1997 - prior to that, the test fishery operated with the eight-inch mesh net only.

From September 1st through October 20th, the Albion Chinook test fishery fishes every other day, alternating days with the Chum test fishery (which fishes a 6.75 inch mesh gill net). Throughout this period, the Chinook test fishery uses the eight-inch mesh net exclusively.

Since the 'Larocque decision' in 2006, which affected the Department's management of test fisheries, the Albion test fishery has been administered through a Joint Project Agreement (JPA). Similar administrative agreements will likely be in place in 2011.

The total catch for Chinook in 2010 (April 1st to October 20th) was 1,797 Chinook. This consisted of 1,247 from the standard 8-inch mesh net (which fished for 98 days) and 550 from the multi-panel net (which fished for 73 days). Additional catch information from

the Albion Test Fishery can be found in Appendix A or at: <http://www.pac.dfo-mpo.gc.ca/fraserriver/commercial.htm>.

6. Enhancement

Egg targets, eggs taken, and fry/smolt release details for all South Coast hatcheries can be found in the South Coast Integrated Fisheries Management Plan for Salmon available online at:

<http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/MPlans.htm>.

6.1. Lower Fraser Chinook Enhancement

6.1.1. Chilliwack River Hatchery

On the Chilliwack River, the spring Chinook population is thought to be a mixed population of indigenous and transplanted mid-Fraser stocks. From 1985 to 1988, mid/upper Fraser River Chinook were transplanted from Bowron (spring-run 5₂), Slim (spring-run 5₂), Finn (spring-run 5₂), Chilko (summer-run 5₂) and Quesnel (summer-run 5₂), stocks. Between 1981 and 1985, some upper Pitt (spring run 5₂) white-fleshed Chinook were transplanted into this system to reportedly bolster a weak summer-run. Harrison Chinook were transplanted to the Chilliwack River in the early 1980's with some occasional replenishment in the 1990's. This population is sustained predominately through continuing enhancement by the Chilliwack hatchery. Escapements of the spring and summer-run populations are significantly smaller than those of the fall-run population.

6.1.2. Chehalis Hatchery

The Chehalis River historically had a spring/summer-run red-fleshed Chinook population that was enhanced in the late eighties with summer-run red-fleshed populations from Slim Creek and Chilliwack River. This population arrives on the spawning grounds in late June to July with peak of spawn usually occurring from late August to early September.

6.2. Interior Fraser Chinook Enhancement

From the early 1980's through the early 1990's, the main DFO facilities enhancing interior Fraser River Chinook were the Eagle, Shuswap, Clearwater, and Spius hatcheries (all on the Thompson River); the Quesnel hatchery (mid-Fraser River); and the Stuart hatchery (upper Fraser River). Dome Creek Chinook were also enhanced through the Penny Enhancement Society facility at Penny. In the early 1990's, the Clearwater, Eagle, Quesnel and Stuart facilities were either closed or divested. The Penny facility was recently closed.

The two remaining hatcheries in the interior Fraser watershed provide a small amount of Chinook enhancement, mostly linked to stock assessment and the production of coded-wire tag mark groups required for the CWT indicator program. The indicator program

provides information on harvest rates and ‘smolt to adult’ survival rates. The information is required as part of Canada’s commitment under the Pacific Salmon Treaty. Indicator programs for Chinook salmon typically require hatchery production because capturing and tagging enough naturally-produced Chinook smolts is very difficult. These hatchery smolts must be the same size and have the same release timing as natural smolts in the system.

Overall, enhancement is thought to have a relatively small effect on the total number of Chinook returning to the interior Fraser, although the effects on certain watersheds may be significant (e.g., Nicola watershed enhanced by Spius hatchery and Middle Shuswap stock from the Shuswap hatchery).

6.2.1. Spius Creek Hatchery

The Spius Creek hatchery produces yearling Chinook from Spius Creek, Coldwater River and Nicola River, and produces spring fry from Salmon River (near Salmon Arm). Nicola River is an indicator stock for spring-run age 4₂ Chinook of the Lower Thompson and Louis Creek. The number of coded wire tagged Nicola smolts released is currently 200K. Early-timed Spius Creek and Coldwater River Chinook are also produced at the Spius Creek hatchery, although the number of smolts released for these stocks is lower than Nicola (~65K per system), and none of the releases are coded wire tagged.

6.2.2. Shuswap Falls Hatchery

The Shuswap Falls hatchery produces under-yearling Chinook from the Middle and Lower Shuswap rivers. The hatchery is located on the Middle Shuswap near Lumby. Both the Lower and Middle Shuswap are indicator stocks for summer-run age 4₁ Chinook of the South Thompson, and all smolt releases are coded wire tagged. Currently, 500K Lower Shuswap and 150K Middle Shuswap smolts are produced annually.

7. Fisheries Management

7.1. Fisheries Impacting Fraser River Chinook

Fraser River Chinook salmon stocks exhibit one of three ocean distribution types that directly affect vulnerability to marine fisheries. Most stream-type Fraser Chinook exhibit an “offshore” rearing behaviour, spending much of their ocean residence off the continental shelf in the North Pacific. This is similar to many Fraser Sockeye. No high-seas fisheries target these fish; therefore they do not become vulnerable to marine fishing until their return migration to the Fraser River to spawn. At that time, they must return onto the continental shelf and back into the Gulf of Georgia to enter the Fraser River. Earlier-timed stocks tend to more frequently return through the Strait of Juan de Fuca, while later-returning stream-type stocks frequently “landfall” further north. These later-returning stocks are thus more vulnerable to northerly fisheries, as well as to fisheries located nearer the Fraser River. Of the ocean-type Fraser Chinook stocks, the summer age 4₁ populations are distributed on the continental shelf, typically from Vancouver Island north to Alaska. These stocks reside on the shelf, and therefore remain vulnerable to

coastal fisheries year-round. Similarly, the later returning Fraser Fall Chinook (Harrison Chinook) are also shelf-resident throughout their marine residence, however, their distribution tends to be more southerly. These stocks contribute to fisheries off the west coast of Vancouver Island and Washington State and the inside waters of the Gulf of Georgia, but much less frequently to northern fisheries.

In general, the major determinant of stock-specific vulnerability to fishing, whether in marine or freshwater fisheries, is whether a fishery is open during the time a stock is present in a particular area. Body size is another biological characteristic that affects whether a fish will be harvested in a particular fishery; as determined by regulations on gear that may select for a particular size of fish (e.g. retention limits based on fish length, mesh size of gill nets, etc.).

7.1.1. First Nations Fisheries

First Nations both in and outside the Fraser River are provided with opportunities to harvest Fraser River Chinook. However, most First Nations fisheries in marine areas harvest Fraser Chinook only as by-catch, in fisheries directed on other salmon species. In-river, the number of fishing days provided for directed Chinook fisheries is dependent upon the conservation needs of Chinook stocks and other species such as Sockeye, wild Steelhead, and Interior Fraser Coho salmon.

Historically, limited First Nations Chinook-directed fisheries have been initiated in the Fraser River in the spring, once stocks are present in sufficient abundance to provide for harvest opportunities. Fishing time typically increases in late spring or early summer, when more abundant Chinook stocks are present. By mid-to-late summer, Sockeye salmon enter the Fraser River, and management actions are driven by considerations for those stocks. During this period, Chinook are generally harvested only as by-catch. In some situations however, fisheries may implement the use of selective gear which target available Chinook, thereby limiting Sockeye impacts. Later in the summer and through the fall, conservation concerns for Coho salmon and wild Steelhead have resulted in fisheries being curtailed from early September to mid-October in recent years.

This generalized fishing pattern is adjusted annually to account for conservation objectives at specific times of the year. The Department engages in on-going consultations with First Nations concerning potential alterations to fishing patterns, as necessary, to ensure conservation objectives are met.

7.1.2. Recreational Fisheries

By regulation, the marine waters off the Pacific coast of British Columbia are open for harvest of Chinook salmon year round, unless closed by variation order. Recreational harvest is also constrained using a variety of regulations including:

- daily and annual possession limits,
- gear restrictions,
- time and area closures,
- size limits, and/or

- a combination of measures to achieve a range of policy and operational objectives (e.g. conservation and allocation objectives).

The coast-wide daily limit for Chinook is two. The total Chinook annual limit is 30 from any tidal waters, of which at most:

- 10 may be caught in the tidal waters of the Fraser River;
- 15 may be caught in the waters of Areas 12 to 18, 28 and 29 and that portion of Area 19 north of Cadboro Point; and
- 20 may be caught in the waters of Area 20 and that portion of Area 19 south of Cadboro Point.

Recreational harvest is further constrained using:

- minimum size limits (minimum size limit is 45 cm coast wide, with the exception of a 62 cm size limit in Johnstone Strait, the Strait of Georgia and the Fraser River mouth),
- maximum size limits (in some areas),
- reduced daily quotas and
- closed areas.

Closed areas may be closed year-round or seasonally, depending on local stocks. In the past, the fishery has opened on differing dates.

Prior to it closing in 1980, the recreational fishery in the Fraser River and tributaries had higher limits than today. The Fraser River downstream from Sawmill Creek was open year-round with a daily limit of four Chinook and no annual limit. In 1980, Chinook fishing was closed to assist in rebuilding Chinook stocks. When the fishery re-opened, in the Fraser River from Sawmill Creek to CPR Bridge at Mission, it started on June 1st of each year. In 1998, the recreational Chinook fishery in this area was opened on May 1st based on an assessment that the additional fishing time and associated catch and effort would not compromise the long term sustainability of Fraser Chinook stocks. When the fishery reopened in the Fraser River above Sawmill Creek it was opened in limited areas, mainly in terminal areas targeting stronger stocks.

In all non-tidal waters of the Fraser there is an annual limit of 10 Chinook. Daily limits range from one to two adults per day. In the non-tidal portions of the Fraser River and tributaries, an adult Chinook is defined as a Chinook over 50 cm in length; except during the fall when the larger Harrison origin fish predominate. From September 1st to December 31st in the waters of the Fraser River downstream of the Agassiz-Rosedale Bridge, in the Harrison River and in the Chilliwack River, an adult Chinook is defined as being over 62 cm.

7.1.3. Commercial Fisheries

Fraser River Chinook migrating along northern (Johnstone Strait) and southern (Juan de Fuca Strait) approach routes to the Fraser River may be harvested in a number of fisheries. These fish are regulated as non-retention in Sockeye net fisheries (seine and gill net) in Johnstone Strait, Juan de Fuca Strait, Fraser River and some US fisheries. Seines

must use brailers and revival boxes to minimize mortality. In addition, there are directed fisheries for Chinook by WCVI, North Coast and Alaskan troll fisheries. Since 1980 only very limited directed commercial net fisheries have occurred within the Fraser River (i.e. 2004 Area E gill net exploratory fishery).

During the last eight years, a mandatory non-retention requirement in all South and North Coast seine fisheries has significantly reduced Chinook by-catch. Over the past few years the majority of the Fraser River commercial Chinook catch (primarily of summer run 4₁ stocks) has been taken in the Area F commercial troll fishery in northern BC waters. Fall-run Chinook stocks are also harvested in the Area G commercial troll fishery off the west coast of Vancouver Island.

The principal U.S. fisheries harvesting Fraser River Chinook are the net fisheries in Juan de Fuca Strait, the San Juan Islands area, and off Point Roberts. The Fraser Chinook catch taken in Southeast Alaska is unknown but thought to be smaller.

BCI Demonstration Fisheries

To date, Commercial Demonstration fisheries occurring in the BC Interior have been directed on South Thompson Summer 4₁ stocks. Chinook are harvested from near terminal areas of the Thompson River and Kamloops Lake. This fishery is the only demonstration fishery targeting Chinook stocks in the BC Interior. Area F Licenses were utilised from the Pacific Integrated Commercial Fisheries Initiative (PICFI) and Allocation Transfer Program (ATP) to provide for a Chinook allocation of these stocks, primarily from the North Coast Aggregate Abundance Based Management (AABM) fishery by Area F troll fleet.

7.2. 2010 Fishing Plan and Objectives

7.2.1. Fraser Spring 4₂ Chinook

The objective for Fraser spring 4₂ Chinook in 2010 was to conserve the populations by continuing to minimize incidental harvests in Canadian ocean fisheries. For directed fisheries in the Fraser River, the objective was to minimize directed harvests of Spring 4₂ Chinook until July 15th. Fisheries that began July 15th were managed, consistent with the management zone identified for Spring 5₂ and Summer 5₂ Fraser Chinook (see Table 4.) given timing overlaps between these populations, for much of the adult migration period.

In the 2010 Salmon Outlook, spring 4₂ Chinook were classified as a *stock of concern* given poor survival rates and very poor spawning escapements in recent years. Returns of spring 4₂ Chinook in 2010 came primarily from a parent generation of 10,637 spawners in 2006.

Fraser spring 4₂ Chinook were one of five management units for Fraser Chinook used in the Pacific Salmon Treaty process. This group contained two conservation units that spawned in the interior Fraser areas including three populations previously referred to as

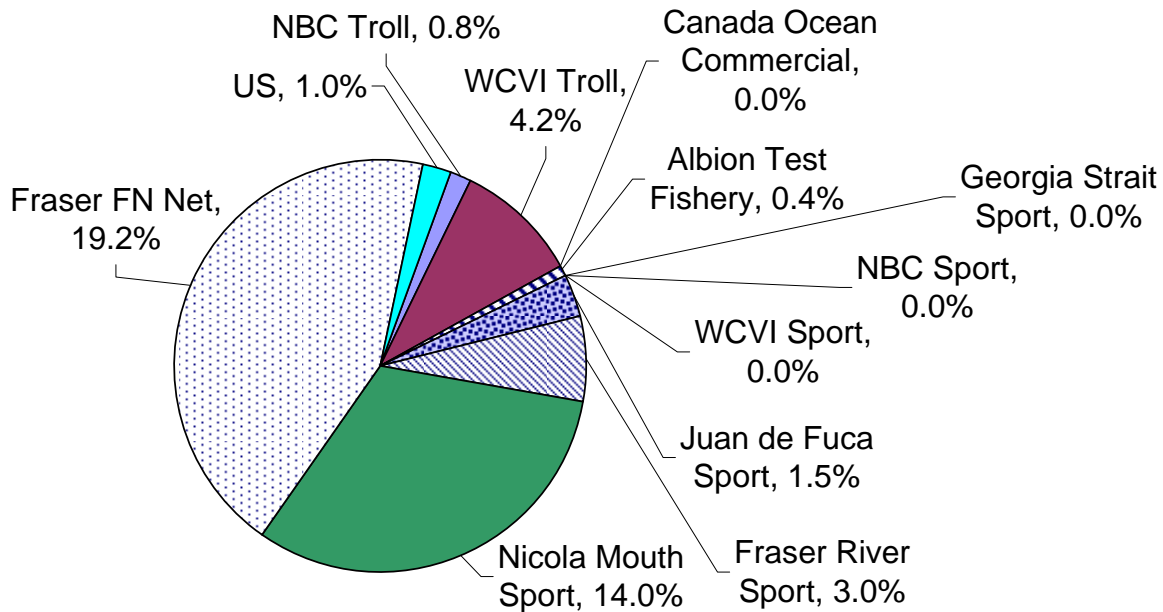
early-timed Chinook (see Table 1). Spring 4₂ Chinook returned to spawn from early March through late July and migration peaked in June for the lower Fraser River. These populations primarily mature as adults at age-4 (90%) with lower numbers maturing at age-5 (7%) and occasionally at age-3 (3%).

Coded wire tagged (CWT) Nicola River Chinook released from the Spius Creek hatchery were the PST exploitation rate indicator stock used to assess survival and exploitation rates of spring 4₂ in Canadian and US fisheries. Based on CWT recoveries from fisheries, Fraser spring 4₂ Chinook have historically been encountered in:

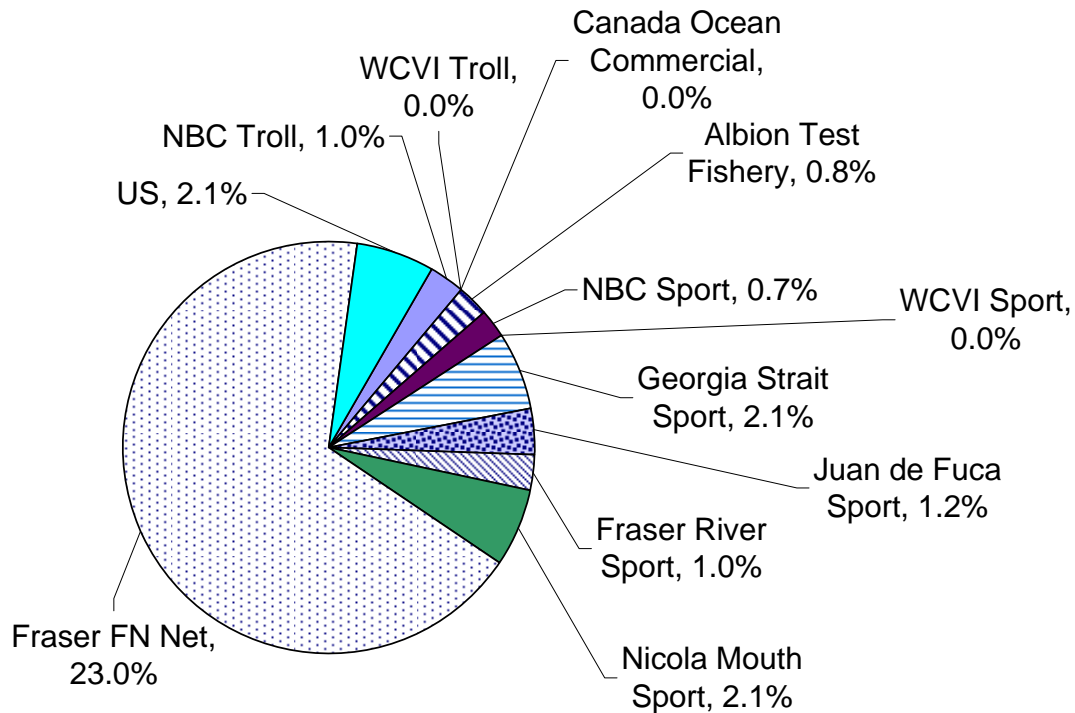
- Fraser River First Nation net fisheries,
- Fraser River and tributary recreational fisheries,
- marine troll fisheries (e.g. WCVI and North Coast), and
- recreational fisheries in the Strait of Juan de Fuca and Strait of Georgia, and
- with lower rates in other marine recreational fisheries.

The total Canadian exploitation rates in 2006-07 averaged 43% with marine fisheries accounting for 6.5% of the total. Exploitation rates were reduced in 2008 with a total of 32.0% in Canada; marine fisheries accounted for 5.0% of the total. Exploitation rates in US fisheries are low and occur mainly in southern areas and average less than 2%.

Nicola Exploitation Rate Distribution- 2006-07 Average (43.9%)

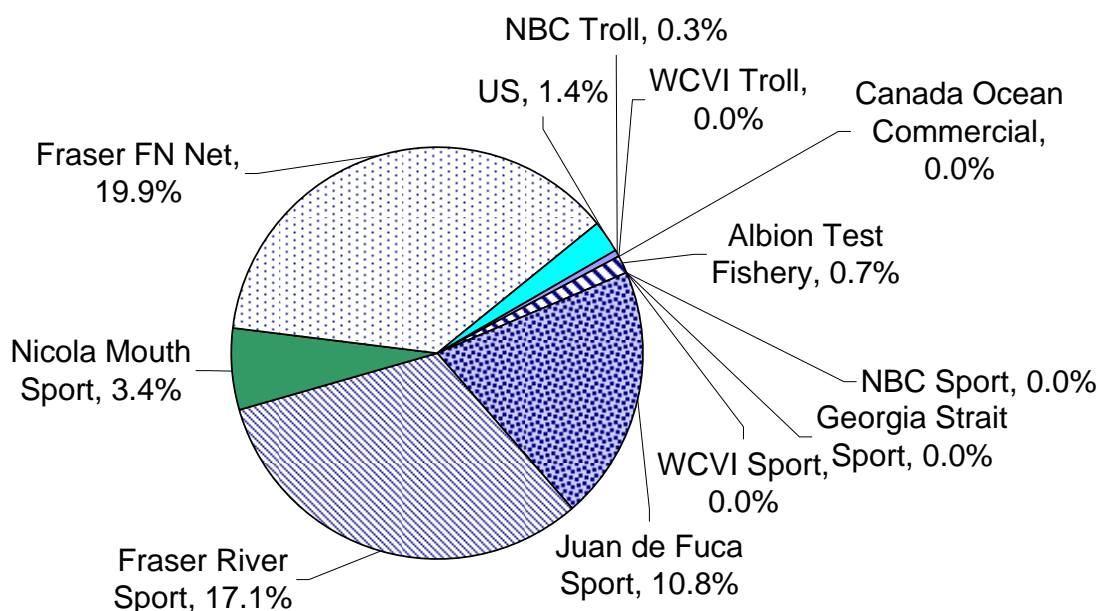


Nicola Exploitation Rate Distribution- 2008 (34.0%)



Exploitation rate estimates increased in 2009 with a total of 52% in Canada; marine fisheries accounted for 11.1% of the total. Preliminary exploitation rate estimates for 2010 Canadian and US fisheries will be available in April of 2011. It is expected that 2010 exploitation rates will likely decline due to the extension of management actions to protect the entire 4₂ management unit (early timed 4₂ Chinook only in 2008 and 2009). Additional management actions to protect spring and summer 5₂ Chinook in 2010 may reduce exploitation rates further due to timing overlaps with 4₂ Chinook.

Nicola Exploitation Rate Distribution- 2009 (53.7%)



There is a high potential for very low abundances of spring 4₂ Chinook in 2011 and subsequent years if poor survival rates persist, given very low spawner abundances in the parental generations. Returns in 2011 will mainly come from 1,489 spawners in 2007.

Over the next year, the Department will be consulting on a longer term, comprehensive management framework for southern BC Chinook populations that considers the effects of fishery related impacts, enhancement activities, and habitat and ecosystem status on these populations. Revisions to management actions may be considered based on development of the southern BC Chinook management framework. Additional work is also required to develop a biologically-based escapement target for the spring 4₂ management unit. Fishing plans similar to those implemented in 2010 will be required again in 2011. Additional consultations will occur in 2011 if changes are contemplated on fishery plans for First Nations, recreational and commercial harvesters.

7.2.2. Spring 5₂ and Summer 5₂ Fraser Chinook

The objective for spring and summer (age 5₂) Fraser Chinook is to continue rebuilding these populations, consistent with the management zones outlined below.

In the 2010 Salmon Outlook, spring 5₂ and summer 5₂ Chinook stocks were classified as *stocks of concern* given poor survival rates and declines in spawning escapements compared to the parental generation in recent years.

The Fraser spring 5₂ and summer 5₂ Chinook comprise two of five PST management units for Fraser Chinook. This group contains 11 conservation units and includes four populations previously referred to as early-timed Chinook. Spring 5₂ Chinook return to the Fraser River to spawn from early March through late July and migration peaks in late June in the lower Fraser. Summer 5₂ Chinook has later timing and return to the Fraser River to spawn from late June to August with a peak in late July. These populations primarily mature as adults at age-5 (approx. 70%) and age-4 (approx. 20%) with lower numbers at age-3 and age-6.

The Department has proposed to use the relationship between the cumulative Catch Per Unit Effort (CPUE) of Chinook (caught in the Albion Chinook test fishery for the period beginning May 1 to the estimated terminal return of Fraser Chinook) as the basis for a 3 zone management approach described below.

The management actions for Spring 5₂ and Summer 5₂ Chinook (below) were in place after July 15 to the end of July in 2010. These management zones also guided fishery management actions for Spring 4₂ chinook in the Fraser River; given that the adult migration timing overlaps for much of the migration period and management actions affect all three of these management units.

Table 4: Spring 52 and Summer 52 Fraser Chinook Management Zone Approach 2010

Management Zones:

Zone	Predicted Return to the Fraser River	Rationale and Actions
3	Greater than 60,000	Rationale: Populations rebuilding towards maximum sustained yield (MSY) levels. First Nations directed fisheries. Directed recreational and commercial fisheries consistent with Allocation policy.
2	Below or equal to 60,000	Rationale: Caution required to avoid population declines. Populations well below MSY levels. Limited directed fisheries. First Nations directed fisheries subject to abundance. By-catch retention/ limited directed Fraser recreational fisheries may be initiated. Management actions to reduce by-catch or incidental harvest in commercial fisheries.
1	Below or equal to 30,000	Rationale: Significant conservation concerns. Very high risk of extremely low spawning populations. Directed fisheries minimized. By-catch retention /limited directed First Nations fisheries. Non-retention/closed recreational and commercial Chinook fisheries in the Fraser River and tributaries Management actions to reduce by-catch or incidental harvest in other recreational and commercial fisheries.

While PST escapement targets and exploitation rate targets have not been formally identified, a number of considerations were used to establish management zones:

- Zone 3: Preliminary analysis of the number of spawners required to utilize the productive capacity of the habitat to produce maximum sustained harvests (S_{MSY}) for these populations is approximately 138,000 spawners (including ~80,000 Spring 5₂ and

~57,000 Summer 5₂). In 15 of the past 35 years spawner abundances greater than 60,000 were observed; the highest spawner abundance recorded for these populations was 92,000 in 2003.

- Zone 2: The number of spawners at 40% of S_{MSY} , a metric suggested as a lower abundance benchmark, is 55,000 spawners. The original PST base period doubling goal is approximately 60,000 spawners. Since a harvest rate of up to 10% may occur in limited directed fisheries, a terminal run of 60,000 was used as a reference point. In 15 of the past 35 years, spawner abundances have been between 30,000 and 60,000.

- Zone 1: The average escapement of spring and summer (age 5₂) Fraser Chinook during the 1979-1982 base period was about 30,000 spawners; a level at which substantial management actions were taken to rebuild populations. This number of spawners is half of the value of 40% S_{MSY} increasing the likelihood of extremely low spawner abundance in CUs; only 5 of the past 35 years had spawner abundances less than 30,000.

- Additional analysis, consultations and discussions on the management zones, escapement targets, and fishery management approaches are planned to further refine the management approach for future seasons. Work is also ongoing to develop WSP benchmarks for Fraser Chinook conservation units. While there is no single formula for selecting lower benchmarks, 40% S_{MSY} has been suggested as one metric. For Fraser spring 5₂ and summer 5₂ Chinook, the stream by stream sum of the estimates of S_{MSY} is about 138,000, and the estimate of 40% of S_{MSY} is about 55,000. Further analysis may indicate that a greater total return is required to maintain most conservation units above their lower benchmarks and provide adequate geographic distribution of spawners among conservation units.

The prediction of the return to the Fraser River based on the Albion test fishery catches will be made on June 15, 2010. If the predicted return is within 17% of the current management zone, the Department may decide to continue to manage, based on the current management zone. A 17% buffer reflects the uncertainty in the regression equation that relates the cumulative Albion catches to date of the estimated terminal run of spring 5₂ and summer 5₂ Chinook to the Fraser River; thus minimizing the chance of moving to a lower or higher zone inappropriately.

Currently, there is no PST indicator stock for these management units, however, information from past CWT recoveries from these populations indicate that spring 5₂ Chinook have been encountered in areas similar to spring 4₂ Chinook. Summer 5₂ Chinook are also encountered in the same areas, but relative impacts between fisheries may differ given the later migration timing of these summer 5₂ stocks.

7.2.3. First Nations Fisheries

Consultations with Fraser River First Nations in 2010 resulted in a fishing regime that was designed to substantially reduce the impacts on the spring 4₂ Chinook in the Fraser River until July 15th. In the Lower Fraser Area, the initiation of First Nations communal fisheries was delayed by nearly two months compared with 2008 and 2009 fishing

seasons. Above the Port Mann Bridge, communal fisheries began June 11th, with a twenty four hour opening and the second communal opportunity was on June 25th for another twenty four hours.

To reduce impacts on spring 4₂ Chinook in 2010, First Nations in the Sawmill Creek to Kelly Creek area and the Shuswap Nation Tribal Council requested a closure. These First Nations groups encouraged their people to conserve spring 4₂ Chinook by not fishing during the migration time.

7.2.4. Recreational Fisheries

In 2010, conservation concerns for Fraser Spring 4₂ resulted in substantial additional management measures in the recreational fishery in Juan de Fuca Strait, Strait of Georgia and the Fraser River and tributaries. Recreational fisheries targeting spring and summer populations were managed using the management actions described in Table 4 entitled 2010 Management Zones and Actions for Spring/Summer 5₂ Chinook.

Specific management actions implemented in 2010 are described below:

Spring run 4₂ Fraser River Chinook

Subareas 19-1 to 19-4 and Subarea 20-5 (Those waters near Victoria west of Cadboro Point to Sheringham Point):

- March 1 to June 18: 2 Chinook per day between 45-67 cm (hatchery or wild) or >67cm (hatchery only). Portion of Subarea 20-4 (Jordan River) added on June 3;

Subareas 19-1 to 19-4, portion of Subarea 20-4 and 20-5.

- June 19 to July 15: 2 Chinook per day of which only 1 may be greater than 67cm. Minimum size of 45cm.

Subareas 18-1 to 18-6, 18-9, 18-11, 19-5, and portions of Subareas 29-4 and 29-5 (Corridor between Juan de Fuca and Fraser River):

- June 3 to July 15: 2 Chinook per day of which only 1 may be greater than 67cm. Minimum size limit of 62cm

Subareas 29-6, 29-7, 29-9, 29-10:

- April 1 to July 15 – no retention of Chinook.

Subareas 29-11 to 29-17 - (tidal waters of the Fraser River and Fraser River non-tidal waters from the CPR Bridge at Mission BC upstream to the Highway No. 1 Bridge at Hope BC):

- January 1 to July 15 - no fishing for salmon.

Hope Bridge to Alexandra Bridge:

- January 1 to July 15 - no fishing for salmon.

Alexandra Bridge upstream:

- January 1 to July 15-no fishing for salmon.

Spring and Summer 5₂ Fraser River Chinook

As a result, of the Zoned management approach outlined in the 2010 pre-season plan, Fraser River recreational fishery restrictions were put in place following the release of the spring and summer Chinook run-size index numbers.

Subareas 29-6, 29-7, 29-9, 29-10:

- July 16 to July 29 - two/day between 62cm and 77cm.

Subareas 29-11 to 29-17 - (tidal waters of the Fraser River and Fraser River non-tidal waters from the CPR Bridge at Mission BC upstream to the Highway No. 1 Bridge at Hope BC):

- July 16 to July 29 - one/day between 30cm and 77cm.

Hope Bridge to Alexandra Bridge:

- July 16 to July 29 - one/day between 30cm and 77cm

Specific management actions implemented in 2010 are described below:

In the non-tidal portions of the Fraser River and Tributaries upstream of Alexandra Bridge:

- August 5 to August 15 - no fishing for salmon (South Thompson River).
- August 1 to August 22 - one/day (Clearwater River)
- June 27 to July 1 - one/day (Bridge River and Fraser River at Bridge River)
- July 27 to Aug 18 - one/day with a fork length less than 77 cm (Cariboo River)
- July 25 to Aug 16 - one/day with a fork length less than 77 cm (Chilko River)
- July 15 to Sep 01 - one/day with a fork length less than 77 cm (Quesnel River)
- July 10 to July 25 - one/day with a fork length less than 77 cm (Fraser River)
- July 15 to Aug 15 - one/day with a fork length less than 77 cm (Bowron River)

Details on recreational Chinook opportunities may be found online at:

http://www.pac.dfo-mpo.gc.ca/recfish/default_e.htm

7.2.5. Commercial Fisheries

Area G Troll – West Coast of Vancouver Island

Under the Pacific Salmon Treaty, West Coast of Vancouver Island (WCVI) Chinook fisheries are managed through an Aggregate Abundance Based Management (AABM) model. This fishery targets a mixture of US and Canadian origin Chinook stocks. Abundance forecasts are used to establish the TAC in this area. Preliminary estimates were used two years in advance to plan the fishery for the start of the Chinook year beginning in October 2009. Forecasts are finalized in April of the following year.

Effective January 1, 2009, the WCVI AABM TAC included a 30% reduction from the allowable catch under the Annex IV provisions of the 2008 PST agreement. It is important to note that the aggregate abundance can, and usually does change in April when stock information from the previous fall can be entered in the model and the Abundance Index is recalibrated for the season. The 2010/11 TAC for the WCVI AABM, based on the two-year out AI of 0.79, is 118,300 (Chinook year October 1, 2010 to September 30, 2011).

For planning purposes, the domestic harvest levels provided for anticipated harvests of:

- WCVI AABM TAC – 118,300
- First Nations FSC – 5,000 pieces
- Recreational – 55,000 pieces
- Area G Commercial Troll TAC – 58,300 pieces

Area E Gillnet – Fraser River

Chinook-directed commercial gill net fisheries within the Fraser River have been closed since 1980 as part of a stock rebuilding approach. Retention of Chinook by-catch is permitted during the in-river Sockeye-directed fisheries that generally occur from late July to early September and Chum-directed fisheries in October and November.

During pre-season discussions with Area E Harvest Committee (AEHC) advisors, the Department received a request for a Chinook-directed opportunity in 2010. DFO staff developed a demonstration fishery plan to harvest 2,000 Chinook during August when more abundant summer 4₁ Chinook were expected in the Fraser River. This fishery did not proceed due to ongoing sockeye fisheries during August.

Area H Troll – Strait of Georgia

There have been no directed Area H troll fisheries for Chinook since 1994 due to conservation concerns. Retention of Chinook by-catch was permitted during most Sockeye, Pink and Chum fisheries until 2005, since then all Area H troll fisheries have had non-retention provisions for Chinook.

Area F Troll – North Coast

From 2005 through to 2009, the Salmon Licence Area F (Northern Troll) fishery has been managed as a demonstration fishery with the overall harvest managed through individual vessel quotas since the 2008 season. An option to continue to operate within the competitive “derby” style was maintained from 2005 through 2007, with participation ranging from 8 vessels in 2005 to two vessels in 2007. From 2008 to 2010, the option to participate in a competitive Chinook fishery was dropped and all vessels participated in the ITQ Chinook fishery. The fishery itself was operated in a non-competitive Individual

Transferable Quota (ITQ) style where licensed fishers were assigned a quota, which they were then able to either fish or lease to other Area F vessels.

A Chinook allocation to the fleet is calculated based on the Northern Aggregate Abundance Based Management model. This allocation is then split between the Queen Charlotte Island sport fishery and the Area F troll fishery. For 2010, the allowable catch of Chinook for the combined North Coast Troll and Queen Charlotte Islands recreational fishery was 143,000 pieces. The pre-season estimate of recreational catch was 50,000 pieces, leaving 93,000 fish as the pre-season troll allocation. Thus, the quota for each of the 284 Area F vessels was 327 Chinook.

BCI Demonstration Fisheries

Chinook allocations were calculated based on the Northern Aggregate Abundance Based Management (AABM) model in 2010. Allocation was derived using a percentage of unallocated (PICFI) licences (20 - Area F licences) and its share of Canadian Commercial Total Allowable Catch (CCTAC) for the area. Chinook fisheries targeted Summer 4(1) stocks with a percentage of 7.04% of available CCTAC, this amounts to 3,017 pieces available. The licences issued were limited to 3,000 Chinook for harvest in the BC Interior fisheries.

7.3. Catch Monitoring

As identified in the 2002 Pacific Region Monitoring and Reporting Framework, timely and accurate information on harvest and harvesting practices is essential to properly assess the status of fish stocks and to support resource management for the conservation and the long term sustainability of fish resources. To address all elements of the Wild Salmon Policy, an effective catch reporting system is required in all sectors to assess the status of Conservation Units. Furthermore, accurate, timely and verifiable catch reporting is a requirement for a 'share-based' management framework as envisioned in Pacific Fisheries.

7.3.1. First Nations Fisheries

All First Nation's fisheries are authorized by communal licence. The majority of areas have catch monitoring systems in place to estimate catches. In areas where there is not a specific catch monitoring program, the fisher is required by licence to report his/her catch to the band and the band to report to DFO.

Areas where specific catch reporting programs have been implemented include:

i) Marine Areas

With the exception of the WCVI, most south coast Chinook is caught as by-catch on fisheries directed at other species.

First Nation participants fish under the authority of a communal licence which requires that catches are reported at specified time periods to the appropriate resource manager.

In Johnstone Strait, A'Tlegay in cooperation with DFO has developed an electronic catch reporting system to track their FSC catch and distribution. A'Tlegay fishery guardians monitor their FSC fisheries on the grounds. Data is captured in the field electronically and is downloaded into their central information system where it is exported automatically to DFO. Several other northern Vancouver Island First Nations have adopted and are utilizing the A'Tlegay database for reporting catch to DFO.

ii) Fraser River mouth to Sawmill Creek

First Nations are licensed for two main fishery-types in this area: Food Social and Ceremonial (FSC) fisheries; and fisheries with a sales component (EO) including Economic Opportunity, Demonstration, and Harvest Agreement fisheries. Monitoring programs differ for FSC and EO fisheries and are detailed below.

Chinook directed EO fisheries do not currently occur in this area; however, Chinook are harvested as by-catch during EO fisheries directed on other species. These fisheries are monitored using a Mandatory Landing Program (MLP). For the duration of the fisheries First Nations monitors are stationed at landing sites and on packer boats through-out the fishing area. All fishers are required to have their catch enumerated by a monitor at one of these sites. A First Nations monitor is present during all fishing activity and catch is recorded on a set-by-set basis for EO fisheries where selective fishing gear is required,

Monitoring for FSC fisheries varies within the area; the monitoring plans for each of the subareas are:

a. Fraser River mouth to the Port Mann Bridge

Monitoring for FSC fisheries is undertaken by Aboriginal Fishery Officers and First Nations monitors by collecting hails or conducting counts of fishers catch. This information is compiled by each First Nation fishery and forwarded to DFO following the close of the fishery.

b. Port Mann Bridge to Mission

First Nations monitors collect drift, set net hails and conduct piece counts at Katzie Reserve Dock, Barnston Island, the Kwantlen Reserve Dock at Fort Langley, Whonnock and Matsqui. Some set net fishers hail in their data by phone to band fisheries offices. In addition, Charter Patrolmen count vessels and take on-the-water hails during the Katzie, Kwantlen and Matsqui fisheries.

c. Mission to Sawmill Creek

Monitoring for drift net catch in this area is similar to the Port Mann Bridge to Mission section. For the set net fishery in this area, a creel-style survey program is used. This survey program is implemented as follows:

- First Nations monitors are stationed at main access points on the river during openings to collect catch and effort information. Sites include: Leq'a:mel, Island 22/Kilby, Skway, Scowlitz, Seabird, Agassiz Bridge, Hunter Creek, Chawathil Reserve, Coquihalla, and Yale Beach;
- Helicopter over-flights are used to conduct instantaneous gear counts between Mission and Sawmill Creek. These over-flights require one flight technician and are conducted once during each Chinook-directed fishery and once a day during a Sockeye-directed fishery; and
- Data collection forms are gathered from each of the monitors at the various monitoring sites and provided to DFO. DFO then produces catch estimates for each opening by expanding the catch rates by effort counts, to generate weekly catch estimates.

iii) Sawmill Creek to Kelly Creek and the Thompson River downstream of the Bonaparte River, Kelly Creek upstream to Deadman Creek and Deadman Creek to Naver Creek

A sample survey program is integrated into First Nation directed Chinook fisheries. It is conducted by First Nations & DFO staff along the Fraser River between Sawmill Creek and Kelly Creek, and in the Thompson River downstream of the Bonaparte River confluence. Fishery Technicians interview all fishers encountered during random roving vehicle patrols to obtain catch and effort information (CPUE). Fishing effort is obtained by averaging the count of each type of active gear observed during a given week.

No catch monitoring program was undertaken in the mainstem Fraser River from Kelly Creek upstream to Deadman Creek during directed First Nation Chinook fisheries. Catch and effort in directed Chinook fisheries in this area is extremely small. Catch monitoring is undertaken by members of the High Bar Indian Band when Sockeye fisheries occur in this area. Chinook caught incidentally in fisheries directed on Sockeye salmon are enumerated.

There are very few directed First Nations Chinook fisheries occurring in the mainstem Fraser River from Deadman Creek to Naver Creek. Accordingly, no monitoring program is in place to monitor catch in directed Chinook fisheries. Monitoring occurs during directed Sockeye fisheries in this area and Chinook harvested incidentally in directed Sockeye fisheries are enumerated.

iv) Naver Creek upstream and the Nechako River to Isle Pierre

Lheidli T'enneh Nation monitors each of the fisheries via collecting hail information from the fishers.

v) *Nechako River upstream of Isle Pierre and the Stuart System*

Carrier Sekani Tribal Council, Tl'azt'en Nation, Nadleh Whut'en Band, Saik'uz and Stelat'en First Nation monitor each of the fisheries via collecting hail information from the fishers.

vi) *Thompson River upstream of the Bonaparte River*

The Secwepemc (Shuswap) Nation Fisheries Commission monitors each of the fisheries on a census basis utilizing staff from their individual member bands.

vii) *Shuswap River (Shuswap Falls to Mabel Lake)*

The Okanagan Nation Alliance monitors their fisheries on a census basis utilizing staff from their individual member bands.

Several First Nations are licensed for Demonstration fisheries in the BC Interior (Section 7.4.3). Monitoring programs for demonstration fisheries were carried out by on-board observers.

7.3.2. Recreational Fisheries

DFO obtains most of its recreational catch information through Creel Surveys. The determination of which recreational fishery to assess is based, in part, on:

- the magnitude of the fishery (either in catch and effort; e.g. Strait of Georgia or Fraser River mainstem Creel Surveys),
- its linkage to indicator projects (e.g. Nicomen Slough or Chilliwack River Creel Survey Projects),
- budgetary constraints, as well as
- whether the populations caught in the fishery are of special concern.

There are two outcomes to a salmon being caught: it is either harvested (kept) or released. It then follows that: *catch = harvest (kept) + release*. Most creel surveys can provide for an estimate of effort and harvest. Additionally, all DFO creel surveys conducted in southern BC provide for estimates of releases.

In order to provide estimates of harvested and released salmon in recreational fisheries (and other species in the case of southern BC marine recreational fisheries), three key pieces of information are required:

- an **Angler Effort** estimate: in Fraser River creel surveys, the units of angler effort are usually expressed in “angler hours”; in the marine creel surveys, the units are usually expressed in “boat trips”;

- a **Rate of Harvest** (or Harvest Rate) estimate: in the context of recreational fisheries this is usually expressed as the number of fish harvested per unit of angler effort; and,
- a **Rate of Release** (or Release Rate) estimate: in the context of recreational fisheries this is usually expressed as the number of fish released per unit of angler effort.

Rates of Harvest and **Release** are estimated using information gathered from angler interviews. The three primary pieces of information collected from angler interviews are:

- how long have you been fishing;
- what have you harvested; and
- what have you released.

Angler Effort can be estimated a number of different ways. In the lower Fraser River recreational fisheries, the effort is generally estimated by combining daily effort profile(s) from a specific fishing site (e.g. hourly rod counts at Peg Leg) with singular instantaneous effort assessment(s) of the entire study area (e.g. overflight rod counts). Angler Effort calculation for the marine recreational fisheries is similar except *boats* are assessed instead of *rods*.

Fraser River Recreational Fisheries

In the Fraser River watershed, many different recreational Creel Surveys are conducted annually by Fraser Stock Assessment and BCI Area Resource Management. Fraser Stock Assessment conducts creel surveys downstream of Sawmill Creek. A description of the surveys can be found in section 7.4.2. Historical and the preliminary results for assessed lower Fraser River recreational fisheries can be found in the Appendix E and at: http://www.pac.dfo-mpo.gc.ca/fraserriver/recreational/recfisherystudies_e.htm

BCI Area Resource Management conducts creel surveys upstream of Sawmill Creek. These include surveys of the Fraser River mainstem and its tributaries, including the Thompson/Shuswap watersheds. A complete census of the Bridge River and Bonaparte Chinook fisheries allowed the total number of Chinook harvested to be measured directly. Access point and hybrid creel surveys were used to estimate catch and effort in all other Chinook fisheries that were surveyed. The near final estimates for the upper Fraser River recreational fisheries can be found in the Appendix E.

Marine Recreational Fisheries

Surveys of recreational fisheries in southern BC marine areas are conducted by South Coast Area Stock Assessment. These surveys are administered in four regional groupings: the Strait of Georgia (SoG), Juan de Fuca (JdF), West Coast of Vancouver Island (WCVI) and North Island (NI).

The SoG survey covers Pacific Fishery Management Areas (PFMA or Area) 13 to 18, part of Area 19 (Saanich Inlet; Subareas 19-7 to 19-12), Area 28 and part of Area 29 (marine only; Subareas 29-1 to 29-7; 29-9 & 29-10). The JdF survey covers the portion of

Area 20 (Subarea 20-5) east of Sheringham Point and portions of Area 19 to Sydney (Subareas 19-1 to 19-6). The WCVI survey covers the portion of Area 20 west of Sheringham Point and north to Esperanza Inlet (Subareas 20-1 to 20-4; Areas 21, 23 to 25, 121 and 123 to 125). The NI survey covers the west coast from Kyuqout Sound north, around the north end of the island and into Johnstone Strait (Areas 11, 12, 26, 27, 126 and 127).

These marine creel surveys generally operate during the summertime peak of recreational fishing activity, with spring and fall fisheries surveyed in some areas. General survey timing is:

- SoG - May to Oct.
- JdF - Feb. to Oct.
- WCVI - Jun. to Sep.
- NI - Jun. to Aug.

Additional information on DFO's marine recreational fishery surveys can be found in section 7.4.2.

7.3.3. Commercial Fisheries

Commercial catch data for the salmon fishery is gathered primarily from fisher hail reports, fish slips, mandatory phone catch reporting requirements, logbooks, on-board observers, offload sampling and CWT catch sampling programs. Fish slips are required when fish are sold, offloaded or taken home for personal consumption. The number and weight of each salmon species landed and/or sold are required on the slip.

DFO obtains further information about salmon average weight data through a Mark Recovery Program (MRP). This program involves collecting salmon heads from adipose fin clipped fish from commercial landings. When the samplers are at a plant, they also collect individual salmon weights to contribute to the average weight estimate. An average weight estimate is obtained by species, and gear, MRP catch region and fishing period (week).

A table of all Canadian commercial catches of Chinook can be found in Appendix F.

7.4. 2010 Fishery Summary

In general, 2010 fisheries proceeded in accordance with the fishing plan outlined at the beginning of the season. The only in-season assessment tool available for Fraser Chinook in 2010 was the terminal return update provided for spring 5₂ and summer 5₂ Chinook. A planned in-season terminal return update based on the Albion test fishery was scheduled for these combined stock groups for mid-June. A three-zone management approach was implemented where management actions would be likely if the estimated terminal return of these stock groups was estimated to be equal to or below 60,000 fish.

The estimated 2010 terminal return for the spring and summer 5₂ aggregates using Albion catch through mid-June was 67,185 (95% prediction interval: 44,234 and 102,044). Although the in-season estimate was above the Zone 2 management zone the Department chose a precautionary approach and took uncertainty associated with the regression equation into account. This estimate resulted in the implementation of a Zone 2 management approach, as outlined in the 2010 pre-season plan.

7.4.1. First Nations Fisheries

Food Social and Ceremonial Fisheries –marine areas

First Nations FSC fisheries in the South Coast marine areas targeting Chinook salmon are generally, low impact, low effort with low harvest levels. Chinook harvest in most areas generally occurs as by-catch while fishing for other species such Fraser Sockeye and Chum. Some low, effort directed Chinook fishing does occur mainly on the WCVI with troll gear. This fishery is generally open year round, with the majority of effort and catch occurring during the summer period. Based on available information the estimated catch in South Coast marine areas in 2010 was 5,800 Chinook.

Food Social and Ceremonial Fisheries - Lower Fraser

During the period of Early Stuart Sockeye migration through the Fraser River in 2010, First Nations implemented several selective-gear fisheries directed on Chinook salmon. In the Lower Fraser River (downstream of Sawmill Creek), selective Chinook fisheries utilized eight-inch mesh drifted gill nets (with a 3:1 hang ratio). Additional monitoring was put in place to ensure that impacts on Early Stuart Sockeye were minimal. Sockeye encounter limits were set and catch monitoring occurred during the entire duration of the fishery.

Birkenhead River Chinook are one of the earliest returning Chinook stocks and are largely through the Fraser River prior to the commencement of Chinook fisheries each year. These fish may be caught in very small numbers during Fraser River mainstem FSC fisheries and in terminal FSC Chinook fisheries in the Birkenhead and Lillooet Rivers.

Chinook fisheries commenced on June 11th, 2010 in the Lower Fraser River and continued until September 17, 2010, with a focus on sockeye harvest as the summer progressed. Drift net fishing opportunities were initially limited to 8 hours per week and later increased to 48 hours per week as more abundant stocks entered the Fraser River system (i.e. summer 4₁ stocks). Set net fishing opportunities started with 24 hours per week and were later increased to 48 hours per week.

Food Social and Ceremonial Fisheries – BC Interior

Within the Mid-Fraser River, First Nations in the Sawmill Creek to Texas Creek area and Thompson River below Bonaparte River area voluntary did not fish until June 11th. After June 11th there were limited openings in portions of the area with selective gear (rod reel and dip net) until July 25th when fisheries were opened 7 days a week. Fisheries then continued through to September 21st.

Chinook fishing in the Texas Creek to Deadman Creek area voluntarily did not fish until June 26th. After June 26th there were limited openings in portions of the area with selective gear (rod reel and dip net) until July 25th when fisheries were opened up 7 days a week. Fisheries then continued through to September 21st.

Chinook fisheries in the Thompson River above Bonaparte River opened on July 7th. However, restrictions were put in place by some of the First Nations in this area to protect Spring run 4₂ Chinook.

Economic Opportunity Fisheries

In 2010 there were sockeye directed Economic Opportunity fisheries for First Nations in the Lower Fraser Area. The total number of Chinook retained as by-catch in these fisheries was 670 pieces from the mouth to Port Mann Bridge area, there were 3,651 pieces retained between the Port Mann Bridge and Sawmill Creek, and 152 pieces in the Chehalis/Scowlitz Demonstration Fishery.

In 2010 there was a Commercial Demonstration fishery conducted by the Secwepemc Fisheries Commission (SFC) in Kamloops Lake. This fishery was directed on the summer run 4₁ Chinook which spawn mainly in the South Thompson River. The fishery was cooperatively managed to avoid stocks of concern such as: summer run 5₂ Chinook stocks spawning in North Thompson and Clearwater Rivers. The fishery took place over 15 days from August 23rd to September 18th and was conducted by one vessel utilizing eight inch mesh gillnets. The total catch was 534 Chinook. Fisheries and Oceans Canada staff were on board this vessel as observers for the entire duration of the fishery.

A table of First Nations fishery openings and catch for 2010 can be found in Appendix D.

7.4.2. Recreational Fisheries

Fraser River Recreational Fisheries

In 2010, four recreational fisheries were assessed in the lower Fraser River:

1. Fraser River mainstem: the study area for this survey was bounded by the Mission Bridge (downstream boundary) and the mouth of the Coquihalla River (upstream boundary). The Agassiz Bridge separated the study area into 2 sections. The study was conducted from July 16th to Oct.15th, 2010. This fishery can catch significant numbers of Chinook. Preliminary catch estimates can be found in Appendix E.
2. Chilliwack River: the study area was bounded by its confluence with the Fraser River (downstream boundary) and the mouth of Slesse Creek (upstream boundary). The survey covered the entire area open to angling. The Vedder Crossing separated the study area into two sections. Similar to last year, the study was conducted from Sep.15th to Nov.15th, 2010. This fishery can catch significant numbers of Chinook. Preliminary catch estimates are not yet available for 2010.

3. Nicomen Slough/Norrish Creek: the study area extends from the mouth of Nicomen Slough to its confluence with Norrish Creek and up Norrish Creek to a point approximately 200 meters upstream of the Hawkins Pickle Road bridge crossing. This fishery is primarily directed at Coho salmon; Chinook were not open to retention. The survey was conducted from Oct.08th to Nov.30th, 2010. This fishery catches limited numbers of Chinook. Preliminary catch estimates are not yet available for 2010.
4. Stave River: the study area was bounded by its confluence with the Fraser River (downstream boundary) and Ruskin Dam (upstream boundary). The Stave River recreational fishery was last assessed in 2001. The survey covered the entire area open to angling. The study was conducted from Sep.15th to Dec.06th, 2010. This fishery catches limited numbers of Chinook. Preliminary catch estimates are not yet available for 2010.

Birkenhead River Chinook have been subject to a non-retention recreational fishery in the Birkenhead and Lillooet Rivers. Previously, recreational fishing for salmon was prohibited in the portion of the Birkenhead River from the Birkenhead Bridge on Portage Road to the canyon (approximately 10 km upstream of the bridge) from August 1st to September 15th each year. This closure provided protection for Chinook before and during their critical spawning time. In 2009, concern for Birkenhead Chinook returns from an extremely low brood year resulted in the Sport Fish Advisory Committee recommending a 'no fishing for salmon' closure from April 1st until July 31st. In 2011, there will be a 'no fishing for salmon' closure implemented year round in the area outlined above.

Chinook salmon recreational openings in specific sections of the Fraser River upstream of Sawmill Creek, the Bridge River, the lower Shuswap River, the middle Shuswap River, the South Thompson River, Mabel Lake and the Thompson River were also surveyed during their open times. Preliminary catch numbers are available in Appendix E.

Marine Recreational Fisheries

The South Coast Creel Survey is divided into four geographic areas for administrative purposes: (1) North Island, (2) Strait of Georgia, (3) Juan de Fuca, and (4) West Coast of Vancouver Island. The North Island Surveys are administered from the DFO office in Port Hardy and the Strait of Georgia, Juan de Fuca, and West Coast of Vancouver Island Surveys are administered from DFO offices in Nanaimo.

1. The North Island (NI) Survey includes northern Johnstone Strait, Queen Charlotte Strait and the offshore waters north of Vancouver Island (Areas 11 and 12). The NI survey also has responsibility for surveys of Kyuquot (Area 25) and Quatsino (Area 26) Sounds and the associated offshore waters (Areas 125 and 126). Kyuquot Sound did not have a creel program in 2010 but had a logbook program

in place as well as a pilot elog program. In 2010 NI surveys were conducted from June to the end of August.

2. The Strait of Georgia (SG) Survey includes the waters north of Sydney through the Gulf Islands (part of Area 19, Areas 17 & 18), the mouth of the Fraser River and mainland inlets (Area 28 & 29), north through the Strait of Georgia and Discovery Passage, including the southern portion of Johnstone Strait (Areas 13 – 16). In 2010 the SG survey operated from May to end of September with an extension of the survey in Area 13 through October.
3. The Juan de Fuca Survey (JdF) includes the Canadian waters of Juan de Fuca Strait east of Sheringham Point near Sooke and north through Haro Strait to just north of Sydney (Subareas 20-5 and 19-1 to 19-6). The JdF survey operated from March to September in 2010.
4. The West Coast of Vancouver Island (WCVI) Survey includes the waters of Juan de Fuca Strait west of Sheringham Point and north up the West Coast to Esperanza Inlet (part of Area 20, Area 21 and Areas 121 to 125). This survey also covers Barkley Sound & Alberni Inlet (Area 23), Clayoquot Sound (Area 24), and Nootka Sound & Esperanza Inlet (Area 25). The WCVI Survey operated from June through September 15th in 2010.

South Coast Creel Reports, including Chinook kept and released catch estimates by area, are available online:

http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc_creelbulletins

North Coast Marine recreational Chinook fisheries occur from May to September in Areas 1 to 6 and include various catch monitoring programs.

1. Areas 1 and 2W: Haida Fisheries conducts a creel survey and this is complimented with a logbook program which all of the lodges in Areas 1 and 2 participate.
2. Areas 3, 4 and 5: A creel survey was conducted in 2009 by DFO staff. There are 3 lodges that operate in these areas and all participate in a logbook program.
3. Areas 6: Chinook fisheries in this area are much smaller. There were 3 lodges operating and all participate in a logbook program.

Chinook catch in 2010 was reported as:

Area 1	- 27,500
Area 2W	- 18,400
Area 2E	- 450
Area 3/4/5	- 7570
Area 6	- 1754

7.4.3. Commercial Fisheries

Area E Gill Net - Fraser River

Chinook-directed commercial gill net fisheries within the Fraser River have been closed since 1980 as part of a stock rebuilding approach. Retention of Chinook by-catch is permitted during the in-river Sockeye-directed fisheries that usually occur from late July to early September and Chum-directed fisheries in October and November.

In 2010, there were 8 Area E Gill Net Sockeye openings while Chum fisheries remained closed for the season; 2010 Chinook by-catch during sockeye fisheries was estimated at about 6,300 pieces.

Area F Troll – North Coast

Chinook catches in the North Coast troll fishery were sampled and DNA analyses were conducted. This fishery is constrained by a management objective designed to limit the exploitation of Chinook stocks originating from the West Coast of Vancouver Island (WCVI). Due to these constraints, the fishery generally does not open until mid-June and closes upon achieving the AABM and/or the WCVI TACs. In 2010, the Chinook fishery opened on June 15th. The Chinook fishery was originally scheduled to close on August 3rd, however, an opportunity to extend the fishery was implemented and the fishery closed on August 8th as the WCVI TAC had been attained.

Based on the DNA analysis, of the 90,213 Chinook landed, 3,361 were of West Coast Vancouver Island origin, 1,826 from the Skeena, 268 from the Nass, and 38,459 from the South Thompson River. The remainder come from a wide variety of streams stretching from Alaska to southern Oregon.

Area G Troll – West Coast Vancouver Island

After the completion of the 2010 CTC Chinook model calibration, the AABM Canadian allowable harvest was 143,700. It was anticipated that the FSC harvest would be 5,000; and that the recreational catch would be 55,000, leaving 83,700 available to plan for commercial harvest by Area G troll.

Since 1999, a major objective for the management of the WCVI troll fishery has been to distribute the catch throughout the fall-winter-spring-summer periods. This objective was continued in 2009/2010. Fisheries were also monitored to determine encounter rates of other species and estimate numbers of released Chinook. Biological sampling was conducted for size distributions, and stock compositions (via CWT, DNA and otolith samples).

Total Chinook catch in the 2009/2010 season for Area G troll was 79,123 kept and 5,267 released. No DNA analysis is available to assess stock composition for this catch.

7.5. Assessment of Fishery Impacts on Fraser River Chinook

The ability to assess the impacts of fisheries on Fraser Chinook stocks depends on what data is available for a particular stock group. Specifically, the ability to measure the exploitation rate on a given stock group requires the establishment of a coded wire tag (CWT) indicator stock. Currently, there are indicator stocks established for the spring 4₂, summer 4₁, and fall (Harrison) 4₁ stock groups. There are currently no CWT indicator programs in place for the spring or summer 5₂ stocks.

Annual reporting of exploitation rates on indicator stocks is provided through the Chinook Technical Committee's (CTC) annual exploitation rate analysis. This analysis estimates fishery specific and overall exploitation rates for CTC indicator stocks, based on CWT recoveries. Exploitation rates for Fraser River indicator stocks are summarized in Appendix J. Due to the time lag in processing and analyzing the CWT data for some southern U.S. fisheries (e.g. sport fisheries in Puget Sound), there is usually a two-year time lag in publishing these results on the PSC website. However, CWT data are analysed for several Canadian stocks, including those originating from the Fraser River, in the year following the fishing year. This means that the 2010 exploitation rate summaries for Fraser River stocks should be available during April of 2011, after management actions have begun.

The other analysis currently produced for Fraser Chinook is the Fraser Chinook Terminal Run Reconstruction, which is typically available by March of the year after the stocks return (i.e. the 2009 Run Reconstruction is available by March of 2010). The Run Reconstruction provides estimates of in-river catches, harvest rates, and terminal run size, by stock and stock group. It is based on spawning escapement estimates, hatchery removals (e.g. brood stock, given to First Nations, etc.), assumed migration rates, and assumed migration times for each stock. Note that the Run Reconstruction does not provide any information regarding impacts in pre-terminal, marine fisheries.

7.6. Proposed 2011 Fishing Plan

Spring and summer yearling Fraser Chinook stocks (e.g. spring 4₂, spring 5₂ and summer 5₂) continue to be classified as *stocks of concern* (Outlook status = 1) in the 2011 Salmon Outlook given a combination of poor survival rates and/or low abundance of spawners in the parental generation. Fraser Chinook stock status in 2011 mirrors the 2010 stock status. Fraser Chinook will continue to be managed using the spring 4₂, spring 5₂ and summer 5₂ management units consistent with the reporting units used in the Pacific Salmon Treaty process. These management units align fisheries management objectives with indicator stocks, escapement, catch and exploitation rate data.

The first management unit, Fraser spring 4₂ Chinook, enters the Fraser River from early March until the end of July. These smaller bodied spring Chinook mainly spawn in the Nicola, Bonaparte, Deadman and other streams that flow into the Lower Thompson River. The second management unit is referred to as Fraser spring 5₂. These populations also return to the Fraser River between early March and late July, and migrate mainly to the mid and upper Fraser and upper North Thompson. The third management unit is

referred to as Fraser summer 5₂. Their return migration into the Fraser River starts in early June and lasts until late August. These stocks include Chilko, Quesnel, Nechako, Clearwater and Stuart rivers.

Conservation will continue to be the top priority in the management of Fraser River Chinook. For 2011, the Department is proposing to implement the management approach developed in 2010 for Fraser spring 4₂, spring 5₂, and summer 5₂ as described in the 2010/2011 South Coast Salmon Integrated Fisheries Management Plan. The objective for Fraser spring 4₂ Chinook is to conserve these populations by continuing to minimize incidental harvests in Canadian ocean fisheries. For directed fisheries in the Fraser River, the objective is to minimize directed harvests of spring 4₂ Chinook until July 15th. Fisheries beginning July 15th will be managed consistent with the management zones identified for spring 5₂ and summer 5₂ Fraser Chinook given timing overlaps between these populations for much of the adult migration period. The objective for spring and summer (age 5₂) Fraser Chinook is to continue rebuilding these populations consistent with the management zones identified in Table 5.

Table 5: Spring 5₂ and Summer 5₂ Fraser Chinook Management Zone Approach 2011 Management Zones:

Zone	Predicted Return to the Fraser River	Rationale and Actions
3	Greater than 60,000	Rationale: Populations rebuilding towards maximum sustained yield (MSY) levels. First Nations directed fisheries. Directed recreational and commercial fisheries consistent with Allocation policy.
2	Below or equal to 60,000	Rationale: Caution required to avoid population declines. Populations well below MSY levels. Limited directed fisheries. First Nations directed fisheries subject to abundance. By-catch retention/ limited directed Fraser recreational fisheries may be initiated. Management actions to reduce by-catch or incidental harvest in commercial fisheries.
1	Below or equal to 30,000	Rationale: Significant conservation concerns. Very high risk of extremely low spawning populations. Directed fisheries minimized. By-catch retention /limited directed First Nations fisheries. Non-retention/closed recreational and commercial Chinook fisheries in the Fraser River and tributaries Management actions to reduce by-catch or incidental harvest in other recreational and commercial fisheries.

The management actions for spring 5₂ and summer 5₂ Chinook will be in place post July 15, lasting to the end of July and are based on an assessment of catch per unit effort at the Albion Chinook test fishery in the Fraser River. These management zones will also guide fishery management actions for spring 4₂ Chinook during the last 2 weeks of July in the Fraser River given that the adult migration timing overlaps for much of the migration period and management actions will affect all three of these management units.

After addressing conservation concerns, DFO is committed to managing fisheries (including fisheries that substantially impact Fraser River Chinook stocks of concern) and assigning priority to First Nations' fishing for food, social and ceremonial purposes over all other users. Restrictions and/or closures developed and implemented in 2010 in commercial and recreational fisheries will continue to be required in 2011. Management actions in recreational and commercial fisheries in marine areas are expected to commence in March.

The Department is planning to release the draft South Coast Salmon Integrated Fisheries Management Plan for comment on March 16, 2011. Management plans for 2011 may be adjusted to account for new information and to improve catch monitoring.

7.6.1. First Nations Fisheries

The Department will be consulting with First Nations on plans for Food, Social and Ceremonial (FSC) fisheries and specific fishery management actions required in 2011. Management actions to protect and conserve Fraser spring 4₂ Chinook (similar to those in 2010) is proposed for 2011 (see Table 1 in Appendix G with summary of 2010 management actions). The migration timing of spring 4₂'s is significantly longer than early-timed Chinook and fishing restrictions are proposed, in times and areas where these stocks are present. For the lower Fraser River, this period is proposed until July 15th. Management of spring 5₂ and summer 5₂ Chinook will depend on the in-season abundance of Chinook estimated from the Albion test fishery and will follow the management zones for spring 5₂ and summer 5₂ outlined above.

Although the outlook for the Fraser spring 4₂, spring 5₂, and summer 5₂ Chinook is poor in 2011, the returns of the Fraser summer 4₁ stocks returning to the Thompson system later in the summer are expected to be of sufficient abundance to provide FSC harvest opportunities for those First Nations that have access to them. The forecast return of fall Chinook to the Harrison River in 2011 is usually completed in April; the Outlook is for returns to be low to near target levels.

Selective fisheries may be considered during periods of increased Chinook abundance as a way to provide FSC harvest opportunities for First Nations while protecting weak stocks. Selective methods must ensure that co-migrating stocks of concern are avoided or released unharmed. First Nations are encouraged to submit their selective fishing proposals as soon as possible. Compliance with previous licence conditions for selective fisheries will be considered during the review of selective fishing proposals.

The Department encourages discussion among all Fraser River First Nation groups in the watershed, in the development of integrated fishing plans. Improved discussion and coordination regarding the development of a Fraser River watershed Chinook fishing plan for First Nations will assist in addressing conservation needs for all stocks of concern.

7.6.2. Recreational Fisheries

The Department is seeking to minimize impacts on Fraser River spring 4₂, spring 5₂, and summer 5₂ Chinook stocks in recreational fisheries in 2011. Management actions similar to those implemented in 2010 are proposed for 2011 for spring 4₂ Chinook (see Table 1 in Appendix G with summary of 2010 management actions); restrictions or closures are proposed for portions of Areas 18, 19, 20, 29 and in the Fraser River. Management of spring 5₂ and summer 5₂ Chinook will depend on the in-season abundance of Chinook estimated from the Albion test fishery and will follow the management zones for spring 5₂ and summer 5₂ outlined above. Discussions on management actions for the coming year will be taken into consideration in the development of the 2011 fishing plans and development of the South Coast Salmon Integrated Fisheries Management Plan for 2011/12.

7.6.3. Commercial Fisheries

Management actions similar to those implemented in 2010 are proposed for 2011 for spring 4₂ Chinook for the Area G troll fishery on the West Coast of Vancouver Island (see Table 1 in Appendix G with summary of 2010 management actions). Management of spring 5₂ and summer 5₂ Chinook will depend on the in-season abundance of Chinook estimated from the Albion test fishery and will follow the management zones for spring 5₂ and summer 5₂ outlined above. Consultation between the Department and commercial fishing representatives on management measures for the coming year will be taken into consideration in the development of the 2011 fishing plans and development of the South Coast Salmon Integrated Fisheries Management Plan for 2011/12.

It is anticipated that pre-season discussions with the Area E Harvest Committee (AEHC) may include a proposal for a limited Chinook-directed demonstration fishery in 2011. DFO staff will continue to assess the status of Chinook stocks and review the potential impacts of this fishery within the scope of overall cumulative impacts on all stocks. In reviewing the viability and direction of this proposal, the Department will be consulting with First Nations and stakeholders in order to make a decision about the future direction of this initiative as part of the South Coast Salmon Integrated Fisheries Management Plan.

BCI Demonstration Fisheries

Demonstration fisheries will move towards long term distribution (Access) for participants in the Pacific Integrated Commercial Fisheries Initiative (PICFI). Groups are currently developing business plans to establish Commercial Fishing Enterprises (CFE'S) to secure access and move from demonstration fisheries. Chinook directed fisheries will likely occur in 2011 targeting summer Chinook 4₁ in the Thompson watershed.

Appendix A: Albion Test Fishery

The following figures summarize catch information from the Albion Chinook test fishery for 2010 and compare it to the historical averages from previous years. Figure 1 displays the daily catch per unit effort (CPUE) index and Figure 2 provides the cumulative CPUE over the season.

Figure 1. The 2010 daily catch per unit effort (CPUE) index compared to the 1981 to 2009 daily CPUE index average.

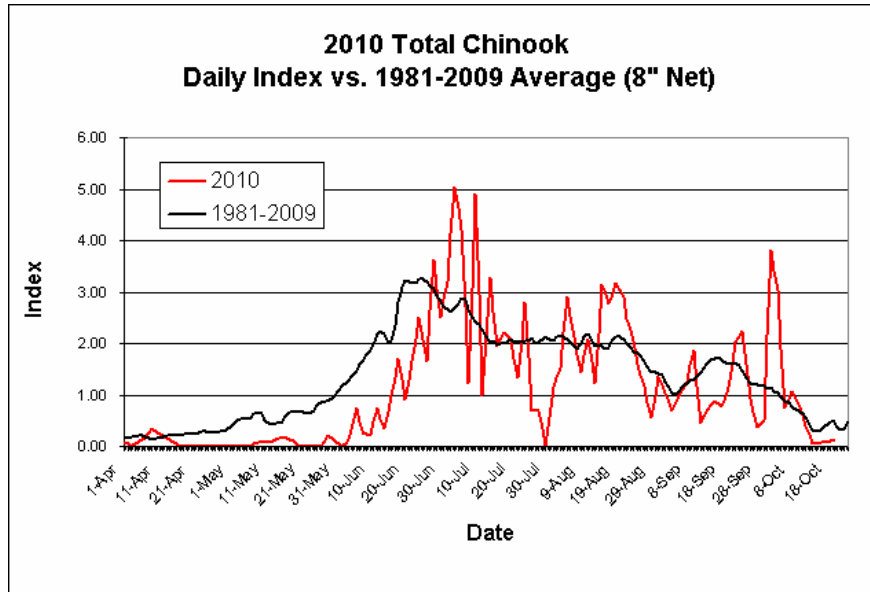
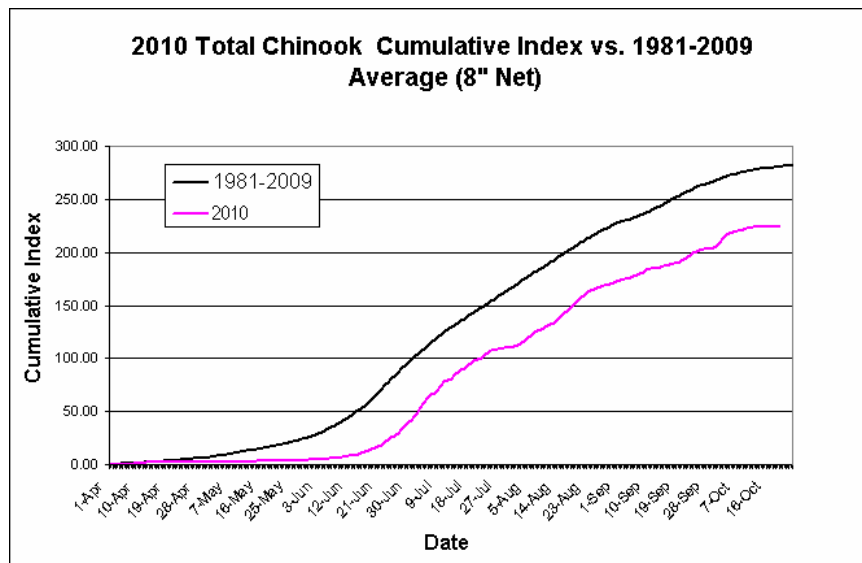


Figure 2. The 2010 cumulative catch per unit effort (CPUE) index compared to the 1981 to 2009 cumulative CPUE index average.



Due to absence of test fishing Apr 1 - Jun 17 2007, 2007 is NOT incl. in average

Appendix B: 1995-2010 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser

CTC Indicator Stream

	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u> ²
Spring - Run Age 1.3 (5₂)															
Upper Pitt River (Lower Fraser)	N/R	N/R	N/R	N/R	N/R	N/R	276	171	N/I	341	248	138	198	500	85
Birkenhead River ¹ (Lower Fraser)	344	634	636	166	446	703	512	480	202	1491	1259	1968	206	631	1520
Bridge River	1900	1968	626	898	769	198	969	N/I	1115	183	109	138	103	11	51
Chilcotin River	2285	4000	1636	2896	2971	1574	2092	3396	1064	1509	1027	360	2018	986	1695
Cottonwood River	1750	3329	2592	641	1208	781	1352	1555	1241	646	740	392	225	535	832
Horsefly River	400	115	43	137	174	281	380	246	375	509	345	51	98	209	89
Westroad River	4615	7206	3827	984	1600	1924	1620	2966	1366	846	1052	461	961	992	1269
Bowron River	4577	7334	7618	3455	3220	5491	8719	10059	8160	4074	3876	1823	3740	4900	3066
Fraser R. (Tete Juane)	4100	2935	2586	2081	2262	4976	3913	3048	2062	2535	2142	1021	1858	3281	1500
Goat River	440	354	302	89	212	411	820	569	174	151	158	114	145	311	75
Holmes River	2775	3203	2362	523	1795	1018	3740	4110	1376	821	1458	764	454	2187	369
Horsey River	20	75	57	14	128	78	308	288	62	34	146	22	0	111	68
McKale River	N/A	N/A	20	Present	32	9	81	49	68	78	11	17	18	118	29
McGregor Tributaries	3461	2505	4471	1870	2449	2420	3751	4103	3253	1310	1333	1041	1260	2305	763
Chilako Creek	624	186	39	115	20	7	229	N/I	106	202	168	78	300	171	91
Endako River	167	43	191	171	160	275	292	N/I	N/I	252	118	26	N/I	166	271
Ormond Creek	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/I	N/I	N/I	N/I	N/I	20	N/I	N/I
Nevin Creek	N/A	N/A	161	46	62	57	132	385	238	77	174	42	1389	174	58
Slim Creek	2268	3130	2664	1235	2112	2876	3021	3676	2284	2161	2204	654	422	3173	1458
Swift Creek	1500	1200	1098	375	486	982	1535	835	520	335	643	328	189	747	378
Walker Creek	426	122	392	206	252	177	381	543	277	103	234	160	941	494	75
Torpy River	1055	1042	2293	1819	1468	1755	2565	4457	2730	1027	1221	886	666	1966	905
Willow River	1612	1961	2041	717	1314	893	1033	1980	1887	1012	1206	377	101	1003	566
Finn Creek	1569	725	632	524	1511	1115	650	45	538	185	157	38	655	91	72
Eagle River	780	915	N.I.	624	1085	1397	1458	1583	867	427	521	334	447	574	1712
Salmon River (Prince George)	1054	1200	1362	823	634	478	429	2395	1681	668	544	269	535	731	308
Salmon River (Salmon Arm)	727	252	284	350	357	1362	1003	89	395	307	554	173	198	382	605
Stock Aggregate Totals	38449	44434	37933	20759	26727	31238	41261	47028	32041	21284	21648	11675	17147	26749	17910

¹ historical escapement estimates to the Birkenhead River were reviewed and adjusted in Schubert et al. 2007.

CTC Indicator Stream

	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u> ²
Spring Run Age 1.2 (4₂)															
Deadman River	1506	934	665	350	787	780	1940		1159	417	1234	301	1273	188	1125
Spius Creek	500	450	300	52	668	603	1012	1170	1866	291	529	64	168	138	206
Coldwater River	1500	400	300	267	497	781	1394	1195	1018	183	478	107	365	26	245
Nicola River	16400	7614	1211	7263	8808	7771	11643	14574	7850	2926	3863	912	4151	461	4711
Louis Creek	420	480	377	183	611	349	481	198	105	63	297	18	95	6	154
Bessette Creek	400	N.I.	150	404	360	323	350	N/O	182	18	241	5	69	25	135
Stock Aggregate Totals	20726	9878	3003	8519	11731	10607	16820	17137	12180	3898	6642	1407	6121	844	6576

Summer Run Age 1.3 (5₂)

Portage Creek	300	N/R	18	200	46	248	445	158	103	86	248	51	217	74	123
Seton River	N/I	N/R	N/I	N/I	N/I	N/O	6	5	N/I	Present	N/I	N/I	N/I	Present	Present
Chilko River	17000	16272	14549	8920	9171	10891	11027	21625	16287	7668	5201	4366	5186	8694	6345
Quesnel River	3100	3185	4906	1620	1718	2418	5520	5265	3356	3230	2665	1758	1383	1875	2319
Cariboo River	1850	1800	936	573	744	503	1097	2198	351	526	949	546	449	877	852
Stuart River	7415	6221	4642	3875	1875	1954	Present	Present	Present	Present	Present	Present	Present	Present	Present
Nechako River	2040	1954	1868	1917	N/A	9331	5546	4077	5189	3217	7376	0	4614	2659	7208
Stellako River	N/R	N/R	15	18	N/R	N/R	N/R	N/O	N/I	231	0	1895	5	3	5
Barriere River	N/K	N/K	N/I	Present	77	362	377	131	306	220	215	100	97	37	132
Clearwater River	7780	7830	7007	3837	4563	5051	5689	6234	4622	3519	3768	74	3307	5980	1102
Mahood River	415	260	341	91	245	172	155	929	317	269	217	74	52	214	6
Raft River	870	1230	309	712	936	237	443	311	741	109	141	38	395	194	128
North Thompson River	2375	2130	2156	3375	2732	3175	2200	1989	N/I	N/I	N/I	N/I	Present	N/I	Present
Stock Aggregate Totals	43145	40882	36747	25138	22107	34342	32505	42922	31272	19075	20780	8902	15705	20607	18220

Summer Run Age 0.3 (4₁)

Maria Slough (Lower Fraser)	100	100	150	198	266	400	1200	823	N/R	439	314	650	574	594	617
Adams River	2200	3400	4182	2029	2266	5890	3674	2496	2216	3837	6344	3181	3474	6397	9691
Little River	3000	1850	1246	1163	2043	9885	3680	2488	6000	7504	8590	7352	11446	7286	12454
Lower Shuswap River	19000	13100	16704	24691	20409	18349	19327	21380	13329	12927	28828	14503	15165	25097	56008
Middle Shuswap River	5000	3800	4474	2449	2617	3022	5442	4799	1415	1883	5468	1080	1418	2018	2000
South Thompson River	21600	27000	41277	22675	17560	36740	51298	38178	38592	61837	103387	58956	74462	45036	76504
Stock Aggregate Totals	50900	49250	68033	53205	45161	74286	84621	70164	61552	88427	152931	85722	106539	86428	157274

Non CTC Indicator Streams

	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u> ²
Spring - Run Age 1.3 (52)															
Baker Creek	150	292	420	47	282	268	420	423	N/I	51	N/I	N/I	82	N/I	N/I
Dome Creek	571	625	400	309	198	49	450	444	270	248	224	181	226	N/I	N/I
East Twin Creek	N/I	N/I	64	N/I	18	35	51	52	62	25	12	6	18	94	9
Holliday Creek	N/I	N/I	N	N/I	15	74	126	48	54	72	17	6	6	86	14
Humbug Creek	N/I	N/I	N/I	N/I	26	22	85	35	N/A	N/I	N/I	N/I	N/I	N/I	N/I
Kazchek Creek	N/I	N/I	0	Present	Present	N/O	N/O	6	8	N/I	N/I	N/I	35	18	NO
Kenneth Creek	N/I	N/I	132	17	65	58	338	148	N/A	N/I	N/I	N/I	N/I	N/I	N/I
Kuzkwa Creek	N/I	N/I	N/I	N/I	N/I	215	300	345	245	N/A		N/I	401	189	225
Morkill River	567	550	2398	1152	926	Present	Present	Present	1122	355	549	408	123	1309	482
Naver Creek	150	777	994	57	231	240	281	489	N/I	236	N/I	N/I	N/I	229	N/I
Narcosli Creek	150	757	254	161	145	383	129	382	N/I	89	N/I	N/I	48	N/I	N/I
Pinchi Creek	N/I	N/I	N/I	Present	45	14	Present	15	25	N/A		N/I	60	25	9
Ptarmigan Creek	N/I	N/I	58	103	49	8	66	140	N/A	N/I	N/I	N/I	N/I	N/I	N/I
Small Creek	N/I	N/I	115	66	34	48	268	212	6	15	77	49	N/I	20	5
Snoeshoe Creek	N/I	N/I	N	N	N/I	N/I	165	66	N/I	N/I	N/I	N/I	N. obs	N/I	N/I
Upper Cariboo River	N/I	N/I	N/I	N/I	N/I	407	198	367	N/I	N/I	477	152	N/I	66	155
West Twin Creek	N/I	N/I	24	N/I	34	14	22	108	40	58	75	14	31	102	14
Stock Aggregate Totals	1588	3001	4859	1912	2068	1835	2899	3280	1832	1149	1431	816	1030	2138	913
Spring Run Age 1.2 (4₂)															
Bonaparte River	4391	10084	1864	1954	5258	6150	8216	8470	7990	3516	3995	1046	5242	1220	2462
Stock Aggregate Totals	4391	10084	1864	1954	5258	6150	8216	8470	7990	3516	3995	1046	5242	1220	2462

	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u> ²
Summer Run Age 1.3 (5₂)															
Big Silver (Lower Fraser)	N/K	N/K	N/K	N/K	N/K	N/K	363	138	N/I	243	62	209	20	38	32
Blue River	0	0	110	11	235	88	480	329	152	N/I	117	212	142	63	152
Chilcotin River (Upper)	735	360	617	285	229	243	523	678	220	97	89	158	97	235	171
Elkin Creek	1250	806	651	417	394	458	420	1038	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Lemieux Creek	N/I	N/I	N/I	216	115	117	155	N/O	194	28	297	5	54	17	34
Lion Creek	95	N/I	N/I	34	0	3	N/O	N/I	N/I	N/I	N/I	N/I	N/I	0	0
Stock Aggregate Totals	2080	1166	1378	963	973	909	1941	2183	566	368	565	584	313	353	389
Non CTC Indicator Stream															
Summer Run Age 0.3 (4₁)															
Adams River (Upper)	220	275	100	107	60	109	46	150	238	N/I	20	165	150	81	55
Thompson River (Below Kamloops Lake)				2015	3205	6904	18927	N/K	10010	Present	23646	8549	16898	Present	12045
Stock Aggregate Totals				2122	3265	7013	18973	150	10248	Present	23666	8714	17048	81	12100

² estimates for populations in the Fraser River in 2010 are preliminary

N/I = Not Inspected

N/O = None Observed

N/R = Not Recorded

N/K = Not Known

NYA = Not Yet Available

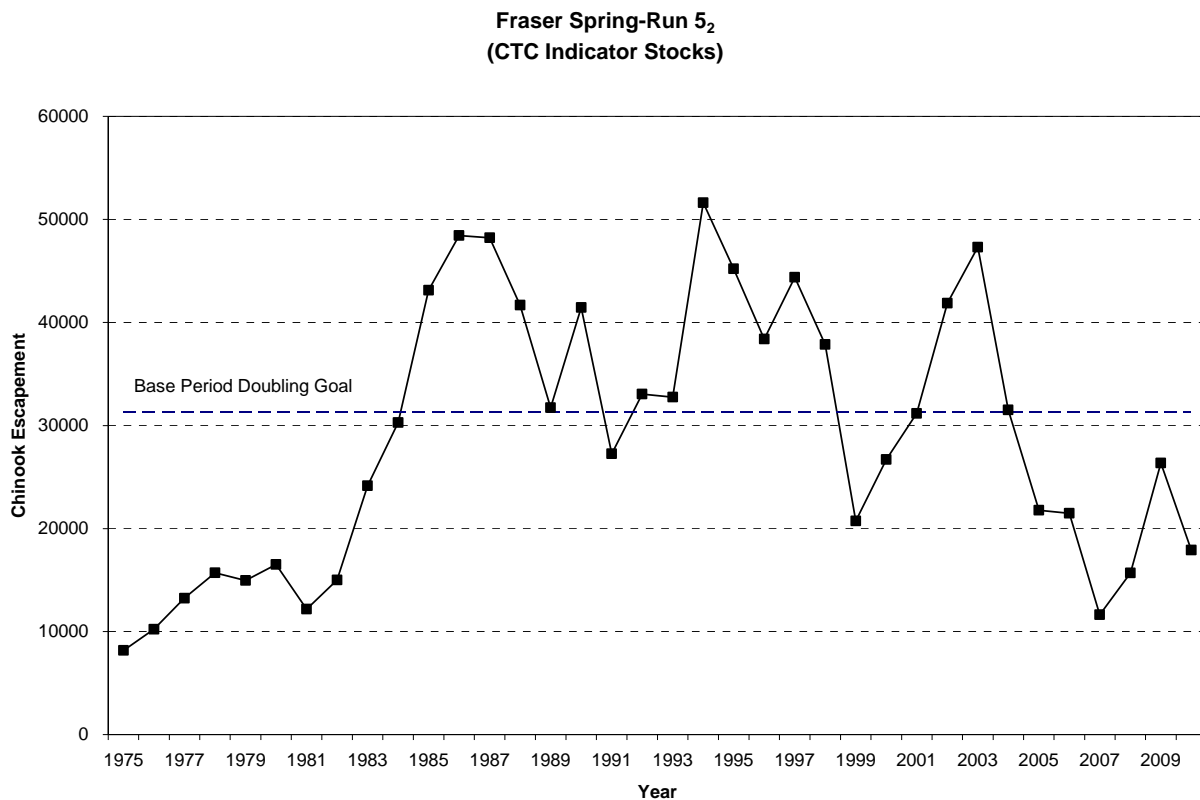
Present = Chinook seen but quality of assessment too poor to estimate escapement

Appendix C: CTC Indicator Stocks

In 1986, DFO established interim escapement goals for British Columbia Chinook stocks. The escapement goals were set at either double the averaged escapement for the 1979-82 base period or, for key streams, double the 1984 escapement estimate. These escapement goals are not biologically-based and consequently, they are not used for stock assessment and management of stock impacts under the Pacific Salmon Treaty. The Lower Fraser fall run has a biologically-based escapement goal range between 75,000 and 101,000 based on a stock-recruitment analysis (Brown et al. 2001). Biologically-based escapement goals based on habitat carrying capacity, are being developed and several examples for Fraser River stocks are available (Parken et al. 2006; described in Appendix H).

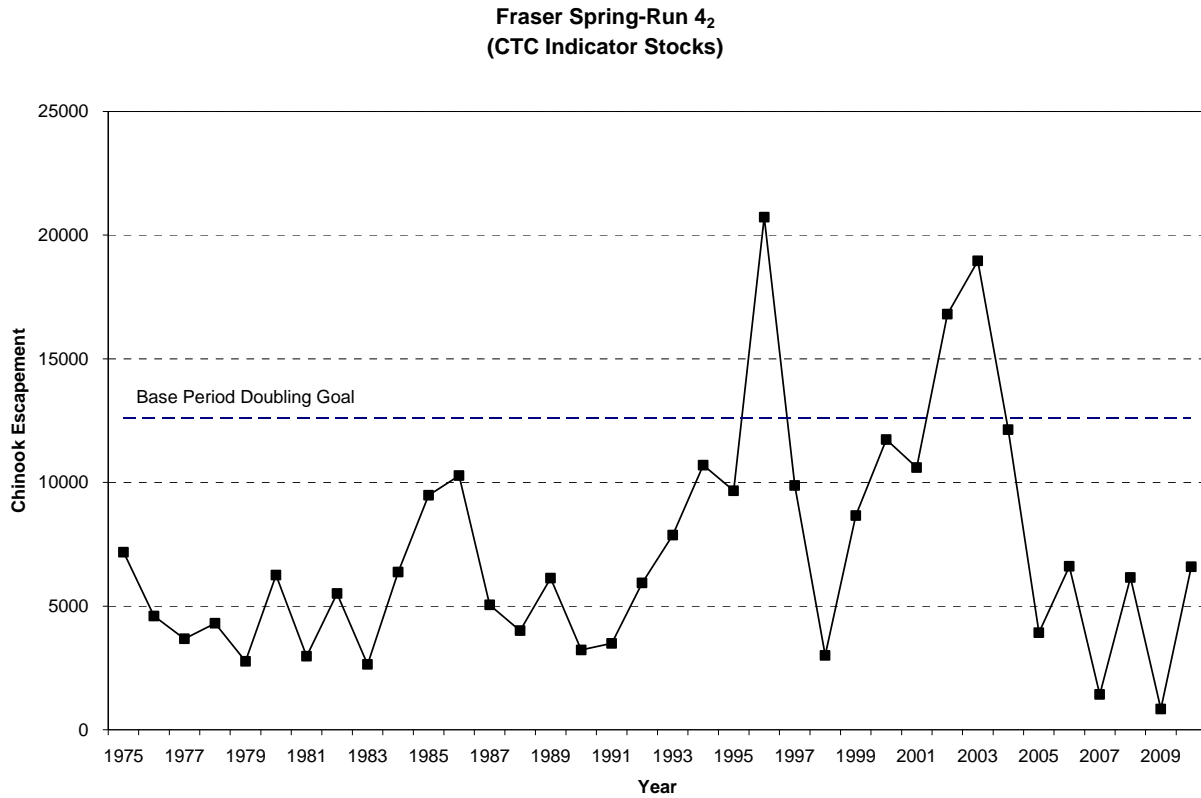
The escapement information provided below is specific to the indicator stock reported annually through the Chinook Technical Committee of the Pacific Salmon Commission. These stocks are enumerated annually, in support of Canada's commitments to the Pacific Salmon Treaty.

Fraser Spring Run 5₂ (CTC Indicator Stocks)



This aggregate includes the Upper Pitt River and Birkenhead River stocks in the Lower Fraser, and the spring-run Chinook of the Mid and Upper Fraser, North Thompson, and South Thompson, but excluding those of the Lower Thompson (CTC 2002b). Aggregate escapement declined slightly in 2010, after recovering somewhat in 2008 and 2009. Escapement to the aggregate was estimated at approximately 18,200 in 2010; roughly 94% of the brood year escapement in 2005..

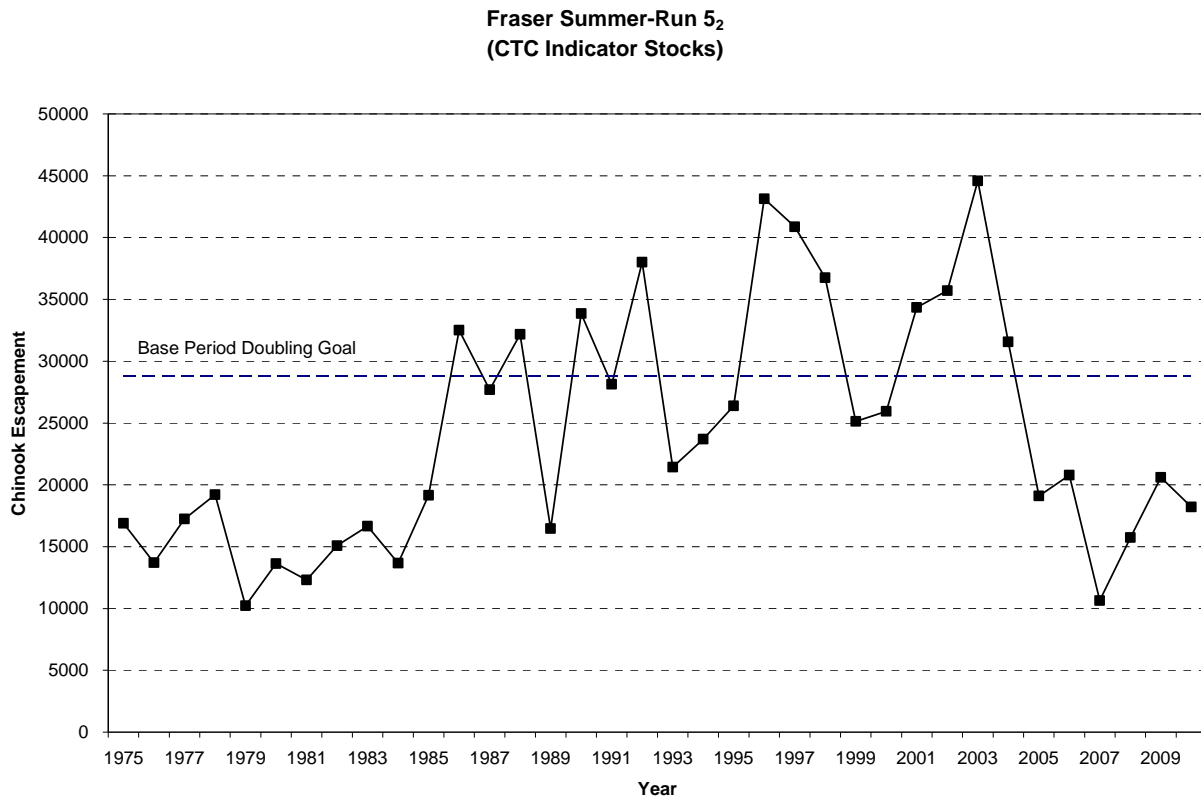
Fraser Spring Run 4₂ (CTC Indicator Stocks)



The Fraser spring-run age 4₂ aggregate includes six smaller body size populations that spawn in the Lower Thompson River tributaries, Louis Creek of the North Thompson and the spring-run fish of Bessette Creek in the South Thompson (CTC 2002b). Escapements recovered from the sharp declines in 2009 to almost 6,600. Those levels represent approximately 99% of the 2006 parental brood escapements. Escapements remained low at Spius Creek (206) while Nicola improved to 4,722.

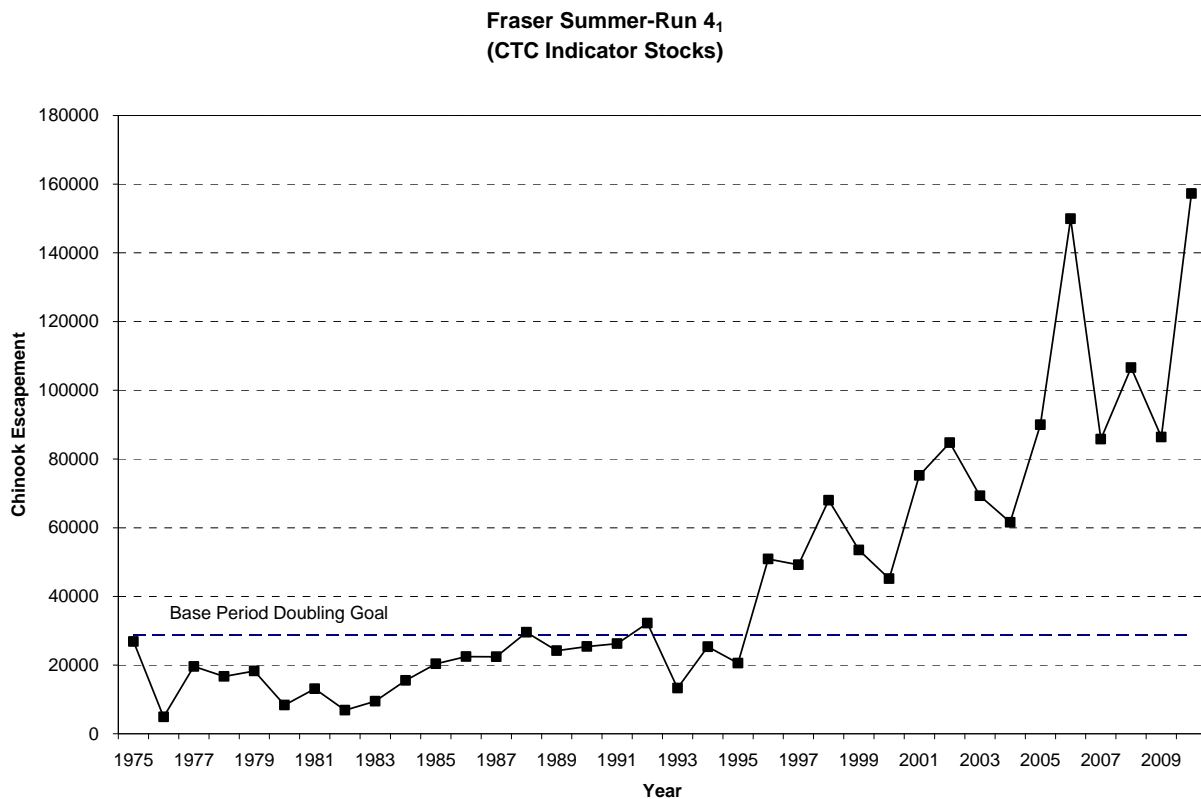
Fraser Summer Run 5₂ (CTC Indicator Stocks)

The Fraser summer-run age 5₂ stock complex includes 10 populations, spawning in large rivers, mostly below the outlets of large lakes. These include the Nechako River upstream of Prince George, Chilko and Quesnel Rivers in the mid Fraser and the Clearwater River in the North Thompson watershed (CTC 2002b). Escapement surveys of the Stuart River and North Thompson River were discontinued in 2004 due to unreliable counting conditions. Escapements in 2010 declined slightly compared to the brood year escapements in 2005. Aggregate escapement was estimated at 18,215, roughly 96% the 2005 parental brood of 19,100.



Fraser Summer Run 4₁ (CTC Indicator Stocks)

The Fraser summer-run age 4₁ aggregate includes six populations of Chinook spawning in the South Thompson watershed upstream of Kamloops and one in the lower Fraser. These include the Middle Shuswap, Lower Shuswap, Lower Adams, Little River and the South Thompson River mainstem, in the BC interior, and Maria Slough in the lower Fraser (CTC 2002b). Escapements to the summer run age 4₁ aggregate were again very strong in 2010. An estimated 157,300 Chinook escaped, marginally greater than the aggregate escapement in the brood year (2006). Escapements to the Lower Adams, Little River and Lower Shuswap exceeded brood escapements. Returns to the South Thompson River, Adams River and Little River were estimated to be 76,500, 9,690 and 12,450 adults respectively.



Harrison Fall Run 4₁ (CTC Indicator Stocks)

The lower Fraser stock is dominated by fall returning Harrison-origin Chinook that includes natural spawners in the Harrison River and Harrison-origin fish that were introduced to the Chilliwack River. Since 1984, mark-recapture studies have been conducted annually on the Harrison River to obtain reliable estimates of spawning escapements. Estimates of fall Chinook escapement to the Chilliwack River are based on a procedure long established by the Chilliwack Hatchery staff for expanding the number of carcasses counted in standardized reaches of the river. Preliminary spawning escapement estimates for the Harrison River in 2010 were approximately 105,000 adult Chinook, and 10,500 jacks. Total fall Chinook escapements to the Chilliwack River were estimated to be approximately 75,000 adults and 10,000 jacks.



Appendix D: 2010 Fraser River First Nations Fishing Times and Catch by Area

Area and Gear	Dates	Hours per Week (Days per week)	
Mouth to Pt Mann Bridge- drift net	Jun. 14 – Jun. 27	24 hours per week	
	Jul. 26 – Aug. 1	21 hours per week	
	Aug. 2 – Aug. 8	30 hours per week ^A	
	Aug. 9 – Aug. 15	4-7 hours per week ^A	
	Aug. 16 – Aug. 22	Closed ^A	
	Aug. 23 – Aug. 29	5 hours per week ^A	
	Aug. 30 – Sep. 5	Closed ^A	
	8" mesh 3:1 hang ratio	Jun. 28 – Jul. 11	24 hours per week
		Jul. 12 – Jul. 25	48 hours per week
Jun. 14 – Jun. 27		24 hours per week	
Mouth to Pt Mann Bridge- set net	Jul. 26 – Aug. 1	21 hours per week	
	Aug. 2 – Aug. 8	24 hours per week ^A	
	Aug. 9 – Aug. 15	4-7 hours per week ^A	
	Aug. 16 – Aug. 22	Closed ^A	
	Aug. 23 – Aug. 29	5 hours per week ^A	
	Aug. 30 – Sep. 5	Closed ^A	
	Pt Mann Bridge to Sawmill Creek- drift net	Jun. 7 – Jun. 13	8 hours per week
		Jun. 14 – Jun. 20	Closed
		Jun. 21 – Jun. 27	8 hours per week
8" mesh 3:1 hang ratio		Jun. 28 – Jul. 11	12 hours per week ^B
	Jul. 12 – Jul. 25	24 hours per week ^B	
Pt Mann Bridge to Sawmill Creek- set net	Jun. 7 – Jun. 13	24 hours per week	
	Jun. 14 – Jun. 20	Closed	
	Jun. 21 – Jun. 27	24 hours per week	
	Jun. 28 – Jul. 25	Closed ^C	
	Jul. 26 – Aug. 1	90 hours per week ^{B C D}	
	Aug. 2 – Aug. 8	105 hours per week ^{B C D}	
	Aug. 9 – Aug. 15	15 hours per week ^{B C D}	
	Aug. 16 – Aug. 29	Closed ^C	
Harrison River ^E - drift net	Aug. 16 – Aug. 22	60 hours per week	
	Aug. 23 – Aug. 29	12 hours per week	
Harrison River ^E - beach seine	Aug. 16 – Aug. 22	24 hours per week	
	Aug. 23 – Aug. 29	12 hours per week	
Harrison River ^E - set net	Aug. 16 – Aug. 22	61 hours per week	
	Aug. 23 – Aug. 29	72 hours per week	

Sawmill Creek to Texas Creek – set net (openings include DN and RR as well unless stated otherwise)	Mar 28 – Jun 12 Jun 12 – Jun 13 Jun 13- Jun 24 Jun 24 – July 3 July 3 – July 18 July 18 – July 22 July 22 – Aug 1 Aug 1 – Sep 20 Sep 20 – Oct 15	Closed Closed ^F (2 days) Closed 2 days per week Closed ^F (3 days) Closed ^F (3 days) Closed ^F (7 days), G 7 days per week Closed ^H (7 days), J
Thompson River below Bonaparte – set net (openings include DN and RR as well unless stated otherwise)	Mar 28 – Jun 12 Jun 12 – Jun 13 Jun 13 – Jun 24 Jun 24 – July 3 July 3 – July 15 July 15 – July 18 July 18 – July 22 July 22 – Aug 1 Aug 1 – Sep 22 Sep 22 – Oct 8 Oct 8 – Oct 15	Closed Closed ^F (2 days), I Closed 2 days per week ^I Closed Closed ^F (3 days), I Closed ^F (3 days) Closed ^F (7 days) 7 days per week ^J (Sep 20 onward) Closed ^H (7 days), J, I and K Closed ^H (7 days), J, I
Texas Creek to Kelly Creek – set net (openings include DN and RR as well unless stated otherwise)	Mar 28 – Jun 19 Jun 19 – July 3 July 3 – Aug 8 Aug 8 – Sep 27 Sep 27 – Oct 15	Closed 2 days per week – daylight only Closed ^F (7 days - daylight) L (July 9th onward) 7 days per week – daylight hours ^L Closed ^H (dip only - daylight)
Kelly Creek to Deadman Creek – set net (openings include DN and RR as well unless stated otherwise)	Mar 28 – Jun 25 Jun 25 – July 4 July 4 – Aug 1 Aug 1 – Sep 27 Sep 27 – Oct 15	Closed 2 days per week Closed ^F (7 days), M 7 days per week Closed ^H (dip only)
Deadman Creek upstream to Naver Creek – (set net not a common gear – typically dip net or angling)	Mar 28 – July 1 July 1 – July 11 July 11 – Aug 8 Aug 8 – Oct 31	Closed 7 days per week (Dip net and Rod Reel) Closed to SK retention ^F 7 days per week
Naver Creek upstream to 5km above the Nechako confluence and Nechako River to Stuart River, upstream to Hwy Bridge at Fort St James set-net	Mar 28 – July 1 July 1 – July 16 July 16 – Aug 13 Aug 13 – Oct 31	Closed 7 days per week Closed to SK retention ^F 7 days per week
5km upstream of Nechako confluence to Shelley and upstream of Nechako/Stuart River confluence- set net	Mar 28 – July 1 July 1 – Oct 31	Closed 7 days per week

^A Kwikwetlem First Nation provided licences for 48 hours per week

^B Dip net gear also licensed

^C Matsqui First Nation provided licences for limited harvests from fish wheels

^D Bristol Island/Hope to Sawmill Creek area only

^E Chehalis and Scowlit First Nation demonstration fishery

^F Selective fisheries for Chinook only by dip net or rod and reel.

^G Siska/NTA provided licence for 8" mesh 3:1 hang ratio attended net (licensed between July 22 – Aug 3)

^H Selective fisheries for Sockeye and Chinook by dip net, rod and reel (or other selective means if stated)

^I Open along the Thompson/Fraser Confluence to Skihist, and Oregon Jack Creek to Bonaparte R. only (one or more bands)

^J No use of bait on rod and reel

^K Use of angling with rod and reel only (Nicomen Indian Band) (Skihist to Oregon Jack Creek)

^L Closed to use of rod and reel in the Bridge River Traditional Area

^M Highbar selective fishing licence began July 6th rather than July 4th

2010 Annual Summary of First Nations Fisheries Chinook Catch by Area in the Fraser River Mainstem and Tributaries

AREA	Chinook (directed fisheries)	Total Chinook
Mainstem Fraser		
Below Port Mann Bridge	2960	3594
Port Mann Bridge to Mission Bridge	2787	4035
Mission Bridge to Harrison River	853	1491
Harrison River to Hope Bridge	1474	2681
Hope Bridge to Sawmill Creek	1844	4345
Sawmill Creek to Texas Creek	232	309
Texas Creek to Kelly Creek	109	233
Kelly Creek to Deadman Creek	0	2
Deadman Creek to Marguerite Ferry	0	11
Naver Creek to Shelly & Nechako River to Isle Pierre	0	83
Mainstem Subtotals	10259	16784
Tributaries		
Harrison River	0	5
Lillooet River System ^a	1	1
Thompson River downstream of Bonaparte River confluence	7	39
Thompson River upstream of Bonaparte River confluence	0	1202
Chilcotin River System	0	64
Nechako River System upstream of Isle Pierre	0	4
Stuart River System	0	3
Tributary Subtotals	8	1318
Totals	10267	18102

^a Please note, the Lillooet River System was only partially monitored

Appendix E: 2010 Recreational Catch Data

Lower Fraser River mainstem: the lower Fraser River mainstem recreational fishery study area was bound by the mouth of the Coquihalla River (upstream boundary) and Mission Bridge (downstream boundary). The Rosedale Bridge separated the study area into 2 sections. The study was conducted from July 16th to Oct.15th, 2010. Recreational catch and effort estimates for this fishery are preliminary and are reported in Table 1 and Figures 1 and 2.

Table 1. Preliminary catch and effort estimates for the lower Fraser River mainstem recreational fishery in 2010.

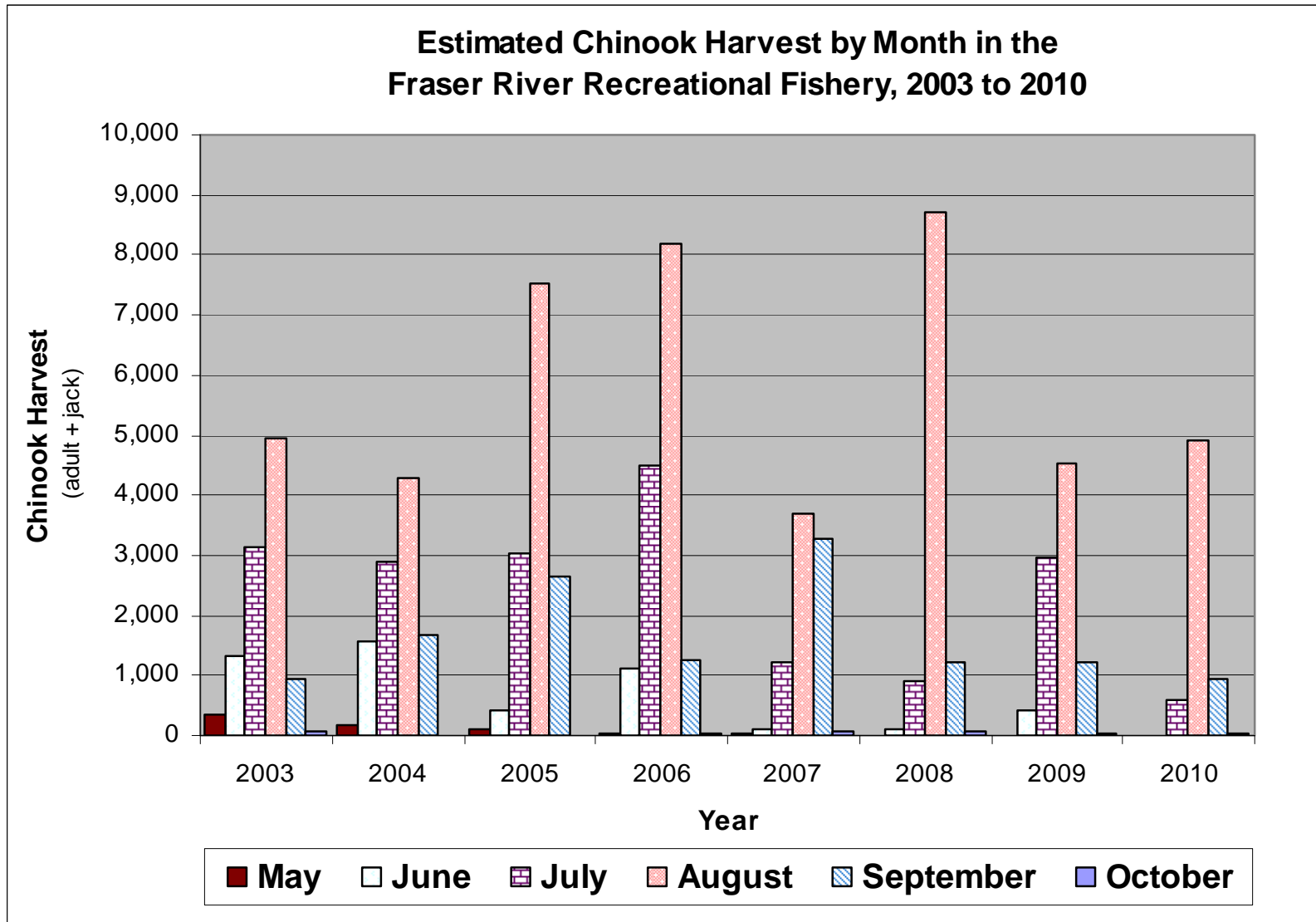
ANALYSIS PERIOD	May ²	June ²	Jul.01 to Jul.15 ²	Jul.16 to Jul.29	Jul.30 to Aug.08	Aug.09 to Aug.15 ³	Aug.16 to Aug.22 ³	Aug.23 to Aug.31 ³	Sep.01 to Sep.12 ³	Sep.13 to Sep.19 ^{3,4}	Sep.20 to Sep.30	Oct.01 to Oct.15	2010 Totals
STATUS OF ESTIMATES	-	-	-	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary	Post-season preliminary
STUDY EFFORT ¹													
Number of Days in Study	-	-	-	14	10	7	7	9	12	7	11	15	92
Number of Days Surveyed	-	-	-	10	8	5	5	5	10	5	7	10	65
Number of Interviews Conducted	-	-	-	695	833	1,422	1,323	1,159	3,182	1,457	193	268	10,532
Angler Effort from Interviews (hrs)	-	-	-	3,268	4,074	5,805	4,772	4,680	10,901	5,152	671	984	40,307
Number of Overflights	-	-	-	4	2	4	4	5	6	2	2	6	35
ANGLER EFFORT													
Average Overflight Count (IRC)	-	-	-	214	588	1,223	1,074	1,080	1,068	970	95	90	na
Estimated Effort (hrs)	-	-	-	32,277	65,685	108,999	90,369	104,233	121,258	72,595	8,523	13,831	617,770
ESTIMATED HARVEST (incl. est. AFC harvest)													
Chinook Adult	-	-	-	574	1,463	665	826	1,639	571	245	56	26	6,065
Chinook Jack	-	-	-	11	49	114	39	107	61	14	0	18	413
Coho Adult	-	-	-	0	0	0	0	0	33	34	11	28	106
Coho Jack	-	-	-	0	0	0	0	0	0	0	0	0	0
Sockeye	-	-	-	0	77	38,898	38,745	35,455	53,358	28,894	64	0	195,491
Pink	-	-	-	0	0	0	0	0	0	0	0	0	0
Chum	-	-	-	0	0	0	0	0	10	17	253	1,269	1,549
ESTIMATED RELEASE													
Chinook Adult	-	-	-	576	143	17	65	281	25	34	62	26	1,229
Chinook Jack	-	-	-	0	0	18	26	0	22	0	0	18	84
Coho Adult	-	-	-	0	0	0	0	0	220	204	45	176	645
Coho Jack	-	-	-	0	0	0	0	0	0	0	13	0	13
Sockeye	-	-	-	2,873	40,106	12,351	9,537	9,900	13,366	8,962	3,754	0	100,849
Pink	-	-	-	0	0	0	0	0	0	0	0	0	0
Chum	-	-	-	0	0	0	26	0	0	0	113	6,103	6,242
ESTIMATED AFC HARVEST													
Chinook Adult	-	-	-	13	11	0	0	12	0	0	0	0	36
Chinook Jack	-	-	-	0	0	0	0	0	0	0	0	0	0
Coho Adult	-	-	-	0	0	0	0	0	0	17	11	9	37
Coho Jack	-	-	-	0	0	0	0	0	0	0	0	0	0
Sockeye	-	-	-	0	0	0	0	0	0	10	0	0	10

- ¹ study area in 2010 from mouth of Coquihalla to Mission Bridge
- ² in 2010, study area was closed to fishing for salmon from May 01st to July 15th; no assessment conducted
- ³ sockeye retention opened on Aug.09th
- ⁴ sockeye retention closed after Sep.19th

IRC Instantaneous Rod Count of entire study area
AFC Adipose Fin Clip
na not applicable

December 9, 2010
JT

Figure 1. Estimated Chinook harvest (adult + jack) by month in the lower Fraser River mainstem recreational fishery, 2003-2010.



Note: in 2010, fishery was closed to fishing for salmon until July 16th.

Table 2. Lower Fraser River Recreational Fishery Catch and Effort Information, 2002 to 2010.

YEAR	2002	2002	2002	2003	2003	2003	2004	2005	2006	2007	2007	2007 ^c	2008 ^d	2009 ^e	2010 ^f
Approx. Period Assessed	May-Sep	Oct-Nov	Total	May-Sep	Oct-Nov	Total	May-Sep	May-Sep	May-Oct	May-Oct	Oct-Nov	May-Nov	May-Oct	May-Oct	Jul-Oct
STATUS OF ESTIMATES	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Preliminary	Preliminary	Preliminary
STUDY DESIGN															
Study Type	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH
Study Start Date	May.15	Oct.15	May.15	May.01	Oct.09	May.01	May.01	May.01	May.01	May.01	May.01	May.01	May.01	May.01	Jul.16
Study End Date	Sep.07	Nov.30	Nov.30	Sep.01	Nov.30	Nov.30	Sep.10	Sep.07	Oct.09	Oct.08	Nov.30	Nov.30	Oct.15	Oct.15	Oct.15
Study Area Upper Boundary	OCR	OHR	OCR/OHR	OCR	OHR	OCR/OHR	OCR	OCR	OCR	OCR	ARB	OCR/ARB	OCR	OCR	OCR
Study Area Lower Boundary	OSR	PMB	OSR/PMB	OSR	PMB	OSR/PMB	OSR	OSR	OSR	OSR	PTB	OSR/PTB	MB	MB/AFB	MB
STUDY EFFORT															
Number of Days in Study	116	47	163	124	53	214	133	130	162	161	53	214	168	168	92
Number of Days Surveyed															65
Number of Interviews Conducted	10,832	774	11,606	6,007	875	6,882	7,446	6,823	10,235	4,933	1,242	6,175	4,599	7,058	10,532
Number of IRC's (overflights)	34	12	46	34	14	48	38	39	46	45	11	56	37	47	35
ANGLER EFFORT															
Average IRC (overflight) Count	NC	NC	NC	NC	NC	NC	381	341	NC	149	68	129	126	229	616
Angler Effort from Interviews (hrs)	45,659	3,761	49,420	NC	NC	NC	38,575	34,264	49,878	25,243	6,078	31,321	22,537	33,429	40,307
Estimated Effort (hrs)	353,854	37,657	391,511	619,794	39,231	659,025	524,886	439,876	747,058	249,650	35,511	285,161	228,682	429,898	617,770
ESTIMATED HARVEST (incl. est. AFC harvest)															
Chinook Adult	3,479	24	3,503	10,481	66	10,547	10,274	13,546	14,436	7,963	22	7,985	10,352	8,222	6,065
Chinook Jack	189	25	214	217	0	217	335	178	707	367	19	386	690	973	413
Coho Adult	0	235	235	0	796	796	12	0	0	8	160	168	12	190	106
Coho Jack	0	46	46	0	90	90	0	0	0	0	66	66	0	0	0
Sockeye	125,040	0	125,040	73,393	0	73,393	50,388	42,629	134,292	11	0	11	16,344	0	195,491
Pink	0	0	0	9,378	27	9,405	0	17,390	0	18,028	0	18,028	0	40,459	0
Chum	0	2,761	2,761	0	728	728	0	39	900	502	2,505	3,007	760	43	1,549
ESTIMATED RELEASE															
Chinook Adult	476	0	476	693	104	797	587	401	399	373	4	377	856	444	1,229
Chinook Jack	202	5	207	10	68	78	24	125	151	113	29	142	97	58	84
Coho Adult	72	967	1,039	89	1,091	1,180	56	19	90	1,268	552	1,820	92	773	645
Coho Jack	0	96	96	0	330	330	0	0	2	0	377	377	0	34	13
Sockeye	66,789	0	66,789	11,778	0	11,778	9,619	69,814	23,643	24,201	63	24,264	17,131	20,389	100,849
Pink	0	0	0	6,806	1,538	8,344	0	38,522	0	55,197	381	55,578	0	72,039	0
Chum	0	12,484	12,484	0	3,787	3,787	12	172	7,086	2,171	7,897	10,068	2,923	890	6,242

Date last updated: December 9, 2010
 Last updated by: JT

Table 2. Lower Fraser River Recreational Fishery Catch and Effort Information, 2002 to 2010. continued.

Footnotes

- a. Due to extremely high water conditions in 2007, resulting in very unfavourable angling and surveying conditions from June 7th to 26th, the survey area was shifted away from the Sumas River up to Hope, and replaced by the area of Hope up to the Alexandra Bridge (lower Fraser River Canyon). This area switch occurred a second time when the Fraser River mainstem (below Hope) was closed to all angling during August 20th to 30th.
- b. 2008 data still "PRELIMINARY" pending development of new analytical software; 2008 ran from May 1 to Oct 15; Sockeye retention opening was July 26-30..
- c. 2009 data still "PRELIMINARY" pending development of new analytical software; 2009 ran from May 1 to Oct 15; no Sockeye retention opening in 2009.
- f. 2010 data still "PRELIMINARY" pending development of new analytical software; 2010 ran from Jul.16 to Oct 15; Sockeye retention opening was Aug.09 to Sep.19.

Abbreviations

General Abbreviations

AOH Access-Overflight Hybrid
 NK Not Known
 NA Not Applicable
 NC Not Calculated (at present)

Study Area Upper Boundary Abbreviations

OCR Outlet of Coquihalla River
 OHR Outlet of Harrison River
 ARB Agassiz-Rosedale Bridge

Study Area Lower Boundary Abbreviations

OSR Outlet of Sumas River
 PMB Port Mann Bridge
 PTB Pattullo Bridge
 MB Mission Bridge
 AFB Alex Fraser Bridge

Figure 2. Estimated Chinook harvest and angler effort in the lower Fraser River Recreational Fishery, 2002 to 2010.

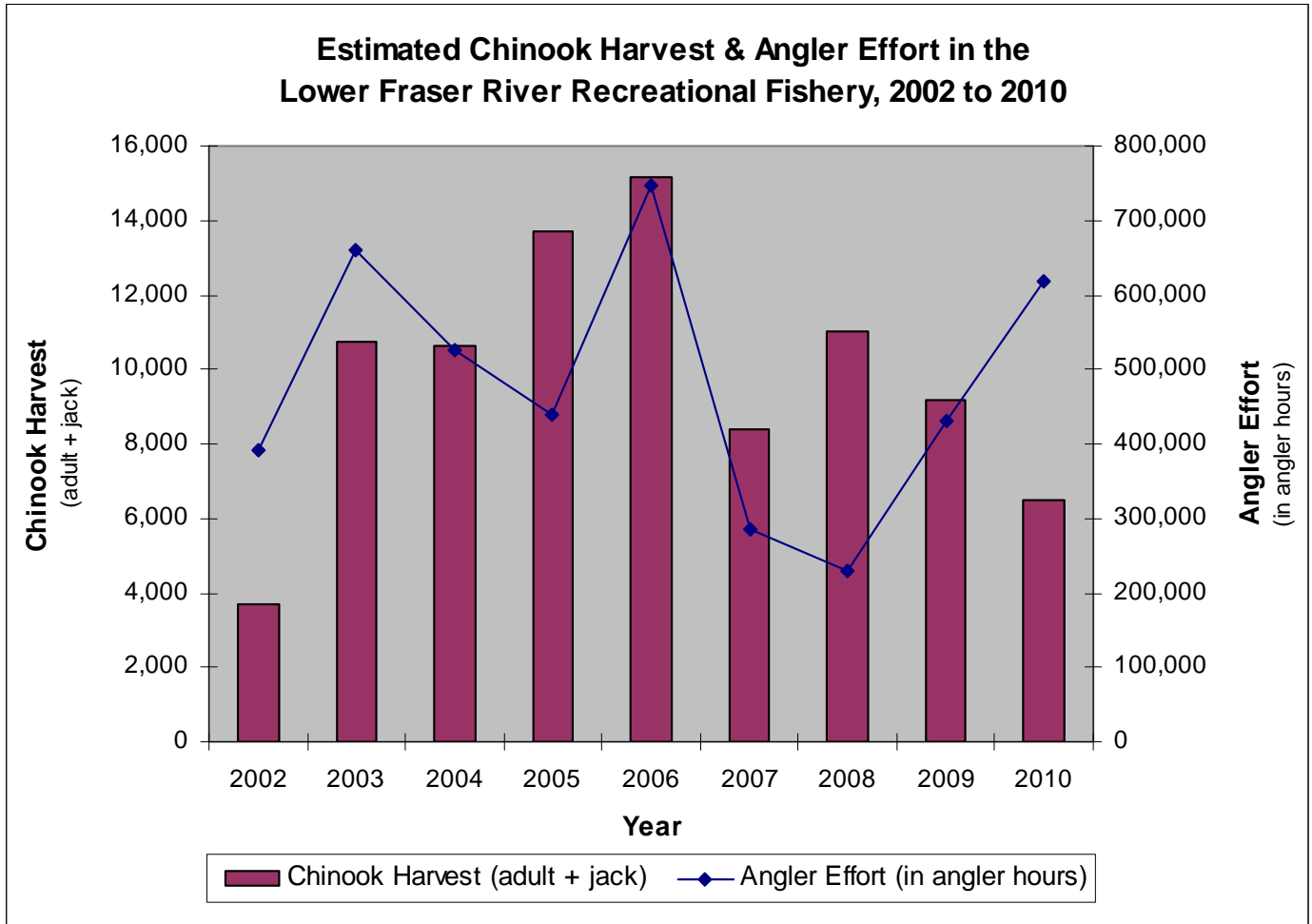


Table 3. Near final, 2010 Chinook Recreational Catches – Upper Fraser River (1)

General Location of Fishery	Duration of Fishery	Hours Fished	Harvested	Released
Bowron River	July 15 - Aug 15	No Creel	N/A	N/A
Chilko River	July 25 - Aug 16	No Creel	N/A	N/A
Fraser River (at Prince George)	July 10 - July 25	No Creel	N/A	N/A
Fraser River (Lillooet)	Aug 16 - Sep 12	323	1	0
Cariboo River	July 27 - Aug 18	No Creel	N/A	N/A
Quesnel River	July 15 - Sep 1	No Creel	N/A	N/A
Bridge River	June 27 - July 1, & July 7 - 8	340	15	0
Mabel Lake	July 25 - Sep 12	16766	620	60
North Thompson/Clearwater River	Aug 1 - Aug 22	No Creel	N/A	N/A
Shuswap River (Lower)	July 25 - Sep 12	19367	1284	302
Shuswap River (Middle)	July 15 - Aug 15	No Creel	N/A	N/A
South Thompson River	Aug 16 - Sep 22	22898	963	93
Thompson River (Savona)	Aug 22 - Sep 30	13067*	18	0
Thompson River (Walhachin)	Aug 22 - Sep 31	966*	0	0
Thompson River (Juniper)	Aug 22 - Sep 32	5788*	80	0
Thompson River (Ashcroft)	Aug 22 - Sep 33	802*	0	21
Thompson River (Goldpan & Martel)	Aug 22 - Sep 34	3955*	29	4
Thompson River (Spence's Bridge)	Closed	.	.	.
Thompson River (Bonaparte)	Aug 13-15 & Aug 20- 22	22	0	1

*"Hours fished" for salmon are pooled (Sockeye & Chinook)

(1) Generally, creel surveys are not undertaken in recreational fisheries where historical information suggests that catch , effort, and associated harvest rates, are very low.

Appendix F: 2010 Commercial Catches

Table 1: Preliminary Estimates of Canadian Commercial Catch of Chinook Salmon by Gear Type and Salmon Licensing Area October 1, 2009 to September 30, 2010 (from FOS*)

Areas	Purse Seine	Gill Net	Troll	Total
Area A	0			0
Area B	87			87
Area C		3325		3325
Area D		1772		1772
Area E		6419		6419
Area F			84444	84444
Area G			79123	79123
Area H			7	7
Total	87	11516	163574	175177

*Fishery Operations System – a database in which DFO maintains catch information for various fisheries.

Appendix G: 2010 Management Measures Summary for Fraser Spring 4₂, Spring 5₂ and Summer 5₂ Chinook

Fishery	Area	Status Quo	March			April			May			June			July			August		
			1	15	31	1	15	30	1	15	31	1	15	30	1	15	31	1	15	31
Commercial:																				
Area F Troll	North Coast		Closed-Status Quo												Open June 15					
Area G Troll	NWVI (Area 125 to 127)		March 16 to April 19 closed. April 20 to May 31 managed to effort limit/catch target limit.									June 1 to 15: managed to 650 boat day effort/catch target limit			Closed					
	SWVI (Area 123/124)	Closed Mar. 15 to Apr. 15	Closed March 1 to April 30 (except inside areas 23/24 open April 19)						May 2 to 31 managed to effort/catch target limit			Closed								
Recreational: Marine																				
Juan de Fuca	West of Cadboro Point to Sheringham Point	2 Chinook per day with minimum size limit of 45cm	March 1 to June 18: 2 chinook between 45-67 cm (hatchery or wild) or >67cm (hatchery only). Subareas 19-1 to -4 and 20-5. Portion of area 20-4 (Jordan River) added to area on June 3.									June 19 to July 15: 2 chinook of which only 1 may be greater than 67cm. Minimum size of 45cm. Subareas 19-1 to 19-4, portion of 20-4 and 20-5.								
Georgia Strait	Corridor between Juan de Fuca and Fraser River (Subareas 18-1 to 18-6, 18-9, 18-11, 19-5, and portions of Subareas 29-4 and 29-5)								June 3 to July 15: 2 chinook of which only 1 may be greater than 67cm. Minimum size limit of 62cm.											
	Area 29 off Fraser River (Area 29-6, 7, 9-10)	2 Chinook per day with minimum size limit of 62cm							May 1 to July 15: Non-retention of Chinook						July 16 to 29: 2 chinook per day between 62cm and 77cm.					
Recreational: Fraser Tidal + Non-tidal																				
Fraser Tidal	Fraser River Tidal (Areas 29-11 to -17)	Currently closed. Open May 1 with daily limit of 4 Chinook, only 1 over 50 cm	Closed-Status Quo						May 1 to July 15: No fishing for salmon						July 16 to 29: 1 chinook per day between 30cm and 77cm.					
Fraser Non-tidal	Freshwater (Mission to Alexandra Bridge)	Currently closed. Open May 1 with daily limit of 4 Chinook, only 1 over 50 cm	Closed-Status Quo						May 1 to July 15: No fishing for salmon						July 16 to 29: 1 chinook per day between 30cm and 77cm.					
	Freshwater (Alexandra Bridge upstream)		Closed-Status Quo						May 1 to July 15: No fishing for salmon						July 16 to August 21: No fishing for Salmon (Mouth of Nicola River); July 15 to August 15: No Fishing for Salmon (Mouth of Besette Creek); July 15 to Aug 15: 1 Chinook per day 77cm or Greater (Mabel Lake and Shuswap River); August 5 to August 15: No Fishing for Salmon (South Thompson River). Fisheries directed on Spring and Summer 5-2 fish (size restriction 30-77cm or reduced fishing times/limits)					
	Freshwater (Region 5 & 7)		Non-retention Chinook															1 Chinook per day between 30cm and 77cm at the following dates and locations: July 10-25 (Fraser River at Prince George); July 15 to Aug 15 (Bowron River); July 15 to Sept 01 (Quesnel River); July 25 to Aug 16 (Chilko River); July 27 to Aug 18 (Cariboo River).		
Fraser River First Nations	Lower Fraser: Below Port Mann	Mid March: 24 hrs/wk drift nets Mid April: 36 hrs/wk drift nets May 1: 48 hrs/wk	Closed for communal fisheries									Start June 19 with reduced communal fishing time								
	Lower Fraser: Port Mann to Sawmill	Mid March: 24 hrs/wk set net, 10hrs/wk drift net May 1: 48 hrs/wk set net, 12 hours/wk drift net	Closed for communal fisheries; very limited ceremonials									Start June 11 with reduced communal fishing time								
	BC Interior: Sawmill to Kelly Cr. And Thompson below the Bonaparte	April 1 to June 15: 4 days per week all gears June 16: 7 days per week until E. Stuart window closure	Closed-Status Quo						Closure to June 11; limited openings for Dip Net fisheries on portions of the Fraser and Thompson Rivers to July 25. Some terminal area restrictions initiated by First Nations						Some fisheries in terminal areas closed or restricted					
Albion Test Fishery	Fraser River Chinook Assessment Fishery	starting April 1: 2 sets per day with 8" or multi-panel net	Closed-Status Quo			April 1: Start of chinook test fishery														

Note: Management actions to protect Fraser Spring 4₂ chinook extend to July 15th. After July 15th, management actions area based on a 3 zone management approach based on the abundance of Spring 5₂ and Summer 5₂ chinook as determined at the Albion chinook test fishery.

Appendix H: Additional Technical Information

1. Harrison Chinook:

The run size of Harrison fall returning Chinook is calculated using the results of the Harrison River escapement program. An exploitation rate is calculated using the run size estimate. The Chinook tag rate produced at the Chehalis River hatchery is very low compared to the total Harrison return. This makes it difficult to find enough tags to develop an exploitation rate during the Harrison escapement program. To get a better estimate, the Chilliwack River exploitation rate has been used in place of Harrison run size calculations. Unfortunately, several problematic issues with the Chilliwack escapement program have contributed to high uncertainty with the estimated exploitation rates. Discussions are underway to decide whether to improve the Harrison program (Chehalis hatchery fish survival), or to improve the Chilliwack escapement and creel programs.

The Chehalis hatchery enhances Harrison River fall returning Chinook through the collection of broodstock from the Harrison River and a small number of *swim-ins* to the hatchery. Production from both facilities is monitored through application and recovery of coded-wire tags (CWT's). The contribution from the Chehalis hatchery to the in-river escapement in the Harrison River is less well known than the Chilliwack hatchery's contribution to the in-river escapement of fall-run fish returning to the Chilliwack River system. This is due in part to the relatively small Chehalis hatchery contribution within the large natural spawning Harrison population. This in turn makes the recovery of CWT's during annual assessment programs difficult, and the absence of CWT recovery sampling and escapement estimation for the Chehalis River. The estimate of fall-run Chinook hatchery contribution to the escapement in the Chilliwack River is better known due to a smaller natural spawning population and a greater proportion of CWT's present.

2. Stock Assessment:

Stock assessment of Chinook salmon coast wide relies upon estimating the exploitation rate on 'indicator stocks' and annual monitoring of escapements to a sample of these naturally spawning Chinook populations. Exploitation rate is the portion of the production from one spawning year that is killed by fishing; this includes catch and incidental mortality. It is determined by dividing the total fishing mortality (i.e., the sum of all kept catches plus incidental mortality over all ages and is adjusted for natural mortality rates of juvenile fish) by the total pre-fishery Cohort estimate (i.e., the total fishing mortality plus total spawning escapement).

Currently, exploitation rate can only be estimated through the CWT program because accurate age and stock-specific catches are required. Other methods and technologies have not been able to provide similar accuracy at similar costs. CWT data from the fall returning, white-flesh stock to the Chilliwack River are used as a surrogate to estimate exploitation of the Harrison River natural stock. Harrison stock from the Chehalis hatchery has been used to determine Harrison exploitation. This technique has been limited by the CWT data due to:

- a small CWT sample size in the Harrison River spawning escapement,
- a lack of assessment information on the number of CWT Chinook returning to the Chehalis River, and
- lower survival of fish released from Chehalis hatchery than Chilliwack hatchery.

This results in a sub-optimal estimation of Harrison stock contribution to fisheries. However, the annual mark-recapture program in the Harrison River does provide a quantitative estimate of this population's spawning escapement (natural production plus the Chehalis hatchery enhancement) by age and sex. Total production from one spawning year in the Harrison natural population is estimated by:

- estimating the exploitation rate by age from the CWT program;
- estimating the spawning escapement by age based on the mark-recapture program;
- estimating the return of Chehalis Chinook and subtracting them from the total escapement by age;
- expanding the terminal run (terminal catch plus spawners) by the ocean exploitation rate by age;
- summing over ages (ages 3 to 5).

Accurate CWT and escapement data are essential to the detection of changes in survival due to the effects of fishing. Appendix B contains lower Fraser River Chinook enumeration data.

Exploitation rate indicator stocks were identified for the upper Fraser, but due to an inability to recover coded-wire tags in the in-river terminal fisheries and to quantify recoveries in the spawning escapements, much of the tagging was discontinued in the late 1980's. Tagging of hatchery production has been continued, largely for Nicola, and Lower Shuswap exploitation rate indicator stocks, but has been discontinued for Dome Creek after the Penny Hatchery operation was closed. Spawning escapements are estimated quantitatively with representative sampling of CWTs in these rivers. As CWT recoveries from some in-river fisheries have not been directly sampled, CWT recoveries will be estimated using alternate methods with information from other nearby in-river fisheries. The best available approach will be used in order to estimate fishing impacts across all fisheries, including those in the Fraser River. The spawning escapement data used in annual assessments are from a subset of streams selected for annual consistency in enumeration methods (referred to as the CTC indicator stocks).

In order to properly account for the full impact of fishing on Chinook stocks, the PST specifies that all parties develop programs to monitor all sources of fishing related mortality on Chinook. Catch monitoring programs are being modified to include estimates of encounters of all legal and sub-legal Chinook, as well as other salmon species, in all fisheries.

3. Forecasting:

Currently, abundance forecasts are developed for only the Fraser fall-run aggregate, excluding those produced by the PST CTC Chinook model. The Fraser fall-run forecast is actually the total of two separate forecasts: one for the natural Harrison River spawning population and one for the river spawning and hatchery brood-stock components of Chilliwack River. Each forecast is based on sibling regressions of either the age-specific estimated terminal run to each river versus estimated total ocean production or estimated total production versus total production based on data collected since the 1984 return year. Sibling regressions use past observations of the number of spawners at one age to predict the subsequent return at a later age. These relationships explain high amounts of variance ($r^2 \geq 0.80$) and provide useful forecasts of ocean abundance, terminal runs and spawning escapements. For the relationship between spawners to be accurate, it is assumed that the ocean exploitation rates are similar to the average over recent years.

To develop forecasts (other than just recent average values, etc.), annual sampling for age structure in the catch and escapement, and a quantitative estimate of spawning escapements is needed. As noted above, upper Fraser escapements are visual estimates of trends, whose bias is largely not assessed, except for a few locations. Further, it would be desirable to have in-river catch by stock and age. The real deficiency in our inability to develop forecasts for upper Fraser Chinook is the fact we cannot reconstruct Cohort abundance because some in-river fisheries have not been directly sampled for CWTs. As mentioned above, several alternate approaches are under consideration and the best available ones will be used to address this deficiency in order to estimate fishery impacts and reconstruct Cohort abundances. Currently, Nicola River, Dome Creek, and Lower Shuswap River have CWTs and reliable escapement estimation programs; however, the utility of these programs to produce forecasts is limited by the lack of a reliable estimate of CWT removals from in-river fisheries.

To accurately estimate the number of CWT's removed during in-river fisheries, required information includes:

- accurate catch estimates in all the time/area strata; catch must be estimated for all fisheries in order to produce accurate estimates of Cohort size and fishing impacts;
- reliable and representative sampling of CWT's from those strata (sampling rates of about 20%, preferably all CWT's encountered by surveyors); indirect CWT recovery rate information can be used from suitable alternate fisheries when direct information is unavailable; and,

DFO assessment capabilities and resources are acknowledged as a serious limitation to catch estimation and sampling of all fisheries. An approach to address these data gaps may involve greater participation by stakeholders in catch estimation and sampling programs in addition to a greater role in decision making. To summarize, we currently do not have an empirical basis to forecast upper Fraser River Chinook returns.

4. Other Stock Assessment Information:

a.) Coded Wire Tag Information

Nearly all the exploitation rate information available on Fraser River Chinook is derived from CWT's recovered from commercial, recreational and aboriginal fisheries. In addition, CWT analyses provide information on the stock distribution, abundance, survival and timing.

b.) DNA Analysis

Over successive generations, distinct fish populations have adapted to fit and prosper in particular niches in their ecosystems. These specialized characteristics are frequently expressed as unique patterns in their genetic code. The Molecular Genetics Lab at the Pacific Biological Station utilizes micro-satellite DNA and major histo-compatibility complex (MHC) genetic variation to examine differences in fish populations for ecological and conservation reasons as well as to assist in fisheries management.

To date, hundreds of distinct fish stocks (primarily Pacific salmon) have been examined, resulting in the most comprehensive set of micro-satellite DNA baseline data for fisheries in the

world. DNA baseline samples and fishery samples have been collected from selected Pacific fisheries for the past five years. DNA analysis of fishery samples and additional baseline sampling has been reduced since 2000 due to other funding priorities.

5. Setting Escapement Objectives:

DFO is looking at new methodologies for setting escapement goals including a stock-recruitment based assessment and a habitat based escapement assessment. The information needs for the stock recruitment method include; number of spawners, fishing mortalities by stock and age, definitions of spawning stocks. Additionally, assumptions must be made about natural mortality rates and patterns, time sequence of environmental patterns, and consistency of data series.

The information needs for a habitat based assessment are more readily available in large spatial databases such as the Provincial Watershed Atlas and Terrain Resource Information Maps. Two biologically-based methods appear useful to establish escapement goals and both focus on estimating carrying capacity. Escapement goals will be based on each aggregate's management objectives. One method estimates spawner capacity from spawner density-habitat relationships developed from Fraser River populations (Parken et al. 2002¹). Presently, the method is being ground-truthed with fish production and stock-recruitment data for the Nicola River. The second method relies on relationships between carrying capacity, estimated from stock-recruitment analyses, and habitat parameters such as watershed area (Parken et al. 2006²). The habitat and stock-recruitment data are from 25 populations ranging from North-western Alaska to 9 coastal Oregon. The model predicts the spawning abundance producing maximum sustained yield and the spawning abundance at the stable equilibrium, called capacity, in units of total spawners. Since most of the Fraser River stocks only have spawner abundance indices, which tend to underestimate the total number of spawners (Bailey et al. 2000³; Parken et al. 2003⁴), further calibration of the current visual escapement estimates is needed in order to use similar units for comparisons. Calibration work will be continued at the Lower and Mid Shuswap rivers, Coldwater River, and possibly Chilcotin River in 2009.

¹ Parken, C.K. J.R. Irvine, R.E. Bailey, and I.V. Williams. 2002. Habitat-based methods to estimate spawner capacity of Chinook salmon in the Fraser River watershed. Canadian Science Advisory Secretariat Research Document 2002/114, Ottawa.

² Parken, C.K., R.E. McNicol, and J.R. Irvine. 2006. Habitat-based methods to estimate escapement goals for data limited Chinook salmon stocks in British Columbia, 2004. Canadian Science Advisory Secretariat Research Document 2006/083, Ottawa.

³ Bailey, R.E., C. K. Parken, J. R. Irvine, B. Rosenberger, and M. K. Farwell. 2000. Evaluation of the utility of aerial overflight based estimates versus mark-recapture estimates of Chinook salmon escapement to the Nicola River, British Columbia. Canadian Stock Assessment Secretariat, Research Document 2000/152, Ottawa.

⁴ Parken, C.K., R.E. Bailey, and J.R. Irvine. 2003. Incorporating uncertainty in area-under-the-curve and peak counts salmon escapement estimation. North American Journal of Fisheries Management 23:78-90.

Appendix I: DFO Contacts

Fisheries Management - Lower Fraser Area	Area Chief	Janet Gagne	(604) 666-6512
	Program Co-ordinator - Recreational, Commercial and Aboriginal Fisheries	Debra Sneddon	(604) 666-6509
	Resource Manager - Aboriginal Fisheries	Jason Morgan	(604) 666-8426
	Resource Manager - Aboriginal Fisheries	Sheldon Evers	(604) 666-8049
	Resource Manager - Commercial Fisheries	Barbara Mueller	(604) 666-2370
	Resource Manager – Recreational Fisheries & PICFI	Brian Matts	(604) 666-2096
	A/Management Biologist (Chinook, Coho, Chum)	Jason Mahoney	(604) 666-2417
A/Management Biologist (FN catch monitoring)		Matthew Parslow	(604) 666-6608
Fisheries Management - B.C. Interior	Area Chief	Les Jantz	(250) 851-4878
	Resource Manager - Fraser River watershed upstream of Deadman Creek	Dave Reedman	(250) 305-4019
	Asst. Resource Manager - Fraser River watershed upstream of Deadman Creek	Steve Ratko	(250) 305-3014
	Resource Manager - Thompson/Columbia/Okanagan Rivers and Fraser River from Sawmill Creek to Deadman Creek.	Dean Allan	(250) 851-4821
	Asst. Resource Manager - Thompson/Columbia/Okanagan Rivers and Fraser River from Sawmill Creek to Deadman Creek.	Merv Mochizuki	(250) 851-4952
	Senior Management Biologist	Jamie Scroggie	(250) 851- 4948
	A/Management Biologist	Lita Gomez	(250) 851- 4852
Fraser Stock Assessment	Area Chief – Fraser Stock Assessment	Timber Whitehouse	(250) 851-4833
	Head – Chinook and Coho Program	Richard Bailey	(250) 851-4814
	Assessment Biologist – Chinook and Coho	Nicole Trouton	(250) 851-4989
	Assessment Biologist – Chinook and Coho	Sue Lemke	(250) 851-4849
	Assessment Biologist – Chinook and Coho	Kris Singer	(604) 666-8713
	Head – Chinook and Coho Analysis Program	Mike Chamberlain	(250) 851-4947
	Head – Chum, Pink and Recreational Fisheries Assessments Program	Joe Tadey	(604) 666-7273
Assessment Biologist – Chum, Pink and Recreational Fisheries Assessments	Vacant	(604) 666-2453	
Conservation & Protection	Area Chief - Lower Fraser River Area	Herb Redekopp	(604) 607-4156
	Area Chief – B.C. Interior Area	Stu Cartwright	(250) 851-4922

Appendix J: Total mortality distributions of Fraser River Chinook indicator stocks among fisheries and spawning escapement by catch year.

Table 1: Total mortality distribution of Dome Chinook among fisheries and spawning escapement by catch year. Estimates were not developed for 1999, 2004, 2007-8 due to sparse or no data.

Catch Year	SEAK AABM			NBC AABM		WCVI AABM		ISBM														Spawning Escapement
	T	S	N	T	S ¹	T	S ³	Canada										US				
								Georgia St. T	Other T ³	Georgia St. S	Juan de Fuca S	Terminal S	Nicola Mouth S	Lower Shuswap S	North/Central N	Terminal Commercial N	Terminal Native N	Other N	T	S	N	
1995	0.0%	0.0%	0.0%	0.8%	0.0%	1.9%	0.0%	0.0%	0.0%	1.8%	5.3%	3.3%	0.0%	0.0%	0.0%	1.9%	10.4%	0.0%	0.4%	1.7%	0.0%	72.5%
1996	0.0%	0.0%	0.0%	0.8%	1.1%	0.3%	0.0%	0.0%	0.0%	0.0%	6.1%	4.2%	0.0%	0.0%	0.0%	4.8%	34.0%	0.0%	0.0%	2.4%	0.0%	46.4%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.3%	0.0%	0.0%	0.0%	8.5%	0.0%	0.0%	0.0%	0.0%	3.5%	27.5%	0.0%	1.7%	0.0%	1.4%	55.6%
1998	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	3.1%	3.9%	0.0%	0.0%	0.0%	4.9%	63.1%	0.0%	0.0%	0.0%	0.0%	23.7%
2000	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.3%	0.0%	0.0%	0.0%	0.0%	3.0%	50.3%	0.0%	2.9%	0.0%	0.0%	28.5%
2001	0.0%	0.0%	0.0%	0.0%	1.1%	2.3%	0.0%	0.0%	0.0%	3.0%	15.9%	3.4%	0.0%	0.0%	0.0%	4.6%	44.9%	0.0%	0.4%	0.0%	0.0%	24.5%
2002	0.0%	0.0%	0.0%	11.0%	0.0%	11.7%	0.0%	0.0%	0.0%	0.0%	11.0%	0.0%	0.0%	0.0%	0.0%	2.2%	17.2%	0.0%	3.2%	0.0%	0.0%	43.5%
2003	0.0%	0.0%	0.0%	5.3%	0.0%	0.0%	7.2%	0.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	8.9%	51.0%	0.0%	0.0%	0.0%	0.0%	15.1%
2005	0.0%	0.0%	0.0%	4.2%	0.0%	0.5%	0.0%	0.0%	0.0%	1.5%	2.7%	7.5%	0.0%	0.0%	0.0%	1.1%	55.5%	0.0%	0.0%	0.9%	0.0%	26.2%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%	1.6%	3.2%	0.0%	0.0%	0.0%	0.0%	1.6%	55.6%	0.0%	0.7%	0.0%	0.0%	32.0%

Table 2: Total mortality distribution of Nicola Chinook among fisheries and spawning escapement by catch year.

Catch Year	SEAK AABM			NBC AABM		WCVI AABM		ISBM														Spawning Escapement
	T	S	N	T	S ¹	T	S ³	Canada										US				
								Georgia St. T	Other T ³	Georgia St. S	Juan de Fuca S	Terminal S	Nicola Mouth S	Lower Shuswap S	North/Central N	Terminal Commercial N	Terminal Native N	Other N	T	S	N	
1995	0.0%	0.0%	0.0%	0.2%	0.8%	1.2%	0.5%	0.0%	0.0%	0.9%	1.7%	2.1%	1.3%	0.0%	0.0%	1.2%	7.7%	1.5%	0.1%	0.4%	0.0%	80.5%
1996	0.0%	0.0%	0.0%	4.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	15.6%	2.7%	0.0%	0.0%	0.0%	74.7%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%	0.0%	4.8%	0.0%	0.3%	1.9%	8.2%	14.9%	0.0%	9.7%	0.0%	54.7%
1998	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.6%	0.6%	1.1%	5.9%	0.0%	0.0%	1.8%	19.7%	1.1%	0.0%	0.0%	0.0%	67.7%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%	1.8%	0.0%	0.0%	0.0%	0.8%	23.3%	0.0%	0.6%	0.0%	0.0%	72.8%
2000	0.0%	0.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.6%	3.1%	0.8%	3.5%	0.0%	0.0%	1.5%	26.1%	0.0%	0.0%	0.0%	0.0%	62.9%
2001	0.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	0.3%	3.8%	2.0%	2.6%	0.0%	0.0%	1.0%	6.2%	0.0%	0.8%	0.0%	0.0%	82.8%
2002	0.0%	0.0%	0.0%	1.4%	0.3%	0.8%	0.0%	0.0%	0.0%	0.3%	1.0%	0.3%	2.4%	0.0%	0.2%	0.3%	3.3%	0.0%	0.8%	0.2%	0.0%	88.7%
2003	0.1%	0.0%	0.0%	2.0%	0.0%	0.7%	0.5%	0.0%	0.0%	0.6%	1.5%	2.9%	2.7%	0.0%	0.0%	2.3%	16.4%	0.0%	0.4%	0.0%	0.0%	69.9%
2004	0.0%	0.0%	0.0%	2.3%	0.0%	1.8%	0.0%	0.0%	0.0%	2.4%	1.7%	0.0%	0.0%	0.0%	0.0%	1.7%	21.9%	0.0%	0.9%	0.0%	0.0%	67.3%
2005	0.0%	0.0%	0.0%	0.9%	0.0%	3.2%	0.0%	0.0%	0.0%	2.4%	3.4%	2.7%	10.5%	0.0%	0.0%	0.5%	24.1%	0.0%	0.4%	0.0%	0.0%	51.8%
2006	0.0%	0.0%	0.0%	1.6%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	2.9%	0.7%	8.5%	0.0%	0.0%	0.5%	16.7%	0.0%	0.4%	0.0%	0.0%	67.0%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	0.0%	0.0%	0.0%	0.0%	0.0%	5.3%	19.5%	0.0%	0.0%	0.3%	21.6%	0.0%	1.5%	0.0%	0.0%	45.3%
2008	0.0%	0.0%	0.0%	1.0%	0.7%	0.0%	0.0%	0.0%	0.0%	2.1%	1.2%	1.0%	2.1%	0.0%	0.0%	0.8%	23.0%	0.0%	1.8%	0.3%	0.0%	66.0%
2009	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.8%	17.1%	3.4%	0.0%	0.0%	0.7%	19.9%	0.0%	1.4%	0.0%	0.0%	46.3%

Table 3: Total mortality distribution of Lower Shuswap Chinook among fisheries and spawning escapement by catch year.

Catch Year	SEAK AABM			NBC AABM		WCVI AABM		ISBM														Spawning Escapement
								Canada										US				
	T	S	N	T	S ¹	T	S ³	Georgia St. T	Other T ³	Georgia St. S	Juan de Fuca S	Terminal S	Nicola Mouth S	Lower Shuswap S	North/Central N	Terminal Commercial N	Terminal Native N	Other N	T	S	N	
1995	22.7%	5.2%	0.0%	15.6%	10.9%	4.7%	0.0%	0.0%	1.0%	0.0%	1.8%	0.0%	0.0%	0.8%	0.3%	2.2%	4.3%	3.6%	0.0%	0.0%	5.5%	21.4%
1996	18.4%	0.0%	0.0%	0.6%	3.6%	0.5%	1.1%	0.0%	0.0%	0.9%	2.5%	1.4%	0.0%	0.0%	0.2%	5.9%	2.5%	0.5%	0.0%	0.0%	0.0%	62.1%
1997	20.0%	0.0%	1.2%	12.7%	6.4%	0.5%	0.0%	0.0%	1.0%	3.8%	3.5%	0.0%	0.0%	0.0%	0.2%	25.9%	1.7%	4.2%	0.0%	0.0%	4.2%	14.7%
1998	20.9%	8.7%	0.1%	9.0%	16.4%	0.0%	0.7%	0.0%	0.0%	4.7%	1.4%	0.0%	0.0%	0.7%	0.0%	4.6%	4.0%	0.4%	0.0%	0.0%	1.0%	27.4%
1999	32.1%	13.4%	0.0%	1.5%	13.6%	0.0%	0.0%	0.0%	0.0%	4.7%	1.2%	0.0%	0.0%	0.7%	0.0%	1.4%	7.9%	0.0%	0.0%	0.0%	0.0%	23.6%
2000	10.7%	10.0%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%	2.5%	1.2%	1.4%	0.0%	0.0%	0.0%	4.4%	3.1%	0.0%	0.0%	0.4%	0.1%	61.1%
2001	8.0%	0.3%	1.0%	0.0%	5.0%	0.0%	0.0%	0.1%	2.4%	3.2%	2.0%	0.2%	0.0%	4.8%	0.0%	0.7%	0.4%	0.7%	0.1%	0.0%	0.2%	71.0%
2002	18.4%	3.5%	0.0%	12.9%	7.0%	1.5%	0.0%	0.0%	0.1%	1.3%	1.6%	0.0%	0.0%	0.5%	0.0%	3.6%	4.9%	0.0%	0.0%	0.0%	0.0%	44.7%
2003	11.1%	2.3%	1.0%	9.0%	6.2%	0.0%	0.3%	0.0%	1.2%	0.8%	5.0%	1.5%	0.0%	0.3%	0.0%	2.2%	2.5%	0.0%	0.4%	0.0%	0.7%	55.6%
2004	17.9%	2.3%	0.0%	9.4%	11.1%	0.8%	0.0%	0.0%	0.0%	3.8%	0.6%	1.4%	0.0%	0.6%	0.0%	8.3%	3.4%	0.0%	0.3%	0.0%	1.3%	38.8%
2005	14.8%	0.8%	0.0%	12.3%	16.9%	0.4%	3.1%	0.0%	0.0%	2.1%	2.2%	2.7%	0.0%	0.9%	0.0%	0.6%	6.2%	0.0%	0.2%	0.0%	0.4%	36.3%
2006	12.1%	2.1%	0.0%	13.5%	13.6%	0.3%	0.9%	0.0%	0.0%	5.6%	1.3%	2.6%	0.0%	0.4%	0.0%	2.2%	4.5%	0.0%	0.2%	0.0%	0.8%	39.8%
2007	7.2%	7.4%	0.2%	3.1%	9.5%	0.0%	1.0%	0.0%	0.0%	1.4%	2.4%	5.0%	0.0%	0.0%	0.0%	0.7%	9.4%	0.0%	0.0%	0.0%	0.0%	52.8%
2008	8.8%	0.5%	0.0%	7.6%	9.2%	0.0%	1.8%	0.0%	0.0%	3.0%	2.4%	0.9%	0.0%	2.3%	0.0%	0.2%	1.5%	0.0%	0.0%	0.0%	0.0%	61.9%
2009	9.6%	1.2%	0.0%	6.7%	5.9%	0.7%	2.5%	0.0%	0.0%	2.6%	4.4%	1.0%	0.0%	5.4%	0.0%	0.9%	6.6%	0.0%	0.0%	0.0%	0.0%	52.3%

Table 4: Total mortality distribution of Chilliwack Chinook among fisheries and spawning escapement by catch year.

Catch Year	SEAK AABM			NBC AABM		WCVI AABM		ISBM														Spawning Escapement
	T	S	N	T	S ¹	T	S ³	Canada										US				
								Georgia St. T	Other T ³	Georgia St. S	Juan de Fuca S	Terminal S	Nicola Mouth S	Lower Shuswap S	North/Central N	Terminal Commercial N	Terminal Native N	Other N	T	S	N	
1986	0.0%	0.0%	0.0%	0.8%	0.2%	20.5%	0.0%	9.5%	2.6%	17.9%	0.0%	1.0%	0.0%	0.0%	1.5%	6.2%	0.5%	4.9%	2.8%	7.8%	5.0%	18.9%
1987	0.0%	0.0%	0.0%	0.9%	0.3%	19.0%	0.5%	16.0%	0.4%	18.7%	0.0%	1.2%	0.0%	0.0%	0.3%	0.7%	0.3%	0.9%	4.0%	2.8%	3.9%	29.9%
1988	0.4%	0.0%	0.1%	0.2%	0.0%	18.6%	0.0%	6.6%	0.0%	11.1%	0.0%	2.6%	0.0%	0.0%	0.1%	0.8%	0.8%	0.6%	4.3%	2.9%	4.1%	46.7%
1989	0.2%	0.0%	0.0%	0.0%	0.0%	24.1%	0.0%	1.8%	0.0%	17.8%	0.7%	0.6%	0.0%	0.0%	0.5%	1.0%	0.1%	2.1%	6.0%	1.5%	3.7%	39.8%
1990	1.0%	0.0%	0.0%	0.0%	0.3%	11.3%	2.2%	3.7%	0.1%	10.7%	0.4%	1.0%	0.0%	0.0%	1.3%	0.7%	1.1%	1.9%	6.6%	8.5%	16.7%	32.5%
1991	0.2%	0.0%	0.1%	0.4%	0.2%	20.0%	0.7%	9.4%	0.2%	12.8%	0.6%	1.5%	0.0%	0.0%	0.9%	1.0%	0.8%	1.9%	13.8%	5.3%	6.0%	24.3%
1992	0.3%	0.0%	0.0%	0.1%	0.2%	20.3%	0.1%	6.7%	0.7%	9.9%	0.5%	1.2%	0.0%	0.0%	0.3%	0.1%	0.0%	0.8%	8.7%	3.7%	0.9%	45.6%
1993	0.2%	0.0%	0.0%	0.0%	0.4%	13.3%	0.4%	8.1%	0.0%	7.1%	0.2%	1.6%	0.0%	0.0%	0.0%	1.1%	0.2%	0.1%	7.6%	1.1%	0.0%	58.7%
1994	0.4%	0.0%	0.3%	0.7%	0.0%	8.6%	2.7%	3.4%	0.4%	5.6%	0.4%	5.2%	0.0%	0.0%	1.7%	0.3%	0.4%	4.2%	1.5%	6.1%	5.4%	52.7%
1995	0.0%	0.0%	0.0%	0.0%	0.1%	13.0%	0.5%	0.0%	0.0%	6.4%	0.0%	1.0%	0.0%	0.0%	0.8%	0.5%	0.7%	0.4%	1.1%	2.4%	1.4%	71.6%
1996	0.2%	0.0%	0.0%	0.0%	0.0%	2.1%	0.4%	0.0%	0.0%	13.8%	1.9%	2.3%	0.0%	0.0%	1.1%	1.1%	0.1%	0.2%	4.3%	4.6%	1.3%	66.3%
1997	0.8%	0.0%	0.0%	0.2%	0.5%	12.4%	2.7%	0.0%	0.5%	13.1%	0.5%	2.9%	0.0%	0.0%	0.5%	1.9%	0.0%	0.5%	5.4%	4.0%	2.5%	51.5%
1998	0.5%	0.0%	0.0%	0.0%	0.3%	0.2%	0.3%	0.0%	0.0%	3.0%	0.3%	1.3%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	3.5%	0.9%	0.3%	88.9%
1999	0.1%	0.0%	0.0%	0.2%	0.1%	0.3%	1.9%	0.0%	0.0%	10.2%	0.4%	1.6%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	13.6%	1.0%	0.7%	69.4%
2000	0.1%	0.0%	0.0%	0.0%	0.5%	5.9%	2.7%	0.0%	0.0%	3.6%	0.4%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	1.1%	0.7%	78.0%
2001	0.0%	0.0%	0.1%	0.0%	0.2%	3.7%	1.6%	0.0%	0.0%	5.9%	0.9%	11.2%	0.0%	0.0%	0.0%	0.4%	0.1%	0.0%	6.5%	5.3%	1.1%	62.9%
2002	0.3%	0.0%	0.0%	0.1%	0.3%	8.6%	5.1%	0.0%	0.0%	3.5%	0.1%	4.9%	0.0%	0.0%	0.1%	0.4%	0.2%	0.0%	8.1%	3.2%	0.4%	64.8%
2003	0.2%	0.0%	0.0%	0.0%	0.2%	5.9%	2.8%	0.0%	0.0%	2.5%	0.5%	6.5%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	8.5%	1.8%	0.3%	70.7%
2004	0.1%	0.0%	0.0%	0.2%	0.0%	5.2%	2.4%	0.0%	0.0%	0.4%	0.3%	4.8%	0.0%	0.0%	0.0%	0.6%	0.1%	0.0%	6.9%	1.3%	0.1%	77.6%
2005	0.0%	0.0%	0.0%	0.1%	0.2%	7.5%	4.3%	0.0%	0.0%	1.9%	1.5%	6.0%	0.0%	0.0%	0.1%	3.1%	0.2%	0.0%	3.8%	1.9%	0.9%	68.5%
2006	0.0%	0.0%	0.0%	0.5%	0.0%	7.4%	2.1%	0.0%	0.0%	1.1%	1.1%	4.5%	0.0%	0.0%	0.0%	0.5%	0.1%	0.0%	2.8%	2.0%	0.3%	77.5%
2007	0.0%	0.0%	0.0%	0.3%	0.0%	8.5%	3.2%	0.0%	0.0%	1.1%	0.0%	6.0%	0.0%	0.0%	0.0%	2.4%	0.8%	0.0%	2.5%	1.6%	0.7%	72.8%
2008	0.4%	0.0%	0.0%	0.0%	0.0%	10.5%	4.7%	0.0%	0.0%	1.9%	0.0%	10.0%	0.0%	0.0%	0.0%	0.5%	0.1%	0.1%	4.6%	3.3%	0.8%	63.1%
2009	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	3.7%	0.0%	0.0%	1.6%	1.3%	11.4%	0.0%	0.0%	0.0%	2.4%	0.4%	0.0%	0.4%	0.3%	0.0%	76.5%

Footnotes:

1. NBC AABM Sport includes ISBM North S. and ISBM Central S.
2. WCVI AABM Sport includes ISBM WCVI Inside S.
3. ISBM Georgia St. S. includes ISBM Juan de Fuca S.