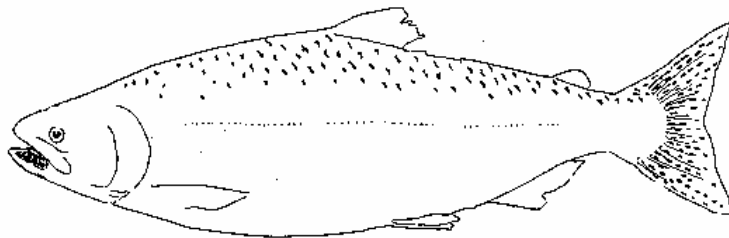


2010

**Information Document to Assist
Development of a**

Fraser Chinook Management Plan



DRAFT FOR DISCUSSION PURPOSES



Fisheries and Oceans
Canada

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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 the seven species of Pacific salmon (including steelhead and anadromous cutthroat) returning to the Fraser and have the widest distribution, with some stocks migrating distances over 900 km from the mouth to systems near the headwaters of the Fraser. They have sustained First Nations for thousands of years, provide important recreational harvesting opportunities, and were an important part of the colonization of British Columbia and development of the commercial fishing industry in British Columbia.

This information document is intended to complement the Southern BC Integrated Fisheries Management Plan for salmon. The development of this document is important for fisheries planning, as chinook fisheries in the Lower Fraser area generally start in March, but the Integrated Fishery Management Plans are usually not finalized until June or July of a given 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 2010. Further consultation will occur as 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 following 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 River in the spring

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

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, the fry of these returning fish 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 shed some light on what they represent.

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

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

the 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 *from 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 in 2010 will 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 the Pacific Integrated Commercial Fisheries Reform package.

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 on this can be found on the internet at http://www-comm.pac.dfo-mpo.gc.ca/publications/wsp/default_e.htm.

An Allocation Policy for Pacific Salmon, announced in 1999, is a significant step towards providing certainty and fairness by establishing clear priorities for allocation between First Nations, commercial and recreational harvesters and forms the basis for general decision guidelines used for planning fisheries.

Pacific Fisheries Reform, announced by the Department in April 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, and fishery participants share in the responsibility of management. Future treaties with First Nations are contemplated, as is the need to be adaptive and responsive to change. 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

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”

access and involvement in management. Work has also been initiated in developing a vision for recreational fisheries to better understand their place in future fisheries. This vision was reviewed at the Fall Dialogue sessions in late 2008 and a copy of this can be found at:

<http://www.pac.dfo-mpo.gc.ca/consultation/fisheries-peche/smon/sfab-ccps/index-eng.htm>

Pacific Fisheries Reform is consistent with existing fisheries management policies and is central to ensuring well integrated, sustainable fisheries for salmon.

In January 2001, 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-comm.pac.dfo-mpo.gc.ca/pages/consultations/consult_e.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 as the primary source of stakeholder input into Integrated Fisheries Management Plans for Salmon.

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-ops2.pac.dfo-mpo.gc.ca/xnet/content/consultations/salmon/sapdefault_e.htm

3.2. Pacific Salmon Treaty (PST)

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). Under the Treaty, Canada and the United States agreed on a Chinook conservation program, based on fixed catch ceilings in certain major mixed-stock ocean fisheries, to rebuild stocks from both countries by 1998. This strategy had mixed results; some populations are slowly rebuilding, while others remain depressed.

Since 1985, Canada based its chinook fisheries management on a rebuilding strategy. Total exploitation rates on a brood year were reduced from past high levels in the range of 75% - 85%. The minimum requirement of the Pacific Salmon Treaty (1985) was a 15% reduction in total exploitation of the four indicator stocks identified at that time. This was in addition to domestic measures already in place, such as the closure of the

terminal Fraser River commercial gill net fishery, and measures required in pass-through fisheries to protect specific stocks.

The PST was revised in 1999 through amendments to the "fishing chapters" contained in Annex IV of the Treaty. Chinook management changed so fishing levels now vary in response to the annual production of chinook salmon (aggregate abundance-based management or AABM). If the ocean abundance of chinook is poor, allowable harvest rates and catches are reduced, so spawning escapements can be protected. However, if the ocean abundance of chinook is very good, then harvest rates and catches can increase, but only to a level that still protects spawning escapements.

The 1999 PST Annex specified allowable landed catches under the AABM management regime for three ocean fishing areas at various levels of chinook abundance. These areas are:

1. SE Alaskan troll, net, and sport fisheries;
2. Northern BC troll and the Queen Charlotte Island sport fishery; and
3. the west coast of Vancouver Island troll and outside sport fisheries.

All other fisheries are referred to as Individual Stock Based Management (ISBM) and are managed to an overall bilaterally-agreed harvest rate, the catch varies with the abundance of chinook. Harvest rates are assessed for individual Canadian and US stocks using coded wire tag (CWT) data and the PSC Chinook Technical Committee (CTC) coast wide model to estimate exploitation rates.

For Canadian and US fisheries, the 1999 agreement established a general obligation to reduce exploitation rates in the ISBM fisheries to 63.5% and 60.0% of the respective average exploitation rates during the 1979-1982 base period. If returns are less than the biologically-based escapement goal then the ISBM fisheries can be required to further reduce their exploitation rates to improve escapements. If returns are greater than the goal, then the harvest rates (and catch) in ISBM fisheries can be increased so long as the goal was still achieved. Only one Fraser River chinook stock has a biologically-based escapement goal (Harrison River) accepted by the PSC Chinook Technical Committee.

The major difference between the 1999 agreement and the 1985 PST was the necessity for a pre-season estimation of chinook abundance in the ocean, and the need for agreed-to escapement goals for each chinook stock identified in Attachments I to V of the 1999 agreement. Chinook forecasts are usually available in March. The establishment of escapement goals remains the responsibility of each management agency, but the technical basis for establishing escapement goals is reviewed by the bilateral PSC Chinook Technical Committee.

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. Included in the modifications to the previous agreement were significant changes to the chinook section (Chapter 3) of the Annex.

Building on changes made in 1999, the Parties agreed to maintain the current abundance-based management regime for chinook, including 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 was reduced by 15%, while the catch ceilings for the Canadian WCVI AABM fishery was reduced by 30% from previous levels.

The chapter also includes new provisions to protect weak stocks, including 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 funds provided by Canada and the US are outlined as follows: (i) \$30M from the US, 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 coastwide coded-wire tag (CWT) program; (iii) \$10M from the Northern and Southern Endowment Funds for a "Sentinel Stocks Program"; (iv) up to \$3M from the US 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. Stocks of Concern for 2010

In the 2010 Salmon Outlook, Spring 4₂, Spring 5₂ and Summer 5₂ chinook have been classified as *stocks of concern*. Over the past 6 years, spawning escapements to these stock groups, known as Fraser River stream-type chinook, have declined steeply, especially those of the 4₂ spring aggregate. Escapements to several of those streams have declined to very low levels, including Louis Creek (6) and Coldwater River (26). In 2003, Nicola escapements exceeded 14, 000, but in 2009, they failed to exceed 500. Abundances of the 5₂ spring and summer aggregates are also fluctuating around 20 year lows⁶, and it is possible that returns of those aggregates will be especially poor in 2010 as the smolts that will make up the majority of the 2010 adult return entered the ocean in 2007. To date returns from Fraser River salmon that entered the ocean in 2007 have been exceedingly poor, as seen by the Interior Fraser coho return in 2008 and the 4₂ spring chinook and sockeye returns in 2009.

⁶ English et al. 2006. Assessment of Chinook salmon returns to the Fraser River watershed using run reconstruction techniques, 1982-04

4. Management Objectives

For management purposes in 2010, Fraser chinook stocks will be managed using the Spring 4₂, Spring 5₂, Summer 5₂, Summer 4₁ and Fraser Fall 4₁ (Harrison) management units employed under the Pacific Salmon Treaty (PST) process. This will align fisheries management objectives with indicator stocks, escapement, catch and exploitation rate data used in the PST process. As a result, the Early-timed Fraser chinook objective will not be used in 2010. Early-timed Fraser chinook, a sub-set of 7 stocks in 3 conservation units, are included in the Spring 4₂ and Spring 5₂ management units. New management objectives will be identified for Spring 4₂ chinook and for the combined management units of Spring 5₂ and Summer 5₂ chinook in the draft Southern BC Integrated Fisheries Management Plan for Salmon.

4.1. Conservation

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

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 impact of fisheries on specific stocks, strategic enhancement and habitat restoration.

4.2. Aboriginal fisheries for food, social and ceremonial purposes

In keeping with DFO's Allocation Policy for Pacific Salmon, DFO is committed to managing fisheries such that First Nations' fishing for FSC purposes has priority over commercial and recreational fishing. All harvesting of FSC is subject to conservation needs.

Consultations are on-going between Resource Management staff and First Nations, both within and outside the Fraser River watershed. Feedback from consultation sessions will be relied upon to provide priority access to First Nations to fish for FSC purposes and any First Nations treaty obligations that may exist.

4.3. International Allocation

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>.

Pre-season fishing plans are formally discussed in bilateral meetings with the United States within the framework of the Pacific Salmon Commission. Scientists from both countries determine catch ceilings in mixed stock fishing areas (AABM fishing areas off the Queen Charlotte Islands and off the West Coast of Vancouver Island). Each country

is responsible for managing their respective fisheries to ensure these catch ceilings are not exceeded.

4.4. Domestic Allocations

The objective is to manage fisheries in a manner that is consistent with the Allocation Policy for Pacific Salmon.

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

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, although management actions developed to conserve MU's are expected 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.⁷ 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, the peak of migrations for summer-run populations entering the Fraser are between July 15th to August 31st, and for fall-run populations, the peak of passage occurs from September 1st onward.⁸ 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, and 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

⁷ **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

⁸ **Department of Fisheries and Oceans (DFO). 1995.** Fraser River Chinook. Prepared for DFO by Fraser River Action Plan. Vancouver, BC

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 both are likely spring stocks.

Table 1. Interim Management Units for Fraser River Chinook salmon

PST Unit	CU #	CU Name	Spawning Locations
4 ₂ Spring Chinook	16	STh Bessette Creek	Bessette Creek;
	17	LTHOM spring age 1.2	Bonaparte River; Coldwater River; Deadman River; Louis Creek; Nicola River; Spius Creek;
5 ₂ Spring Chinook	4	LFR springs	Birkenhead River
	5	LFR Upper Pitt	Pitt River-upper
	8	FR Canyon-Nahatlatch	Nahatlatch River
	10	MFR springs	Cariboo River-upper; Chilako River; Chilcotin River upper; Chilcotin River-lower; Cottonwood River; 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 age 1.3	Blue River; Finn Creek; Raft River
5 ₂ Summer 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 1.3	Eagle River; Salmon River;
	19	NTHOM summer age 1.3	Barriere River; Clearwater River; Mahood River; North Thompson River
4 ₁ Summer Chinook	7	Maria Slough	Maria Slough
	13	STh summer age 0.3	Adams River; Little River; South Thompson River; Lower Thompson River;
	15	Shuswap River summer age 0.3	Shuswap River-lower; Shuswap River-middle
Fraser Late	3	LFR fall white	Harrison River

5.2. Geographical Distribution of Fraser Chinook

Naturally maintained populations of chinook salmon occur throughout the Fraser River watershed. Spawning aggregations are distributed from the lower reaches of the Lower Fraser (Alouette and Pitt rivers) to the Robson River and Swift Creek near Rearguard Falls, 1,100 km above tidewater. Within the BC Interior, all populations are spring or summer timed, and other than those summer populations of the South Thompson and lower Thompson mainstem, all have a stream-type life history. Within the lower Fraser, earlier returning stocks are also stream-types, whereas the later returning Harrison-origin fall runs are immediate migrant ocean-types.

Throughout the Fraser, there are a variety of flesh colours observed in returning adult chinook. White-fleshed chinook are dominant in the Harrison-origin populations, while many other populations tend to have higher proportions of the returns either red-fleshed or marbled (mixes of red and white within the flesh). White-fleshed spawners are not uncommon in Interior populations, and in some instances, may comprise 40% or more of the total escapement.

5.2.1. Lower Fraser River Stocks

Chinook stocks which spawn in the Lower Fraser River are numerically dominated by the fall-returning, white-fleshed 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, as well as transplanted Harrison origin fish returning to the Chilliwack, Stave, and other smaller rivers. Fall-run returns to these systems continue to be supported, to varying degrees, by enhancement. As discussed earlier in this document, the Fraser fall-run stock group exhibits an ocean-type life history but is unusual in that upon emergence from the gravel, the fry migrate immediately 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).

The Lower Fraser River also supports a number of relatively small, unique populations of spring and summer-run chinook. These can be 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 stream-type life history. Chinook returning to Maria Slough are distinct in the Lower Fraser River in that they are a summer-run population that exhibits an ocean-type life history pattern.

Chinook returning to the Birkenhead River (a tributary near the headwaters of the Harrison system) are a very unique early-timed spring-run population that begin returning to the Fraser River as early as February. Data are extremely limited for this population, but peak migration into the lower Fraser River is thought to occur in early April. DNA analysis of Albion Test Fishery catch data indicates Birkenhead chinook continue to be present in the lower Fraser River until mid-May.

It is also important to note that the a single watershed can support multiple chinook stocks, distinguished by timing or other biological characteristics. For example, 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.

5.2.2. Interior Fraser River Stocks

Chinook salmon in the interior Fraser River (above Hope) comprise a large and complex group of spawning populations. These populations can be either red or white-fleshed and frequently both flesh colours occur in a population. Interior Fraser chinook return to 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: spring-run, and summer-run. Recent work by Chuck Parken (DFO Science Branch) has identified further temporal segregation, and has suggested that the spring run could be divided 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 yet been identified in the Interior Fraser.

Most stocks of chinook in the Interior are stream-type life history, with the notable exceptions of the South Thompson and Lower Thompson mainstem summer chinooks which exhibit an ocean-type life history. These Thompson stocks migrate as smolts, typically after 90-150 days of freshwater residence.

5.3. Stock Assessment Methods

Assessments of spawning abundance for lower Fraser River chinook stocks rely on visual surveys, a calibrated dead-pitch project (Chilliwack River fall chinook) and a mark-recapture project (Harrison River). Coded-wire tagging of hatchery produced fish provides 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, calibrated dead-pitch program. Additionally, visual surveys of a suite of smaller stocks including Big Silver and upper Pitt Rivers, as well as Maria Slough provide some information on escapements to those systems. Aerial and ground-based surveys of the Birkenhead River are conducted to estimate escapements to this system.

In the BC Interior, assessment of the four large stock aggregates is largely 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 spawning escapements, comparisons of spawning abundance to reference points such as estimates of the number of spawners required to attain maximum sustainable yield (S_{MSY}), 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 (see Section 6 for details).

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 chinook (Harrison and Chilliwack Rivers) are developed for use in the Chinook Technical Committee's coastwide modelling 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.

The Chinook Technical Committee coastwide model calculates a forecast of ocean abundance for certain chinook stocks represented in the aggregate model. This number is used to manage the AABM fisheries described in Section 3.2. Forecasts for 2010 are not available at this time, but will be developed by mid to late March. Forecasts are not adjusted in-season since there is insufficient information for updates.

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Although quantitative forecasts are not done for stocks managed under the Individual Stock Based Management Regime, the Science Branch of DFO does come up with a qualitative assessment of expectations for the upcoming year. This assessment is called the Salmon Outlook and is available in a draft format by mid-November each year. The Salmon Outlook assigns a categorical value between one and four, associated with varying levels of stock status, to the various salmon stocks. The category reflects the Department's interpretation of available quantitative and qualitative information and forecasts, as well as expert opinion of status. Status categories used in the Outlook are outlined in Table 2. Details of the Outlook for Fraser River chinook stocks for 2010 are shown in Table 3.

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. 2009 Outlook status for Fraser River Chinook

PST MU	Stock	Outlook Status	Comments
Fraser spring-run age 4 ₂	Spring – lower Thompson	1	Extremely poor escapements in 2009. Record lows at Nicola (461), Coldwater (26) and Louis (6). 2009 was the fourth successive year where recruitment failed to replace parental spawning abundance. Exploitation rate indicator for this group is Nicola River. <i>(2009 Outlook status: 1)</i>
Fraser spring-run age 5 ₂	Early spring – lower Fraser	1	Birkenhead River escapement improved (631 adults) in 2009, and was well above the brood year (2004) escapement of 180 adults. The parental brood for the 2010 return was much stronger (1,425), however without an indicator stock for this stock group freshwater and marine survival trends remain unclear. <i>(2009 Outlook status: 2)</i>
	Early spring – upper & mid-Fraser, North Thompson	1	Continued poor marine survival has resulted in continued poor to very poor escapements. 2009 was the third successive year where total recruitment has failed to replace parental spawning abundance. Populations of concern are upper and lower Chilcotin, Westroad, Cottonwood, and Chilako rivers. There is no exploitation rate indicator stock for this group. <i>(2009 Outlook status: 1)</i>
	Spring – upper & mid-Fraser, North Thompson	1	Continued poor marine survival has resulted in continued poor to very poor escapements. 2009 was the third successive year where total recruitment failed to replace parental spawning abundance. There is no exploitation rate indicator stock for this group. <i>(2009 Outlook status: 1)</i>
Fraser summer-run age 5 ₂	Summer – upper & mid-Fraser, North Thompson	1	Continued poor marine survival has resulted in continued poor to very poor escapements. 2009 was the third successive year where total recruitment failed to replace parental spawning abundance. There is no exploitation rate indicator stock for this group. <i>(2009 Outlook status: 1)</i>

PST MU	Stock	Outlook Status	Comments
Fraser summer-run age 4 ₁	Late summer – South Thompson	3/4	Aggregate escapements in 2009 were on average, similar to brood year escapements (2005). Large numbers of 3-yr olds were observed in these systems, also indicating the likelihood of good returns in 2010. South Thompson (45,036), was well under the parent escapement, but others such as Adams (6,397) and Lower Shuswap (25,105) were greater than the brood year levels. Indicator stock is Lower Shuswap (2009 Outlook status: 3)
	Summer – lower Fraser ⁹	1/2	Expectations are for abundance levels for 2010 similar to those seen in 2009, but very little is known about the productivity of these small populations. Maria Slough escapements in 2009 (594 adults) were slightly better than those observed in the previous year (574). Big Silver escapement was poor, and estimated at 38. The small size of these populations increases their vulnerability. (2009 Outlook status: 2)
Fraser fall-run age 4 ₁	Fall – lower Fraser natural	2	Four year old returns expected to be weak in 2010, as indicated by the lack of three year old returns at Harrison in 2009. Jack numbers appear strong which is encouraging for 2011. The 2009 adult escapement preliminary escapement estimate was 70,119. Formal forecast will be available in mid winter. (2009 Outlook status: 2)
	Fall – lower Fraser hatchery	2	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. The 2009 adult spawning escapement estimate to Chilliwack is ~22,000. Poorer escapements of 4 year-olds are expected in 2010. Forecasts will be prepared for mid-winter release. (2009 Outlook status: 2/3)

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 for Fraser River chinook were set in 1986 following negotiation of the original Pacific Salmon Treaty in 1985. While a variety of methodologies were considered in the development of escapement goals, it was agreed to establish the goals at twice the average escapement observed during the period 1979 to 1982. The intention was to use this strategy until 1998 at which time the goals were to be reviewed.

DFO is currently in the process of developing escapement goals to comply with requirements under the Pacific Salmon Treaty and the Wild Salmon Policy. As previously outlined, the Conservation Units for the WSP have been identified. Following this, lower (conservation) and upper (target) benchmarks for escapement will be determined based on input from a broad spectrum of interests and information on stock productivity and capacity. Recent work by Carrie Holt and other researchers of DFO Science Branch has focussed on development of methods to determine biologically based benchmarks. It is anticipated that these methods will be used in developing new escapement goals for Fraser River chinook in the near future.

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

⁹ Big Silver and other yearling smolt Lower Fraser summer populations do not belong to Summer 4₁ however, Maria Slough and transplants do belong to Summer 4₁

5.6. Albion Test Fishery

Since 1981, DFO has conducted a chinook test fishery on the lower Fraser River at Albion (near Fort Langley) from early April to late-October. 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 made. The sets are timed to occur just prior to and just after daylight high tide. The chinook test fishery normally fishes 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, due to the 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 a chum test net (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 provided legal guidance on 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 for the next few years.

Chinook catch in 2009 was 755 for the standard 8-inch mesh net (which fished for 102 days) and 371 for the multi-panel net (which fished for 76 days) for a combined total of 1126 chinook. 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. 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.

6.1.3. Birkenhead Hatchery

The Birkenhead Hatchery on the Birkenhead River was established in 1977. Historical CWT tag returns indicated approximately 10% contribution of enhanced chinook to the run¹⁰. The hatchery suffered devastating damage in the flood of the fall of 2003 and is now closed. This volunteer-run hatchery was operated by the Pemberton Wildlife Association (PWA) and enhanced both chinook and coho. The impact of the hatchery closure is unknown, although a recent review on the status of Birkenhead chinook suggested that, on average, the hatchery production only replaced the number of fish removed for brood stock each year. As Birkenhead chinook have a five year life cycle, 2007 was likely the last year in which returns were seen from this hatchery enhancement program.

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 closed. The Penny facility was also recently closed, and DFO has been exploring options for a replacement facility since its closure.

¹⁰ Schubert et al. 2007. Status of Birkenhead River Chinook salmon, Canadian Science Advisory Secretariat, Research Document 2007/019

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 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 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 Shuswap stocks from the Shuswap hatchery).

6.2.1. Spius Creek Hatchery

The Spius Creek hatchery produces yearling chinook from Spius Creek, the Coldwater River, Nicola River and 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 annually is approximately 140K. 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 relatively small (~50K 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. Lower Shuswap is an indicator stock for summer-run age 4₁ chinook of the South Thompson, and releases are coded wire tagged. The Middle Shuswap chinook smolt releases are not currently tagged.

7. Fisheries Management

7.1. Fisheries Impacting Fraser River Chinook

Fraser River chinook salmon stocks exhibit one of three types of ocean distribution, and those distributions 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, similar to many Fraser sockeye. There are no high-seas fisheries targeting these fish, so 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 Straits 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 as such 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, as well as 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 that a given 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, although 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. Chinook are generally harvested only as by-catch during this period, although in some situations fisheries using selective gear may be implemented which target on available chinook, while limiting sockeye impacts. Later in the summer and through the fall, conservation concerns for coho salmon and wild steelhead and 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 with First Nations in on-going consultations concerning potential alterations to fishing patterns, as needed, 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. However, recreational harvest is 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 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 closed seasonally depending on local stocks.

Historically, the recreational fishery in the Fraser River, downstream from Sawmill Creek was open year-round with a daily limit of four chinook and no annual limit. In 1980, the fishery was closed to assist in rebuilding chinook stocks. When the fishery re-opened, it started on June 1st of each year. In 1998, the recreational chinook fishery was opened on May 1 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.

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 Lower Fraser River, 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 1 to December 31 in those 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 are harvested in a number of fisheries. These fish are taken as by-catch in sockeye net fisheries (seine and gill net) in Johnstone Strait, Juan de Fuca Strait, Fraser River and some US fisheries. In addition, there are directed fisheries for chinook by WCVI, North Coast and Alaskan troll fisheries. Only very limited directed commercial net fisheries (i.e., 2004 Area E gill net exploratory fishery) have occurred within the Fraser River since 1980.

During the last eight years, a mandatory non-retention requirement in all South and North Coast seine fisheries has significantly reduced chinook mortalities. 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.

7.2. 2009 Fishing Plan and Objectives

In 2009, similar to 2008, the Department consulted on conservation concerns for Early-timed Fraser chinook, given poor marine survival and very poor spawning escapements observed in recent years. The 2009 IFMP identified a management objective to implement management actions to reduce the exploitation rate approximately 50% relative to the 2006 to 2007 period. Fishery reductions were structured so that the brunt of the conservation burden was borne by commercial and recreational fisheries, rather than First Nations' fisheries.

Stream-type spring and the summer 5₂ chinook stocks had an outlook as one of "stock of concern" in 2009 associated with continuing declines in spawner abundance. In 2008, DFO staff identified a relationship between the cumulative CPUE of chinook caught in the Albion chinook test fishery and spawning escapements of 5₂ spring and summer Fraser chinook. This methodology was reviewed and approved by PSARC as an in-season indicator of abundance of Spring and Summer 5₂ chinook in 2009.

For the 2009 season, two management zones were outlined in the salmon IFMP with management actions based on an in-season assessment of abundance at the Albion chinook test fishery. A predicted return of 40,000 chinook to the Fraser was used to ensure the spawner abundance of these populations did not decline below the 1979 to 1982 base period level of 30,050 chinook. A predicted return of 40,000 chinook to the Fraser and a 25% harvest rate in the river would result in a spawner abundance of 30,000 spawners. The chinook escapement goal outlined in the 1985 Pacific Salmon Treaty (PST) is to have a spawning escapement at twice the level observed in the 1979 to 1982 base period. The management zones used for 2009 are outlined in Table 4 below:

Table 4. 2009 Management Zones and Actions for Spring/Summer 5₂ Chinook

Zone	Predicted Return to the Fraser River	Rationale
2	Above 40,000	Rebuilding required; continue to use management actions implemented in previous years prior to 2008. (e.g. remove recreational and commercial restrictions implemented in 2008, allow additional FSC fishing time)
1	Below or equal to 40,000	First Nations opportunities similar as in 2006-2008. Management actions to reduce harvest in recreational and commercial fisheries similar to 2008.

In 2009, the estimated terminal return for the Spring and Summer 5₂ aggregates using Albion catch through the end of May was 65,986 (95% CI: 49,963 and 87,148). A second prediction of terminal returns using data through mid-June was 56,588 (95% C.I.: 41,523 and 77,119).

7.2.1. First Nations Fisheries

Consultations with Fraser River First Nations in 2009 resulted in a fishing regime that was designed to reduce the impacts on the Early-timed chinook, relative to fisheries in

2006 and 2007. In the Lower Fraser Area, the initiation of First Nations communal fisheries was delayed by nearly one month compared with recent years. In addition, once communal fisheries began, the weekly opening times were reduced by approximately 50% from recent year openings, through June 15.

To reduce impacts on Early-timed chinook in 2009, First Nations in the Sawmill Creek to Texas Creek area requested a closure. First Nations from Texas Creek to Kelly Creek requested a seven day a week opening with severe gear restrictions in place (i.e. dip net, rod and reel). These First Nations groups encouraged their people to conserve Early-timed chinook by not fishing during the migration time. No effort was observed by catch monitors or fishery officers in the Texas Creek to Kelly Creek area during this time.

7.2.2. Recreational Fisheries

In 2009, conservation concerns for Early-timed chinook resulted in additional management measures in the recreational fishery. Recreational fisheries targeting Spring and Summer populations were managed using the management actions described in Table 4 entitled 2009 Management Zones and Actions for Spring/Summer 5₂ Chinook.

Specific management actions implemented in 2009 are described below:

Early-timed Fraser River Chinook

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

- March 2 to May 14 – retained chinook must be greater than 45 cm and less than 67 cm in length except, the retention of hatchery marked chinook that are greater than 67 cm in length was also permitted in addition to the slot limit noted above.

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

- April 1 to May 31 – no retention of chinook.

Area 29 Fraser River (Subareas 29-11 to 29-17) 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 May 1 – no fishing for chinook
- May 1 to June 15 – no retention of chinook

Spring and Summer 5(2) Fraser River Chinook

As a result, of the Zone 2 management approach outlined in the 2009 pre-season plan, Fraser River recreational fishery restrictions were removed following the release of the Spring and Summer chinook run size index numbers.

Details on recreational chinook opportunities may be found online at:

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

7.2.3. 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 and preliminary estimates two years in advance were used to plan the fishery at the start of the chinook year beginning in October 2008. Forecasts are finalized in April of the next 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 2008/09 TAC for the WCVI AABM, based on the abundance index from the Chinook Technical Committee (CTC) Chinook model was 107,800 for the 2008-2009 Chinook year. (October 1, 2008 to September 30, 2009).

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

- WCVI AABM TAC – 107,800
- First Nations FSC – 5,000 pieces
- Recreational – 50,000 pieces
- Area G Commercial Troll TAC – 52,800 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 usually 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 2009. 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.

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 an increasing fraction of the overall harvest managed through individual vessel quotas. 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. In 2008 and 2009, 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 2009, 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.

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 will be 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 Straits, 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.

ii) Fraser River mouth to Sawmill Creek

First Nations are licenced 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 at other species. These fisheries are monitored using a Mandatory Landing Program (MLP). For the duration of these 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. For EO fisheries for which selective fishing gear is required a First Nations monitor is present during all fishing activity and catch is recorded on a set-by-set basis.

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

i) 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 and forwarded to DFO following the close of the fishery.

ii) Port Mann Bridge to Mission

First Nations monitors collect drift and 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.

iii) 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

iv) *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 during First Nation directed chinook fisheries 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.

Very limited First Nation fisheries directed on chinook salmon occur 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.

v) *Naver Creek upstream and the Nechako River to Isle Pierre*

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

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

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

vii) *Thompson River upstream of the Bonaparte River*

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

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

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

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 follows then that catch = harvest (kept) + release. Most creel surveys provide an estimate of effort and harvest; and most of the creel surveys conducted in the Fraser River additionally provide an estimate of releases.

In order to provide estimates of harvested and released salmon in 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 effort (e.g. angler hours or boat trips); 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 effort (e.g. angler hours or boat trips.)

Harvest and Release Rates 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 but 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.”

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. In 2009, these included: the Fraser River mainstem (May 01 to Oct.15), Chilliwack River (Sep.15 to Nov.15), Nicomen Slough/Norrish Creek (Oct.10 to Nov.30) and for the first time since 2001, the Harrison River (Sep.01 to Dec.15). Historical results and the 2009 preliminary results for the 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. In 2009, these included surveys of the Fraser River mainstem and its tributaries, including the Thompson/Shuswap watersheds. Although currently, the magnitude of the upper Fraser River recreational fisheries is small (both in angler effort and catch) when compared to the fisheries occurring in the lower Fraser River, they are important pieces of the overall assessment of recreational fishing activities in the Fraser River watershed. The 2009 preliminary results for the upper Fraser River recreational fisheries can be found in the Appendix E.

The Strait of Georgia (STG) creel generally operates from May to October and covers Areas 13 to 18, 28 and 29. The STG creel also operates in the Victoria area (Juan de Fuca), which covers Areas 19 and that portion of Area 20 east of Sherringham Point from January to December.

The Strait of Juan de Fuca (the portion of Area 20 west of Sherringham Point) and the West Coast of Vancouver Island (Areas 23 to 26, 121 and 123 to 126) are covered by the West Coast (WC) creel program which operates from June to September. Fishing effort drops markedly after Labour Day.

The Northern Vancouver Island creel program covers Areas 27 and 127 on the West Coast of Vancouver and Upper Johnstone Strait (Portions of Area 11 and Area 12) from June through August. Fishing effort drops substantially in September.

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, recreational and aboriginal 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). The average weight is used to calculate pieces from the total weight reported on the fish slips.

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

7.4. 2009 Fishery Summary

In general, 2009 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 2009 was the run-size update provided for Spring and Summer 5₂ chinook. As outlined earlier in this document, planned in-season updates based on the Albion test fishery were scheduled for these combined stock groups for the end of May and mid-June. A two-zone management approach was implemented, based on whether the estimated terminal return of these stock groups was above or below a breakpoint of 40,000 fish.

The estimated terminal return for the Spring and Summer 5₂ aggregates using Albion catch through the end of May was 65,986 (95% CI: 49,963 and 87,148). A second prediction of terminal returns using data through mid-June was 56,588 (95% C.I.: 41,523 and 77,119). These estimates resulted in the implementation of a Zone 2 management approach, as outlined in the 2009 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 with low effort and low harvest levels. Chinook harvest in most areas generally occurs as by-catch during 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 the effort and catch coming from the summer time period. The estimated catch in South Coast marine areas in 2009 was 2,700 chinook.

Food Social and Ceremonial Fisheries - Lower Fraser

During the period of Early Stuart sockeye migration through the Fraser River in 2009, 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.

In the areas upstream of Sawmill Creek, selective chinook fisheries were largely undertaken using dip nets or rod and reel. Fixed sockeye encounter limits and increased catch monitoring also occurred throughout the fishery, as was done in the Lower Fraser. The initial outcome of these fisheries demonstrated the potential to have directed chinook fisheries with reduced sockeye impacts, provided that proper consideration of site specific flow characteristics was undertaken and that appropriate monitoring was implemented.

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 March 21, 2009 in the Lower Fraser River and continued until September 11, 2009. 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.

Within the Mid-Fraser River, chinook fisheries in the Sawmill Creek to Texas Creek area and Thompson River below Bonaparte River area were scheduled to open on May 1st for 2 days a week and then on June 14th for 7 days a week. First Nations in this area voluntary did not fish until June 14th. Fisheries then continued through to September 21st. Chinook fishing was restricted to rod and reel and dip nets during this time.

Chinook fishing in the Texas Creek to Deadman Creek area opened on May 1st and continued through to September 21st. Chinook fishing was restricted to rod and reel and dip nets during this time. Chinook fisheries in the Thompson River above Bonaparte River were open from July 7th to October 31st.

Chinook fisheries in the Upper Fraser River above Deadman Creek commenced on June 1, 2009 and continued through to the end of October. Chinook are caught using dip nets on the mainstream Fraser in the Williams Lake area, set gill nets in the waters upstream of Naver Creek and in the Nechako watershed and dip nets, spears or gaffs on the Chilko River.

Economic Opportunity Fisheries.

In 2009 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 during the time period 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 2009 can be found in Appendix D.

7.4.2. Recreational Fisheries

In 2009, three 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 May 1st to Oct.15th, 2009. Preliminary catch estimates can be found in Appendix E.
2. Chilliwack River: the study area was bounded by the confluence with the Fraser River (downstream boundary) and the mouth of Slesse Creek (upstream boundary). The survey covered the entire area open for 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, 2009. Preliminary catch estimates can be found in Appendix E.
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.9th to Nov.30th, 2009; no chinook were estimated to have been caught (i.e. none harvested or released) and this fishery is not reported on further.

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.

Birkenhead River chinook have been subject to a non-retention recreational fishery in the Birkenhead and Lillooet Rivers. Recreational fishing for salmon is prohibited in that 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 is to protect 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 1 until July 31st which was implemented.

Marine Recreational Fisheries

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

1. The Johnstone Strait (JS) Survey first focused on the southern portion of Queen Charlotte Strait and JS (Area 12), but recently expanded (2006) to include waters north of Queen Charlotte Strait and the offshore waters north of Vancouver Island (Areas 11 and 12). The JS Survey typically operated annually from July through August with expansion into June since 2008.
2. The Strait of Georgia (SG) Survey includes the Canadian waters of Juan de Fuca Strait east of Sheringham Point near Victoria and north through the SG to Stuart Island, near Campbell River. The SG Survey covers all of Areas 13 to 19, 28, 29 and a portion of Area 20. The SG Survey operates year round from Victoria (Areas 19 and a portion of 20), and from May through October through the remainder of the SG (Areas 13 to 18, 28 and 29).
3. The West Coast of Vancouver Island (WCVI) Survey includes the waters of Juan de Fuca Strait west of Sheringham Point and north through open waters to Brooks Peninsula. In addition, the WCVI Survey provides recreational catch estimates from the more protected waters of Barkley, Clayoquot, Nootka and Kyuquot Sounds. The WCVI Survey operates from June through September throughout Areas 21 to 26, a portion of 20, and the offshore waters of Areas 121 to 126.
4. The Quatsino Sound (QS) Survey focuses on the inshore waters of QS proper and associated offshore waters (Areas 27 and 127). Like the JS Survey, the QS Survey typically operated annually from July through August with recent expansions into June since 2008.

South Coast Creel Reports are posted at:

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 and 4: 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 5 and 6: Chinook fisheries in this area are much smaller. There are usually 3 to 5 lodges operating and all participate in a logbook program.

Chinook catch in 2009 was reported as:

Area 1	- 19,500
Area 2W	- 14,000
Area 2E	- 500
Area 3/4	- 9177

7.4.3. Commercial Fisheries

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 2009, there were no sockeye fisheries and the chum season was restricted to a one day fishery.

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. Due to these constraints the fishery generally does not open until mid-May to early June and closes in September. In 2009, the fishery opened on June 15th and closed on August 8th. The fishery reopened August 28th and closed for the balance of the season on September 30th.

Based on the DNA analysis, of the 52,147 chinook landed, 1602 were of West Coast Vancouver Island origin, 1357 from the Skeena, 45 from the Nass, and 22,441 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 2009 CTC Chinook model calibration, the AABM Canadian allowable harvest was 107,800. It was anticipated that the FSC harvest would be 5,000; and that the recreational catch would be 50,000, leaving 52,800 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 2008/2009. 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 2008/2009 season for Area G troll was 53,191 kept and 4,750 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 various 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. At the present time, 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 run reconstruction analysis. This analysis estimates fishery specific and overall exploitation rates for CTC indicator stocks, based on coded-wire tag (CWT) recoveries. Exploitation rates for Fraser River CTC indicator stocks are summarized in Appendix J. Due to the time lag in processing and analyzing the coastwide CWT data required for this type of assessment, there is usually a two-year time lag in providing these results. This means that the 2009 exploitation rate summaries will not be available until after 2010 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 group, based on spawning escapement estimates and assumed migration times for the various stocks. Note that the Run Reconstruction does not provide any information regarding impacts in marine fisheries.

7.6. 2010 Fishing Plan

The 2010 Salmon Outlook document has classified all Spring and Summer yearling Fraser chinook stocks for 2010 as *stocks of concern* (Outlook status = 1) given poor survival rates and declines in spawning escapements compared to the parental generation in recent years. For management purposes in 2010, Fraser chinook stocks will be managed using the Spring 4₂, Spring 5₂ and Summer 5₂ management units employed under the Pacific Salmon Treaty (PST) process to align fisheries management objectives with indicator stocks, escapement, catch and exploitation rate data used in the PST process. As a result, the Early-timed Fraser chinook objective will not be used in 2010. New management objectives will be identified for Spring 4₂ chinook and for the combined management units of Spring 5₂ and Summer 5₂ chinook in the draft IFMP. Early-timed Fraser chinook, a sub-set of 7 stocks in 3 conservation units (CUs), are included in the Spring 4₂ and Spring 5₂ management units.

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 spawn in the Nicola, Bonaparte, Deadman and other streams that mostly flow into the Lower Thompson River.

The second management unit is referred to as Fraser Spring 5₂. These fish 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. After conservation, DFO is committed to managing fisheries - including fisheries that substantially impact Fraser River chinook stocks of concern - such that First Nations' fishing for food, social and ceremonial purposes has priority over all other users. Accordingly, the brunt of conservation measures will be borne by the commercial and recreational fisheries. While discussions are underway, Fraser chinook will begin returning through marine approach areas shortly. The Department plans to take additional management actions in marine areas commencing in March.

The Department is drafting options for conserving Fraser chinook *stocks of concern* in 2010 fisheries for inclusion in the draft South Coast Salmon IFMP planned for release on March 17, 2010.

7.6.1. First Nations Fisheries

The Salmon Stock Outlook provides a categorical interpretation of available qualitative and quantitative information including pre-season forecasts (where available). In 2010, the Outlook for Fraser River Spring 4₂, Spring 5₂, and Summer 5₂ chinook populations is status 1 (out of 4) which is 'stock of concern'. Based on this Outlook, the Department plans to discuss ways to reduce 2010 fishing plans compared to recent years.

Although the outlook for the Fraser Spring 4₂, Spring 5₂, and Summer 5₂ chinook is poor in 2010, 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 2010 has not yet been finalized, but only modest returns are anticipated, and the Outlook status for this stock is status "2", or "low".

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.

In consultation with various sectors, the Department will be developing approaches that maintain allocation priorities, particularly with regard to First Nations' food, social, and ceremonial needs. Consultations between the Department and Fraser River First Nations will be required to develop fisheries plans that provide opportunity to meet FSC needs, while ensuring conservation objectives are met.

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 unified 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

Based on the pre-season Outlook for Fraser River Spring 4₂, Spring 5₂, and Summer 5₂ chinook the Department is seeking to minimize impacts on these stocks in recreational fisheries in 2010. Consultation between the Department and recreational fishing representatives is on-going to develop management measures for the coming year. Management actions already announced in Subareas 19-1 to 19-4 and 20-5 effective March 1 through May 21 include a maximum size limit of 67 cm for hatchery and wild chinook with retention of hatchery marked chinook greater than 67cm permitted. Discussions on additional management actions are underway and will be taken into consideration in the development of the 2010 fishing plans and development of the South Coast Salmon IFMP for 2010/11.

7.6.3. Commercial Fisheries

Based on the pre-season Outlook for Fraser River Spring 4₂, Spring 5₂, and Summer 5₂ chinook the Department is seeking to minimize impacts on these stocks in commercial fisheries in 2010. Management actions are planned for the area G troll fishery on the West Coast of Vancouver Island; there have been no troll fishery openings to date in this area. Consultation between the Department and commercial fishing representatives is ongoing to develop management measures for the coming year and will be taken into consideration in the development of the 2010 fishing plans and development of the South Coast Salmon IFMP for 2010/11.

During pre-season discussions with Area E Harvest Committee (AEHC), the Department has received a request for a limited chinook-directed Demonstration fishery in 2010. 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 IFMP.

Appendix A: Albion Test Fishery

The following figures summarize catch information from the Albion Chinook test fishery for 2009 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 2009 daily catch per unit effort (CPUE) index compared to the 1981 to 2008 daily CPUE index average.

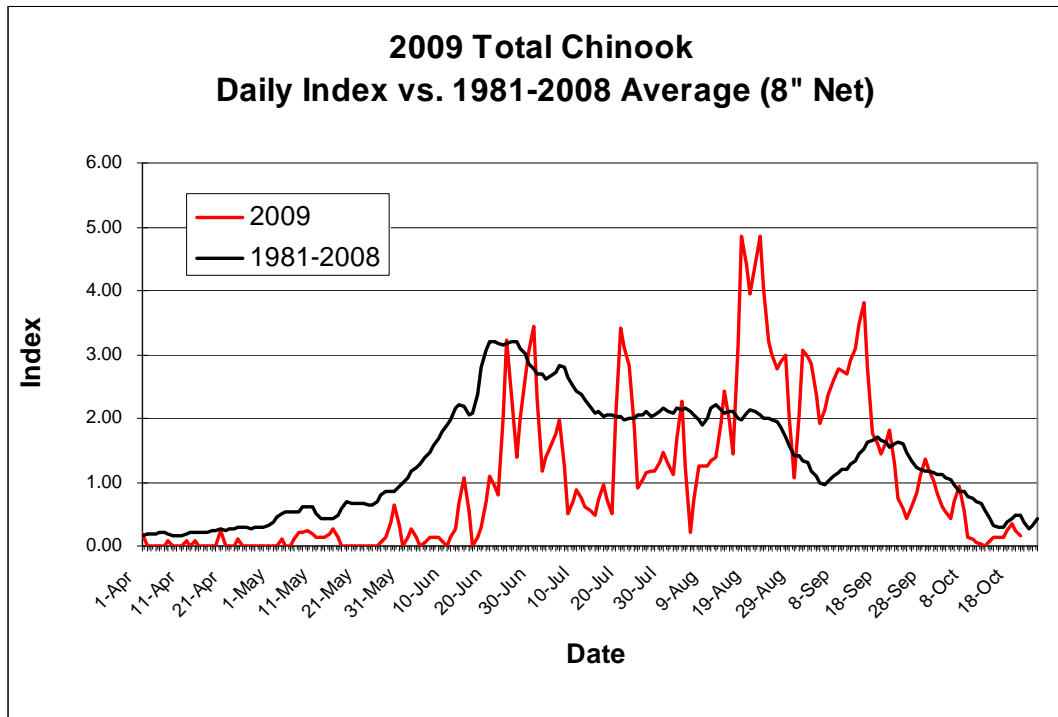
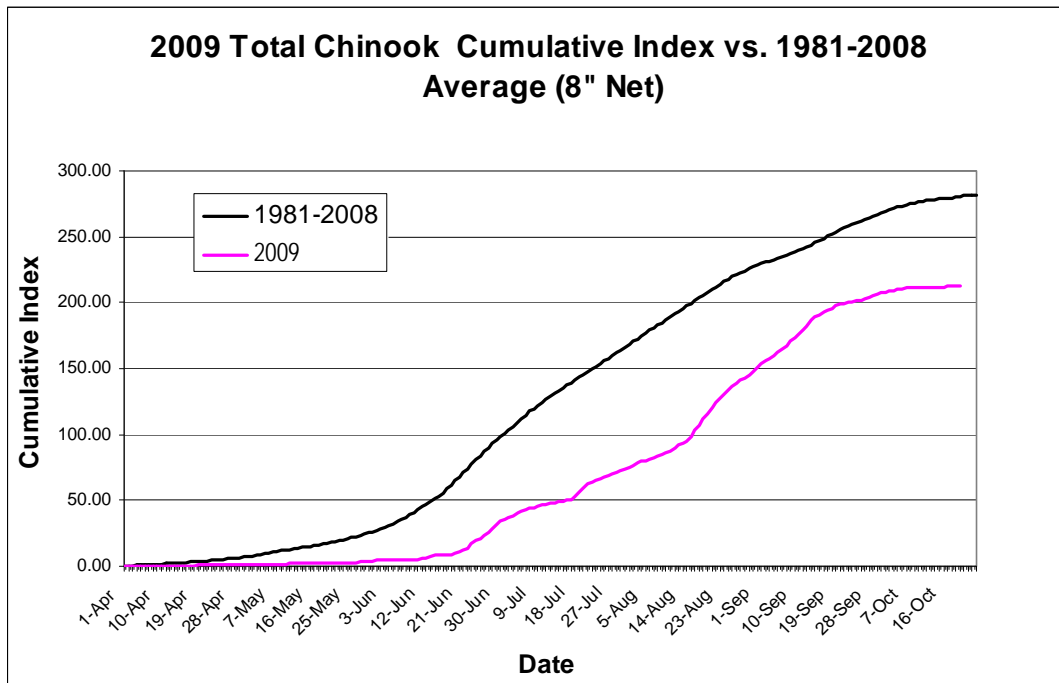


Figure 2. The 2009 cumulative catch per unit effort (CPUE) index compared to the 1981 to 2009 cumulative CPUE index average.



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

Appendix B: 1995-2009 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser

CTC Indicator Stream

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 ²
Spring - Run Age 1.3 (5₂)															
Upper Pitt River (Lower Fraser)	N/R	N/R	N/R	N/R	N/R	N/R	N/R	276	171	N/I	341	248	138	198	105
Birkenhead River ¹ (Lower Fraser)	183	344	634	636	166	446	703	512	480	202	1491	1259	1968	206	631
Bridge River	851	1900	1968	626	898	769	198	969	N/I	1115	183	109	138	103	11
Chilcotin River	3480	2285	4000	1636	2896	2971	1574	2092	3396	1064	1509	1027	360	2018	986
Cottonwood River	2100	1750	3329	2592	641	1208	781	1352	1555	1241	646	740	392	225	535
Horsefly River	185	400	115	43	137	174	281	380	246	375	509	345	51	98	209
Westroad River	6050	4615	7206	3827	984	1600	1924	1620	2966	1366	846	1052	461	961	992
Bowron River	8316	4577	7334	7618	3455	3220	5491	8719	10059	8160	4074	3876	1823	3740	4900
Fraser R. (Tete Juane)	6000	4100	2935	2586	2081	2262	4976	3913	3048	2062	2535	2142	1021	1858	3281
Goat River	400	440	354	302	89	212	411	820	569	174	151	158	114	145	311
Holmes River	2600	2775	3203	2362	523	1795	1018	3740	4110	1376	821	1458	764	454	2187
Horsey River	120	20	75	57	14	128	78	308	288	62	34	146	22	0	111
McKale River	N/A	N/A	N/A	20	Present	32	9	81	49	68	78	11	17	18	118
McGregor Tributaries	2412	3461	2505	4471	1870	2449	2420	3751	4103	3253	1310	1333	1041	1260	2305
Morkill River	407	567	550	2398	1152	926	Present	Present	Present	1122	355	549	408	123	1257
Chilako Creek	200	624	186	39	115	20	7	229	N/I	106	202	168	78	300	171
Endako River	125	167	43	191	171	160	275	292	N/I	N/I	252	118	26	N/I	162
Ormond Creek	N/R	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
Nevin Creek	N/A	N/A	N/A	161	46	62	57	132	385	238	77	174	42	1389	174
Slim Creek	4634	2268	3130	2664	1235	2112	2876	3021	3676	2284	2161	2204	654	422	3173
Swift Creek	1700	1500	1200	1098	375	486	982	1535	835	520	335	643	328	189	747
Walker Creek	101	426	122	392	206	252	177	381	543	277	103	234	160	941	494
Torpy River	1590	1055	1042	2293	1819	1468	1755	2565	4457	2730	1027	1221	886	666	1966
Willow River	817	1612	1961	2041	717	1314	893	1033	1980	1887	1012	1206	377	101	1003
Finn Creek	810	1569	725	632	524	1511	1115	650	45	538	185	157	38	655	91
Eagle River	700	780	915	N.I.	624	1085	1397	1458	1583	867	427	521	334	447	574
Salmon River (Prince George)	901	1054	1200	1362	823	634	478	429	2395	1681	668	544	269	535	731
Salmon River (Salmon Arm)	700	727	252	284	350	357	1362	1003	89	395	307	554	173	198	382
Stock Aggregate Totals	45382	39016	44984	40331	21911	27653	31238	41261	47028	33163	21639	22197	12083	17270	27604

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

1995-2009 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser cnt'd.

CTC Indicator Stream

	<u>1995</u>	<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> ²
Spring Run Age 1.2 (4₂)															
Deadman River	540	1506	934	665	350	787	780	1940		1159	417	1234	301	1273	188
Spius Creek	500	500	450	300	52	668	603	1012	1170	1866	291	529	64	168	138
Coldwater River	1050	1500	400	300	267	497	781	1394	1195	1018	183	478	107	365	26
Nicola River	6500	16400	7614	1211	7263	8808	7771	11643	14574	7850	2926	3863	912	4151	461
Louis Creek	800	420	480	377	183	611	349	481	198	105	63	297	18	95	6
Bessette Creek	280	400	N.I.	150	404	360	323	350	N/O	182	18	241	5	69	18
Stock Aggregate Totals	9670	20726	9878	3003	8519	11731	10607	16820	17137	12180	3898	6642	1407	6121	839

Summer Run Age 1.3 (5₂)

Barriere River	21	N/K	N/K	N/I	Present	77	362	377	131	306	220	215	100	97	37
Portage Creek	N/R	300	N/R	18	200	46	248	445	158	103	86	248	51	217	74
Seton River	N/R	N/I	N/R	N/I	N/I	N/I	N/O	6	5	N/I	Present	N/I	N/I	N/I	Present
Chilko River	10461	17000	16272	14549	8920	9171	10891	11027	21625	16287	7668	5201	4366	5186	8694
Quesnel River	3073	3100	3185	4906	1620	1718	2418	5520	5265	3356	3230	2665	1758	1383	1875
Cariboo River	817	1850	1800	936	573	744	503	1097	2198	351	526	949	546	449	877
Stuart River	3730	7415	6221	4642	3875	1875	1954	Present	Present	Present	Present	Present	Present	Present	Present
Nechako River	1689	2040	1954	1868	1917	N/A	9331	5546	4077	5189	3217	7376	0	4614	2659
Stellako River	N/R	N/R	N/R	15	18	N/R	N/R	N/R	N/O	N/I	231	0	1895	5	3
Clearwater River	5100	7780	7830	7007	3837	4563	5051	5689	6234	4622	3519	3768	74	3307	5980
Mahood River	130	415	260	341	91	245	172	155	929	317	269	217	74	52	214
Raft River	1371	870	1230	309	712	936	237	443	311	741	109	141	38	395	194
North Thompson River	N/I	2375	2130	2156	3375	2732	3175	2200	1989	N/I	N/I	N/I	N/I	Present	N/I
Stock Aggregate Totals	26392	43145	40882	36747	25138	22107	34342	32505	42922	31272	19075	20780	8902	15705	20606.3

Summer Run Age 0.3 (4₁)

Maria Slough (Lower Fraser)	N/R	100	100	150	198	266	400	1200	823	N/R	439	314	650	574	594
Adams River	1900	2200	3400	4182	2029	2266	5890	3674	2496	2216	3837	6344	3181	3474	6397
Little River	150	3000	1850	1246	1163	2043	9885	3680	2488	6000	7504	8590	7352	11446	7286
Lower Shuswap River	10000	19000	13100	16704	24691	20409	18349	19327	21380	13329	12927	28828	14503	15165	25105
Middle Shuswap River	3000	5000	3800	4474	2449	2617	3022	5442	4799	1415	1883	5468	1080	1418	2018
South Thompson River	5500	21600	27000	41277	22675	17560	36740	51298	38178	38592	61837	103387	58956	74462	45036
Stock Aggregate Totals	20550	50900	49250	68033	53205	45161	74286	84621	70164	61552	88427	152931	85722	106539	86434.6

1995-2009 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser cnt'd.

Non CTC Indicator Streams

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 ²
Spring - Run Age 1.3 (5₂)															
Baker Creek	250	150	292	420	47	282	268	420	423	N/I	51	N/I	N/I	82	N/I
Dome Creek	550	571	625	400	309	198	49	450	444	270	248	224	181	226	N/I
East Twin Creek	N/I	N/I	N/I	64	N/I	18	35	51	52	62	25	12	6	18	94
Holiday Creek	N/I	N/I	N/I	N	N/I	15	74	126	48	54	72	17	6	6	86
Humbug Creek	N/I	N/I	N/I	N/I	N/I	26	22	85	35	N/A	N/I	N/I	N/I	N/I	N/I
Kazchek Creek	N/I	N/I	N/I	0	Present	Present	N/O	N/O	6	8	N/I	N/I	N/I	35	18
Kenneth Creek	N/I	N/I	N/I	132	17	65	58	338	148	N/A	N/I	N/I	N/I	N/I	N/I
Kuzkwa Creek	N/I	N/I	N/I	N/I	N/I	N/I	215	300	345	245	N/A		N/I	401	189
Naver Creek	150	150	777	994	57	231	240	281	489	N/I	236	N/I	N/I	N/I	229
Narcosli Creek	250	150	757	254	161	145	383	129	382	N/I	89	N/I	N/I	48	N/I
Pinchi Creek	N/I	N/I	N/I	N/I	Present	45	14	Present	15	25	N/A		N/I	60	25
Ptarmigan Creek	N/I	N/I	N/I	58	103	49	8	66	140	N/A	N/I	N/I	N/I	N/I	N/I
Small Creek	N/I	N/I	N/I	115	66	34	48	268	212	6	15	77	49	N/I	20
Snoeshoe Creek	N/I	N/I	N/I	N	N	N/I	N/I	165	66	N/I	N/I	N/I	N/I	N. obs	N/I
Upper Cariboo River	N/I	N/I	N/I	N/I	N/I	N/I	407	198	367	N/I	N/I	477	152	N/I	66
West Twin Creek	N/I	N/I	N/I	24	N/I	34	14	22	108	40	58	75	14	31	102
Stock Aggregate Totals	1200	1021	2451	2461	760	1142	1835	2899	3280	710	794	882	408	907	828.38
Spring Run Age 1.2 (4₂)															
Bonaparte River	4157	4391	10084	1864	1954	5258	6150	8216	8470	7990	3516	1046	3995	5242	1220
Stock Aggregate Totals	4157	4391	10084	1864	1954	5258	6150	8216	8470	7990	3516	1046	3995	5242	1220
Summer Run Age 1.3 (5₂)															
Adams River (Upper)	128	220	275	100	107	60	109	46	150	238	N/I	20	165	150	81
Big Silver (Lower Fraser)	N/K	N/K	N/K	N/K	N/K	N/K	N/K	363	138	N/I	243	62	209	20	38
Blue River	35	0	0	110	11	235	88	480	329	152	N/I	117	212	142	63
Chilcotin River (Upper)	262	735	360	617	285	229	243	523	678	220	97	89	158	97	235
Elkin Creek	786	1250	806	651	417	394	458	420	1038	N/I	N/I	N/I	N/I	N/I	N/I
Lemieux Creek	N/I	N/I	N/I	N/I	216	115	117	155	N/O	194	28	297	5	54	17
Lion Creek	65	95	N/I	N/I	34	0	3	N/O	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Stock Aggregate Totals	1276	2300	1441	1478	1070	1033	1018	1987	2333	804	368	585	749	463	434.69

1995-2009 Chinook escapement estimates to tributaries in the BC Interior and Lower Fraser cnt'd.

Non CTC Indicator Stream

	<u>1995</u>	<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> ²
Summer Run Age 0.3 (4,)															
Thompson River (Below Kamloops Lake)					2015	3205	6904	18927	N/K	10010	Present	23646	8549	16898	Present
Stock Aggregate Totals					2015	3205	6904	18927	N/K	10010	Present	23646	8549	16898	Present

² estimates for populations in the Fraser River in 2009 are near final

N/I = Not Inspected

N/O = None Observed

N/R = Not Recorded

N/K = Not Known

NYA = Not Yet Available

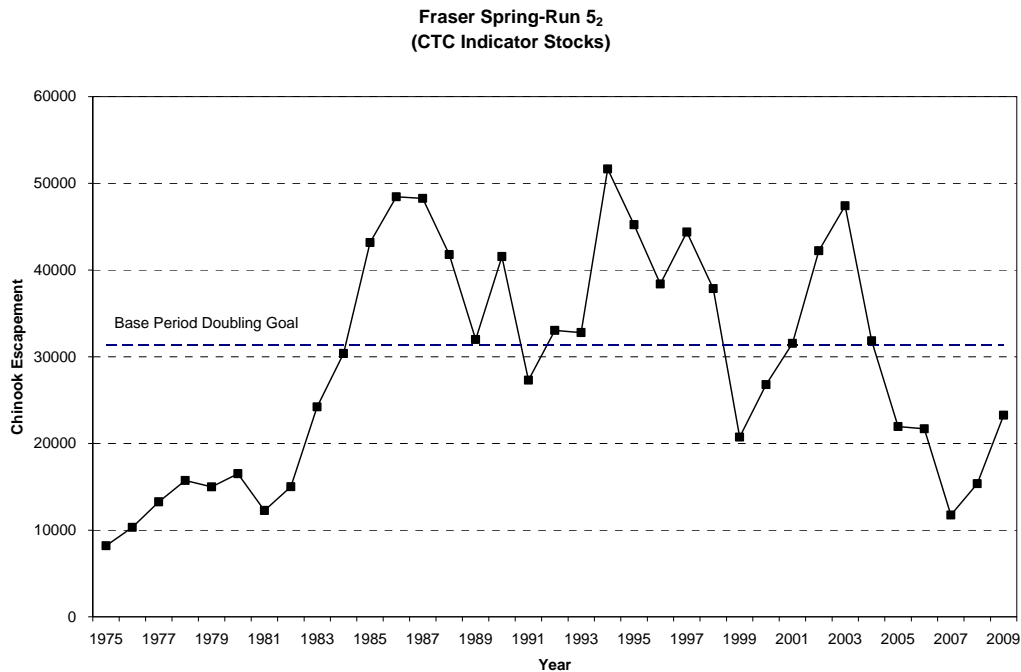
Present = Chinook seen but quality of assessment too poor to estimate escapement

Appendix C: Escapements to 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.

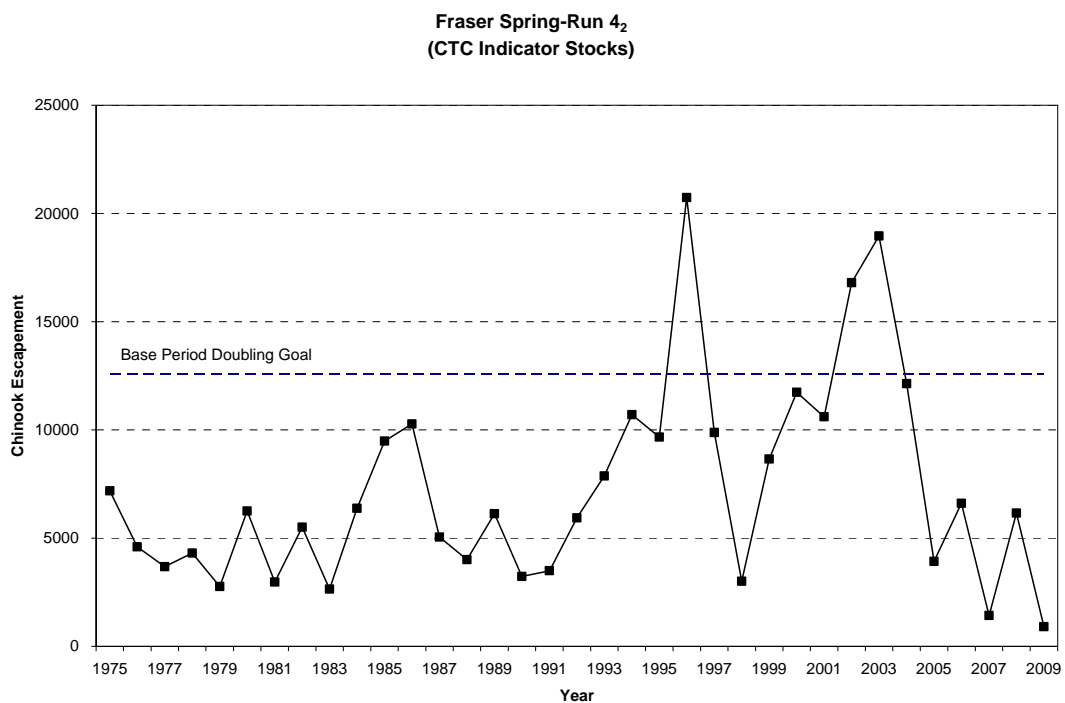
Fraser Spring Run 5₂ (CTC Indicator Stocks)



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). Escapements improved slightly again in 2009, however, they still failed to exceed the parental brood escapement levels in 2004. Escapement to the aggregate improved slightly over escapements in 2008. Escapements represented roughly 75% of the parental brood year escapements in 2005, and only slightly better than levels observed in the early 1980's.

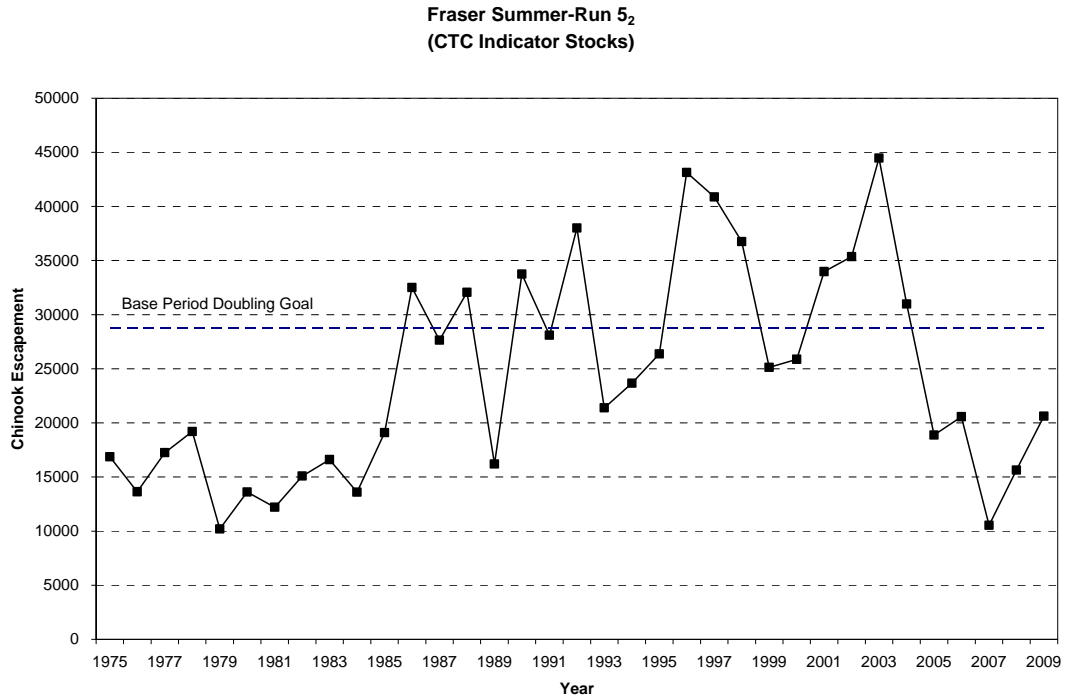
Fraser Spring Run 4₂ (CTC Indicator Stocks)

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 again declined sharply in 2009, and cumulatively represent the lowest levels ever recorded for this aggregate (839), and only 22% of the 2005 parental brood escapements. Escapements were critically low at Louis Creek (6) and Coldwater River (26), while Nicola was also the poorest on record at 461.



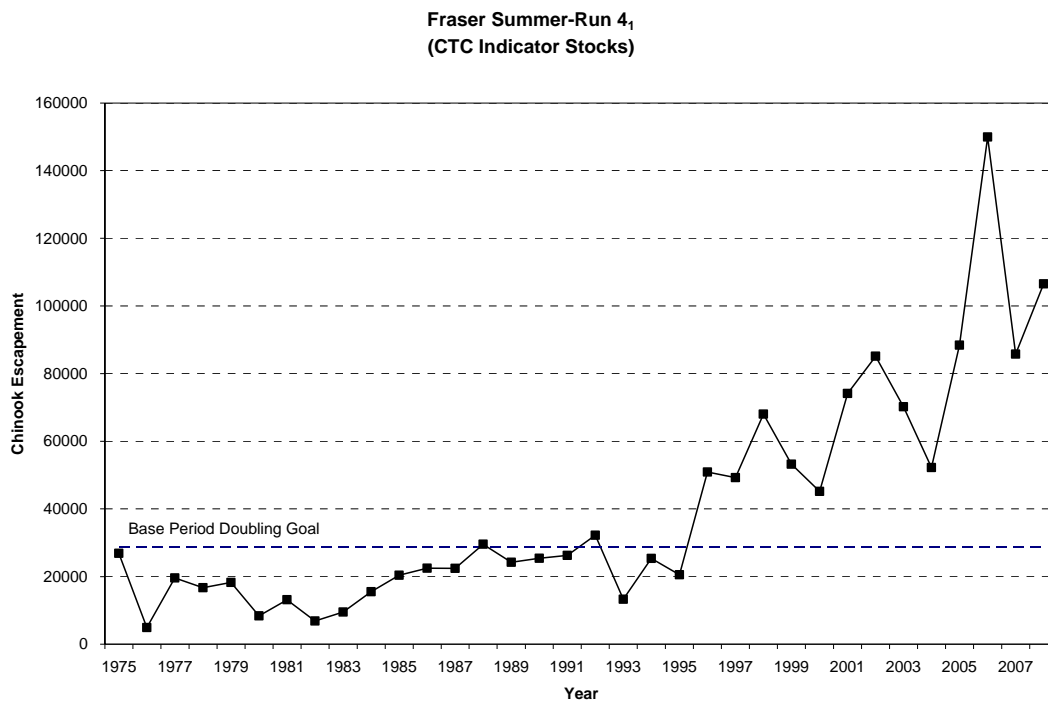
Fraser Summer Run 5₂ (CTC Indicator Stocks)

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 2009 again improved slightly over 2008, however they still represent declines when compared to the brood year escapements in 2004. Aggregate escapement was estimated at 20,619, roughly 67% the 2004 parental brood escapement.



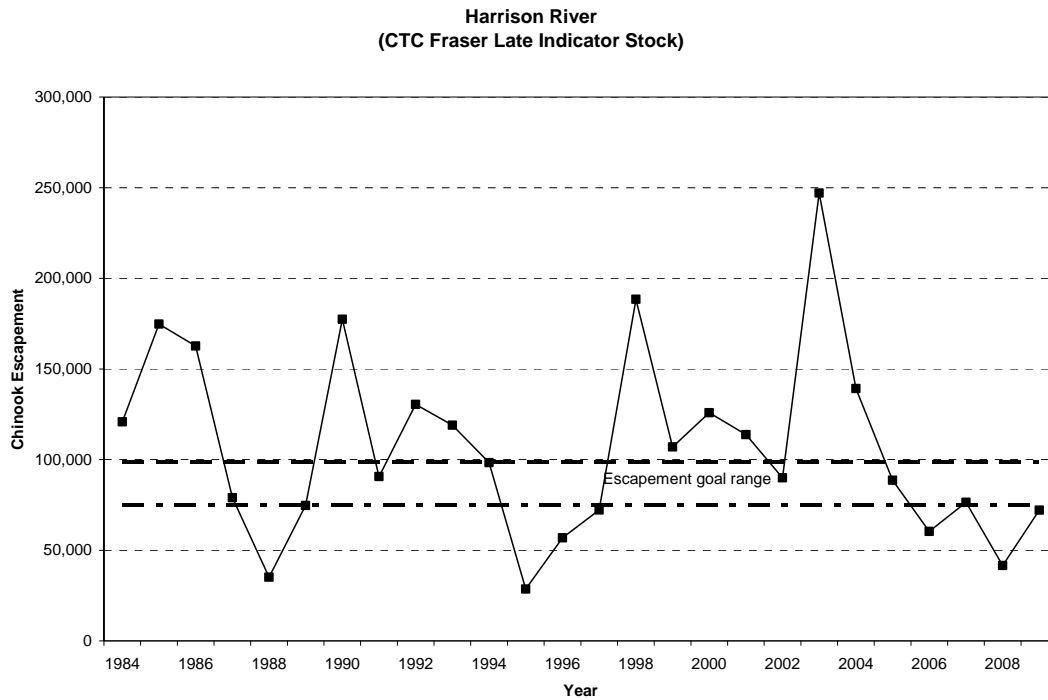
Fraser Summer Run 4₁ (CTC Indicator Stocks)

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 modest (86,443) in 2009, although they declined from levels observed in 2008 (106,539). The observed escapements represent approximately 96% of the parental brood year escapements in 2005. Escapements to the Lower Shuswap River (25, 105) were just over double the parental escapement, however returns to the South Thompson (44,902) were well below the parent escapement of almost 62,000.



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. Spawning escapements to the Harrison River in 2009 were estimated to be 70,119 adult chinook, and 86,282 jacks. Total fall chinook escapements to the Chilliwack River were estimated to be 21,308 adults and 13,465 jacks.



Appendix D: 2009 Fraser River First Nations Fishing Times and Catch by Area

Area and Gear	Dates	Hours per Week
Mouth to Pt Mann Bridge- drift net	Mar. 16 - Apr. 26	12 hours per week
	Apr. 27 - May 31	24 hours per week
	Jun. 1 - Jun. 21	48 hours per week ^M
8" mesh 3:1 hang ratio	Jun. 22 – Sep 6	48 hours per week
Mouth to Pt Mann Bridge- set net	Mar. 16 - Apr. 26	12 hours per week
	Apr. 27 - May 31	24 hours per week
	Jun. 1 - Jun. 21	48 hours per week ^M
	Jun. 22 - Sep. 6	Closed
Pt Mann Bridge to Sawmill Creek- drift net	Mar. 28 - Apr. 5	6 hours per week ^J
	Apr. 6 - May 31	8 hours per week ^J
8" mesh 3:1 hang ratio	Jun. 1 - Jun. 21	12 hours per week ^K
	Jun. 22 - Jul. 12	24 hours per week ^K
	Jul. 13 - Jul. 26	12 hours per week ^{K,N}
	Jul. 27 - Sep.6	24 hours per week ^{K,N}
	Sep. 7 - Sep. 13	24 hours per week ^{L,N}
Pt Mann Bridge to Sawmill Creek- set net	Mar. 28 - Mar. 29	12 hours per week ^J
	Mar. 30 - Apr. 5	18 hours per week ^J
	Apr. 6 - May 31	24 hours per week
	Jun. 1 - Jun. 21	48 hours per week ^K
	Jun. 22 - Aug. 23	Closed ^N
	8" mesh 3:1 hang ratio	Aug. 24 - Sep. 6
	Sep. 7 - Sep. 13	24 hours per week ^{L,N}
Sawmill Creek to Texas Creek–set net	Mar 29 – May 8	Closed
	May 8 – Jun 14	2 days per week – attended net
	Jun 14 – Jun 28	7 days per week
	Jun 28 – July 21	Closed ^{A,B}
	July 21 – July 26	7 days per week
	July 26 – Sep 21	Closed ^{A,C}
Thompson River below Bonaparte – set net	Mar 29 – May 8	Closed
	May 8 – Jun 14	2 days per week – attended net ^D
	Jun 14 – Jun 28	7 days per week ^D
	Jun 28 – July 21	Closed ^A
	July 21 – July 26	7 days per week
	July 26 – Sep 21	Closed ^A
	Sep 30 – Oct 18	Closed ^E
Texas Creek to Kelly Creek – set net	Mar 29 – May 1	Closed
	May 1 – May 31	7 days per week – attended net – daylight only
	May 31 – Jun 28	7 days per week – daylight only
	Jun 28 – July 21	Closed ^{A,F}
	July 21 – July 28	7 days per week
	July 28 – Sept 21	Closed ^{A,GHI}
Kelly Creek to Deadman Creek – set net	Mar 29 – May 1	Closed

Area and Gear	Dates	Hours per Week
Deadman Creek upstream – set net (set net not a common gear – typically dip net or angling)	May 1 – May 31	7 days per week
	May 31 – Jun 14	7 days per week – attended net
	Jun 14 – Jun 28	7 days per week
	June 28 – July 21	Closed ^A
	July 21 – July 28	7 days per week
	July 28 – Sept 21	Closed ^A
	Mar 29 – June 1	Closed
	June 1 – July 12	7 days per week
	July 12 – Aug 2	Closed*
	Aug 2 – Oct 31	7 days per week

^A Selective fisheries for chinook used dip nets or rod and reel.

^B Siska/NTA provided licence for 8" mesh 3:1 hang ratio (July 17 – July 21)

^C Siska/NTA provided licence for 8" mesh 3:1 hang ratio (Aug 9 – Sept 21)

^D Closed between the area of Skihist to Oregon Jack Creek (at request of Nicomen Band and NTA/NWSFA)

^E Selective fishery for chinook by NTA members in the area of Skoonka Creek to the Thompson/Bonaparte confluence.

^F T'it'q'et, Ts'Kw'aylaxw and Xaxli'p provided licence for 8" mesh 3:1 hang ratio (July 13 – July 21)

^G T'it'q'et, Ts'Kw'aylaxw and Xaxli'p provided licence for 8" mesh 3:1 hang ratio (July 28 – Aug 2),

^H T'it'q'et provided licence for 8" mesh 3:1 hang ratio (Aug 13- 16)

^I T'it'q'et, Cayoose and Xaxli'p provided licence for 8" mesh 3:1 hang ratio (Aug 16 – Sep 21) – REVOKED Aug 18th

^J Fishery for Cheam First Nation

^K Dip-net gear also licenced

^L Hope to Sawmill Creek area only

^M Tsawwassen First Nation provided licences for rod and reel

^N Matsqui FN provided licences for limited harvests from a fishwheel

2009 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	6,726	7,272
Port Mann Bridge to Mission	4,568	4,638
Mission to Hope	4,749	9,135
Hope to Sawmill Creek	5,709	7,096
Sawmill Creek to Texas Creek	153	599
Texas Creek to Kelly Creek	387	589
Kelly Creek to Deadman Creek	0	0
Deadman Creek to Marguerite Ferry	65	107
Naver Creek to Shelly & Nechako R to Isle Pierre	120	137
Mainstem Subtotals	22,477	29,573
Tributaries		
Harrison River	0	0
Lillooet River System	unknown	unknown
Thompson River downstream of Bonaparte River confluence	98	100
Thompson River upstream of Bonaparte River confluence ^a	5	1,212
Chilcotin River System	25	184
Nechako River System upstream of Isle Pierre	n/m*	2
Stuart River System	n/m*	0
Tributary Subtotal	128	1,498
Totals	22,605	31,071

* Monitoring was in place for sockeye directed fisheries only. It is expected that no or very little effort would be directed toward chinook only in these areas

^a

Please note, the Fraser River is permanently closed from Williams Creek to Petch Creek. Kelly Creek to Barney Creek and the Lillooet River System was not monitored. The Harrison River upstream of the Highway 7 Bridge was also closed.

Appendix E: 2009 Recreational Catch Data

Fraser River mainstem: the lower Fraser River mainstem recreational fishery study area was bounded by the mouth of the Coquihalla River (upstream boundary) and various downstream boundaries depending on the recreational angler distribution observed in the fishery. The Agassiz Bridge separated the study area into 2 sections. The study was conducted from May 1st to Oct. 15th, 2009. 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 recreational fishery. Fishery assessed from May 1st to October 15th, 2009. Results stratified by catch status (i.e. harvested or released), reporting period and species. Weekday and weekend data analyzed separately and then combined. Data as of Feb. 15th, 2010.

REPORTING PERIOD							
	May 1 - Jun 15	Jun 16-30	Jul 1-31	Aug 1 - Sep 3	Sep 4-30	Oct 1-15	2009 TOTALS
SURVEY EFFORT							
Number of Interviews	19	266	1,964	1,880	2,705	224	7,058
Number of Overflights	11	5	8	12	8	3	47
ANGLER EFFORT							
Average Overflight Count	5	100	303	291	533	162	232
Effort from Interviews (hrs)	62	1,424	9,598	9,824	11,705	817	33,429
Estimated Total Effort (hrs)	2,957	17,226	122,984	118,512	143,598	24,621	429,898
ESTIMATED HARVEST (including adipose fin clipped fish)							
Chinook Adult	0	401	2,812	4,178	789	42	8,222
Chinook Jack	0	0	167	360	446	0	973
Coho Adult	0	0	0	0	73	117	190
Coho Jack	0	0	0	0	0	0	0
Sockeye	0	0	0	0	0	0	0
Pink	0	0	0	573	39,190	696	40,459
Chum	0	0	0	0	21	22	43
ESTIMATED RELEASE							
Chinook Adult	0	0	0	60	45	339	444
Chinook Jack	0	0	0	38	9	11	58
Coho Adult	0	0	0	28	457	288	773
Coho Jack	0	0	0	0	34	0	34
Sockeye	0	0	4,929	14,160	1,026	274	20,389
Pink	0	0	0	484	67,458	4,097	72,039
Chum	0	0	0	0	0	890	890
ESTIMATED HARVEST (adipose fin clipped fish ONLY)							
Chinook Adult	0	15	45	0	25	0	85
Chinook Jack	0	0	0	0	0	0	0
Coho Adult	0	0	0	0	0	81	81
Coho Jack	0	0	0	0	0	0	0

Figure 1. Estimated Chinook harvest (adult + jack) by month in the Fraser River Recreational Fishery, 2003-2009. Note: in most years October not completely assessed.

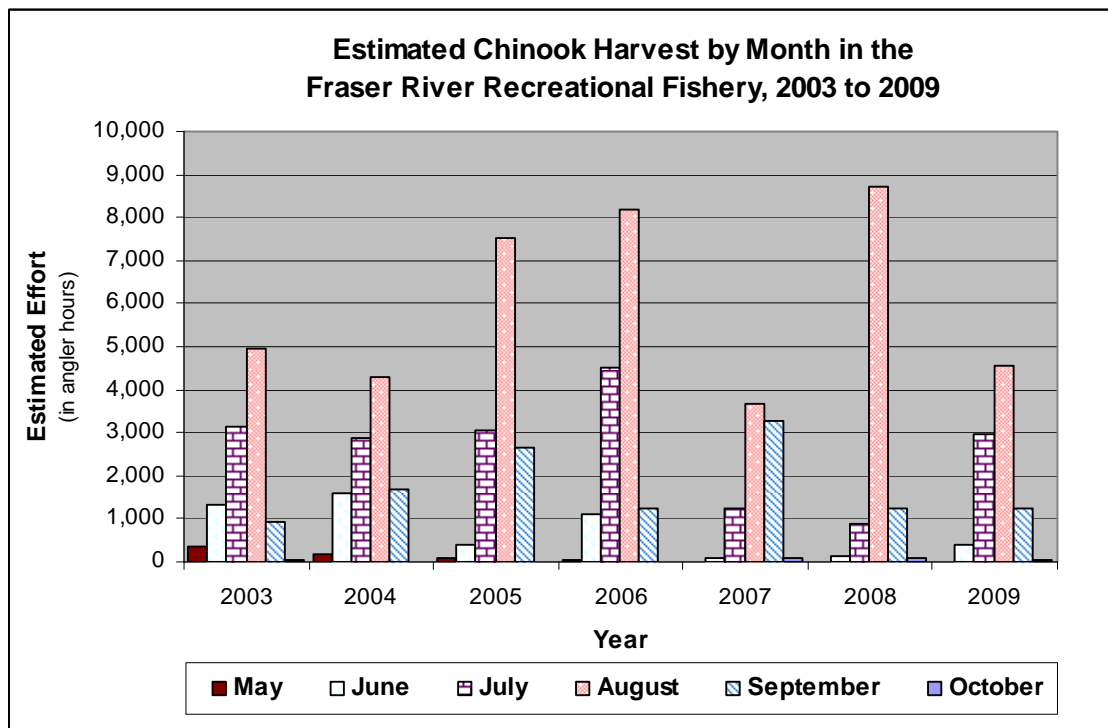


Table 2. Fraser River Recreational Fishery Catch and Effort Information, 2001 to 2009.

	2001 Jul-Aug	2001 Oct-Nov	2001 Total	2002 May-Sep	2002 Oct-Nov	2002 Total	2003 May-Sep	2003 Oct-Nov	2003 Total	2004 ^a May-Sep	2005 ^a May-Sep	2006 ^a May-Oct	2007 ^{a,b} May-Nov	2008 ^{a,c} May-Oct	2009 ^{a,c,d} May-Oct
STUDY DESIGN															
Study Type	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH	AOH
Study Start Date	Jul.01	Oct.20	NA	May.15	Oct.15	NA	May.01	Oct.09	NA	May.01	May.01	May.01	May.01	May.01	May.01
Study End Date	Aug.31	Nov.30	NA	Sep.07	Nov.30	NA	Sep.01	Nov.30	NA	Sep.10	Sep.07	Oct.09	Nov.30	Oct.15	Oct.15
Study Area Upper Boundary	OCR	OHR	NA	OCR	OHR	NA	OCR	OHR	NA	OCR	OCR	OCR	OCR	OCR	OCR
Study Area Lower Boundary	OSR	OFR	NA	OSR	PMB	NA	OSR	PMB	NA	OSR	OSR	OSR	OSR	MB	MB/AFB
STUDY EFFORT															
Number of Days in Study	61	41	102	115	46	161	123	52	175	132	129	161	213	168	168
Number of Interviews	6,724	1,044	7,768	10,832	774	11,606	6,007	875	6,882	7,446	6,823	10,235	6,175	4,599	7,058
Number of Overflights	16	11	27	34	12	46	34	14	48	38	39	46	56	37	47
ANGLER EFFORT															
Effort from Interviews (hrs)	NC	NC	NC	45,659	3,761	49,420	NC	NC	NC	38,575	34,264	49,878	31,321	22,537	33,429
Estimated Total Effort (hrs)	209,239	44,579	253,818	353,854	37,657	391,511	619,794	39,231	659,025	524,886	439,876	747,058	258,161	228,682	429,898
Average Overflight Count	NC	NC	NC	NC	NC	NC	NC	NC	NC	381	341	NC	145	220	232
ESTIMATED HARVEST															
Chinook Adult	10,049	0	10,049	3,479	24	3,503	10,481	66	10,547	10,274	13,546	14,436	7,985	10,352	8,222
Chinook Jack	75	9	84	189	25	214	217	0	217	335	178	707	386	690	973
Coho Adult	0	1,232	1,232	0	235	235	0	796	796	12	0	0	168	12	190
Coho Jack	0	104	104	0	46	46	0	90	90	0	0	0	66	0	0
Sockeye	41,773	0	41,773	125,040	0	125,040	73,393	0	73,393	50,388	42,629	134,292	11	16,344	0
Pink	280	24	304	0	0	0	9,378	27	9,405	0	17,390	0	18,028	0	40,459
Chum	0	1,371	1,371	0	2,761	2,761	0	728	728	0	39	900	3,007	760	43
ESTIMATED RELEASE															
Chinook Adult	3,792	130	3,922	476	0	476	693	104	797	587	401	399	377	856	444
Chinook Jack	29	5	34	202	5	207	10	68	78	24	125	151	142	97	58
Coho Adult	0	1,929	1,929	72	967	1,039	89	1,091	1,180	56	19	90	1,820	92	773
Coho Jack	0	317	317	0	96	96	0	330	330	0	0	2	377	0	34
Sockeye	74,093	0	74,093	66,789	0	66,789	11,778	0	11,778	9,619	69,814	23,643	24,264	17,131	20,389
Pink	218	468	686	0	0	0	6,806	1,538	8,344	0	38,522	0	55,578	0	72,039
Chum	0	4,749	4,749	0	12,484	12,484	0	3,787	3,787	12	172	7,086	10,068	2,923	890

Table 2. Fraser River Recreational Fishery Catch Information, 2001 to 2009 continued.

Footnotes

- a. Survey was continuous.
- b. 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.
- c. Data still "PRELIMINARY" pending development of new analytical software; 2008 & 2009 ran from May 1 to Oct 15.
- d. There was NO sockeye retention opening in 2009.

Abbreviations

General Abbreviations

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

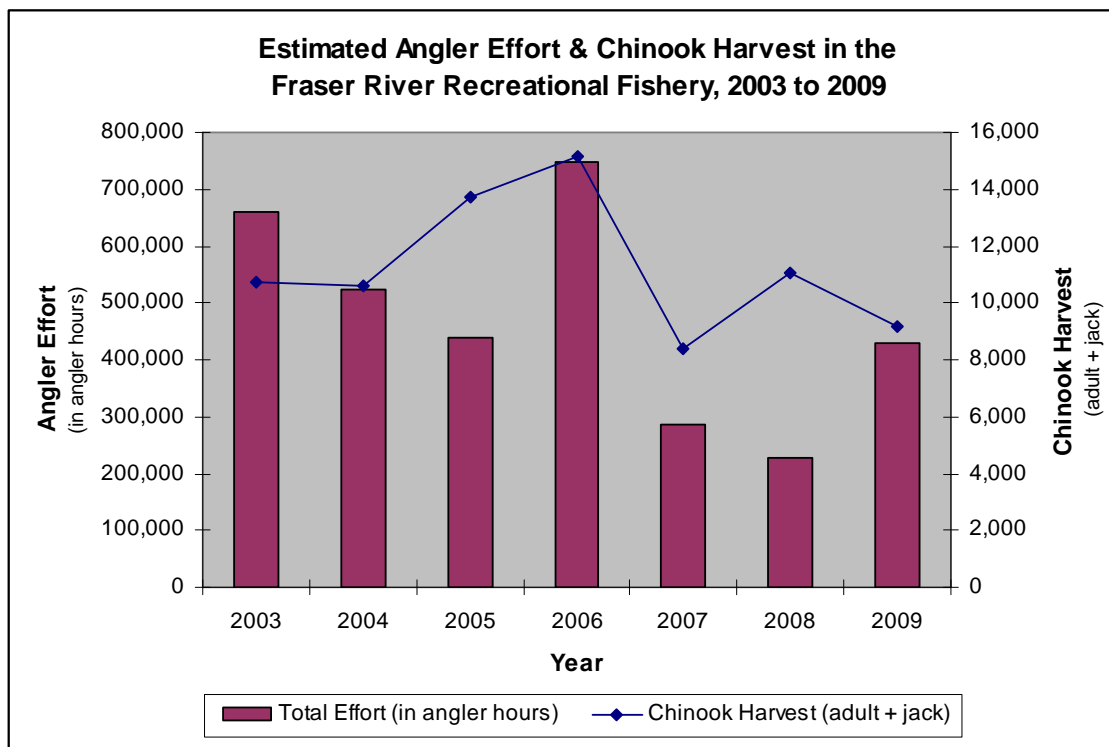
Upper Boundary Abbreviations

OCR Outlet of Coquihalla River
 THB Top end of Herrling Bar
 ARB Agassiz-Rosedale Bridge
 ARP Agassiz-Rosedale Powerline
 OHR Outlet of Harrison River

Lower Boundary Abbreviations

GMT George Massey Tunnel (South Arm)
 OSB Oak Street Bridge (North Arm)
 OFR Outlet of Fraser River
 OSR Outlet of Sumas River
 PMB Port Mann Bridge
 MB Mission Bridge
 AFB Alex Fraser Bridge

Figure 2. Estimated angler effort and Chinook harvest in the Fraser River Recreational Fishery, 2001-2009.



Chilliwack River: the study area was bounded by the mouth of Slesse Creek (upstream boundary) and the confluence with the Fraser River (downstream boundary). The survey covered the entire area open for 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, 2009. Recreational catch estimates for this fishery are preliminary and are reported in Table 3.

Table 3. Preliminary catch estimates for the Chilliwack River recreational fishery. Fishery assessed from September 15th to November 15th, 2009. Results stratified by catch status (i.e. harvested or released), reporting period and species. Weekday and weekend data analyzed separately and then combined. Data as of Feb.15th, 2010.

REPORTING PERIOD					
	Sep 15-30	Oct 1-15	Oct 16-31	Nov 1-15	2009 TOTALS
SURVEY EFFORT					
Number of Interviews	1,332	1,898	1,082	638	4,950
Number of Overflights	4	5	4	4	17
ANGLER EFFORT					
Average Overflight Count	489	601	430	130	413
Effort from Interviews (hrs)	4,608	6,322	3,256	1,662	15,847
Estimated Total Effort (hrs)	71,300	81,946	56,153	12,896	222,295
ESTIMATED HARVEST (including AFC (adipose fin clipped) fish)					
Chinook Adult	1,146	3,698	506	0	5,350
Chinook Jack	1,466	1,748	268	3	3,485
Coho Adult	985	2,159	2,714	388	6,246
Coho Jack	44	228	223	106	601
Sockeye	22	0	0	0	22
Pink	16,701	7,246	678	0	24,625
Chum	24	363	1,523	494	2,404
ESTIMATED RELEASE					
Chinook Adult	1,483	7,348	2,276	69	11,176
Chinook Jack	1,562	1,108	643	3	3,316
Coho Adult	973	2,135	3,025	230	6,363
Coho Jack	116	355	315	49	835
Sockeye	22	0	0	0	22
Pink	78,655	110,661	6,629	3	195,948
Chum	0	1,163	7,719	2,356	11,238
ESTIMATED HARVEST - AFC ONLY (AFC fish ONLY)					
Chinook Adult	109	109	50	0	268
Chinook Jack	65	34	31	0	130
Coho Adult	942	2,063	2,489	383	5,877
Coho Jack	23	202	218	106	549
Sockeye Adult	22	0	0	0	22

Table 4. Preliminary 2009 Chinook Recreational Catches – Upper Fraser River ⁽¹⁾

System	Time/Duration	Hours Fished	Total	
			Harvest	Release
Bowron River	July 15 – Aug 15: 7days/week	486	51	26
Chilko River	July 25 - Aug 16: 7days/week	N/A	No creel survey	
Fraser River (at Prince George)	Jul 10 – Jul 25: 7days/week	N/A	No creel survey	
Fraser River (near Seton River)	July 1 - Sep 7: 7days/week	N/A	No creel survey	
Cariboo River	Jul 27 – Aug 18: 7days/week	N/A	No creel survey	
Quesnel River	Jul 15 - Sep 1: 7days/week	N/A	No creel survey	
Bridge River	June 21 – Jul 16: 5 days/week (0600 - 2100 hrs)	2,222	218	1
Mabel Lake	noon July 25 - noon Sep 12: 7days/week	12,965	345	28
North Thompson River (Clearwater River)	Aug 1 – Aug 31: 7 days/week	5,282	209	17
Shuswap River (lower)	noon July 25 - noon Sep 12: 7days/week (0500 to 2200 hrs. daily)	14,773	507	77
Shuswap River (middle)	noon July 25 - noon Aug 15: 7days/week	N/A	No creel survey	
South Thompson River	Aug 5 - Sep 22: 7days/week	29,163	1,617	54
Thompson River (near Savona)	Aug 21 - Sep 20: 7days/week	361	17	4
Thompson River (near Walhachin)	Aug 21 - Sep 20: 7days/week	10	1	0
Thompson River (near Juniper Beach)	Aug 21 - Sep 20: 7days/week	79	4	1
Thompson River (near Ashcroft)	Aug 21 - Sep 20: 7days/week	97	5	1
Thompson River (near Goldpan)	Aug 21 - Sep 20: 7days/week	380	18	5
Thompson River (near Spences' Bridge)	Jul 25 - Aug 3: Sat/Sun/Mon only 0600 - 2100 hrs.	409	39	3
Thompson River (near Martel)	Sep 3 – Sep 20: 7 days/week	N/A	No creel survey	

(1) Note: Due to budget constraints in 2009 creel surveys were not undertaken in some recreational fisheries. Generally, creel surveys were not undertaken in recreational fisheries where past years information suggested that catch and effort, and associated harvest rates, were very low.

Appendix F: 2009 Commercial Catches

Table 1: Preliminary Estimates of Canadian Commercial Catch of Chinook Salmon by Gear Type and Salmon Licensing Area October 1, 2008 to September 30, 2009 (from FOS*)

Areas	Purse Seine	Gill Net	Troll	Total
Area A	0			0
Area B	2 598			2 598
Area C		6 215		6 215
Area D		7 167		7 167
Area E		1		1
Area F			75 470	75 470
Area G			53 191	53 191
Area H			0	0
Total	2 598	13 383	128 661	144 642

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

Appendix G: Management Measures Proposed to Protect Earliest Timed Fraser River Chinook in 2009

Fishery	Area	March			April			May			June			
		1	15	31	1	15	30	1	15	31	1	15	30	
Area G Troll	NWVI (Area 125 to 127)	Open to Mar. 15	March 16 to May 31 managed to effort limit.											
	SWVI (Area 123/124)	Closed March 1 to April 30 (except inside areas 23/24 Mar. 1-15)						May 1 to 31 managed to effort limit						
Marine Recreational	West of Cadboro Point to Sheringham Point (Subareas 19-1 to -4 and 20-5)	March 2 to May 14: 2 chinook between 45-67cm (hatchery or wild) or >67cm (hatchery only).												
	Area 29 off Fraser River (Area 29-7, 9-10)							Non-retention of Chinook April 1 to May 31						
Fraser River Recreational	Fraser River Tidal (Areas 29-11 to -17)	Closed-Status Quo						Non-retention of Chinook May 1 to June 15						
	Freshwater (Mission to Alexandra Bridge)	Closed-Status Quo						Non-retention of Chinook May 1 to June 15						
Fraser River First Nations	Lower Fraser: Below Port Mann	Closed-Status Quo	Proposed later start and reduced communal fishing time											
	Lower Fraser: Port Mann to Sawmill	Closed-Status Quo	Proposed later start and reduced communal fishing time											
	BC Interior: Sawmill to Kelly Cr. And Thompson below the Bonaparte	Closed-Status Quo			Proposed later start and reduced communal fishing time									
Albion Test Fishery	Fraser River Chinook Assessment Fishery	Closed-Status Quo			Regular chinook test fishery planned start April 1									

A: Area G Status Quo: Closed Mar. 15 to Apr. 15 in SWVI (Area 123/124)

B: Marine Recreational Status quo:

Daily limit is 2 Chinook per day with minimum size limit of 45cm in those waters west of Cadboro Point to Sheringham Point (Subareas 19-1 to 19-4 and 20-5)

Daily limit is 2 Chinook per day with minimum size limit of 62cm in those waters of Area 29 off the Fraser River (Area 29-7, 29-9 and 29-10)

C: Fraser River Recreational Status Quo:

Currently closed. Open May 1 with daily limit of 4 Chinook, only 1 over 50 cm in Fraser River tidal waters (Areas 29-11 to 29-17) and non-tidal waters downstream of the Alexandra Bridge.

D: Fraser River First Nations Status Quo:

Fishery generally opens in mid March: 24 hrs/wk drift nets Mid April: 36 hrs/wk drift nets May 1: 48 hrs/wk in the waters downstream of the Port Mann Bridge.

Fishery generally opens in mid March: 24 hrs/wk set net, 10hrs/wk drift net May 1: 48 hrs/wk set net, 12 hours/wk drift net in the waters upstream of the Port Mann Bridge to the confluence with Sawmill Creek.

Fishery generally opens April 1 to June 15: 4 days per week, all gears, June 16 until E. Stuart Sockeye window closure: 7 days per week in the BC Interior:

Fraser River from the confluence with Sawmill Creek to the confluence with Kelly Creek and the Thompson River below the Bonaparte

E: Albion Test Fishery Status Quo: Fishery usually starts April 1: 2 sets per day with 8" or multi-panel net

Appendix H: Additional Technical Information

1. Harrison Chinook:

The run size of Harrison fall returning chinook is based on the Harrison River escapement program and estimates of exploitation rates. The Chilliwack River exploitation rates are used to represent the exploitation rates on the Harrison stock. The Harrison stock has been tagged at Chehalis River hatchery, however the tag rate was very low compared to the total Harrison return and too few tags were collected to sufficiently measure exploitation rates. Unfortunately, several problematic issues with the Chilliwack escapement program have contributed to high uncertainty with the estimated exploitation rates. A research program is underway to evaluate if sufficient CWT data can be collected at the Harrison River.

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, making 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, but 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 but 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 broodstock 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 unassessed 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 examined and the best available ones are used to address deficiencies in order to estimate fishery impacts and reconstruct cohort abundances. Currently, Nicola River and Lower Shuswap rivers have CWTs and reliable escapement estimation programs; however forecasts are not produced currently for these stocks.

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 at least 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 marine 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 microsatellite DNA and major histocompatibility 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 microsatellite 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, and assumptions must be made about natural mortality rates and patterns, time sequence of environmental patterns, and consistency of data series. The habitat method relies on relationships between carrying capacity, estimated from stock-recruitment analyses, and watershed area (Parken et al. 2006²). The habitat and stock-recruitment data are from 26 populations ranging from Alaska to 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 continue at the Lower and Middle Shuswap rivers, Coldwater River, Chilcotin River, and Chilko River in 2009.

Appendix I: DFO Contacts

	Area Chief	Janet Gagne	(604) 666-6512
	Resource Manager - Aboriginal Fisheries	Sheldon Evers	(604) 666-8049
Fisheries Management - Lower Fraser Area	Resource Manager - Aboriginal Fisheries	Terri Bonnet	(604) 666-8426
	Resource Manager - Recreational Fisheries	Debra Sneddon	(604) 666-6509
	Resource Manager - Commercial Fisheries	Barbara Mueller	(604) 666-2370
	A/Management Biologist (Chinook, coho, chum)	Marla Maxwell	(604) 666-2417
	A/Management Biologist (FN catch monitoring)	Matthew Parslow	(604) 666-6608
	Area Chief	Les Jantz	(250) 851-4878
	Resource Manager - Fraser River watershed upstream of Deadman Creek	Linda Stevens	(250) 305-4004
	Asst. Resource Manager - Fraser River watershed upstream of Deadman Creek	Dave Reedman	(250) 305-4019
Fisheries Management - B.C. Interior	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
	Chief – Fraser River Stock Assessment	Timber Whitehouse	(250) 851-4833
	Head – Chinook and Coho Stock Assessment	Richard Bailey	(250) 851-4814
	Assessment Biologist – Chinook and Coho	Nicole Trouton	(250) 851-4989
Stock Assessment Division	Assessment Biologist – Chinook and Coho	Lynda Ritchie	(250) 851-4938
	Assessment Biologist – Chinook and Coho	Kris Singer	(604) 666-8713
	Head – Fraser River Chinook and Coho Analysis	Mike Chamberlain	(250) 851-4947
	Head – Chum, Pink and Recreational Fisheries Program	Joe Tadey	(604) 666-7273
	Assessment Biologist – Chum, Pink and Recreational Fishery Assessments	Jason Mahoney	(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	North S ²	Central S ¹	Georgia St. S	Juan de Fuca S	WCVI Inside S ²	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%				1.8%	5.3%				3.3%	0.0%	0.0%	0.0%	2.0%	10.3%	0.0%	0.4%	1.7%	0.0%	72.5%
1996	0.0%	0.0%	0.0%	0.6%	0.9%	0.3%	0.0%	0.0%				0.0%	6.6%				4.6%	0.0%	0.0%	0.0%	5.0%	28.5%	0.0%	0.0%	2.6%	0.0%	50.9%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				0.0%	8.7%				0.0%	0.0%	0.0%	0.0%	2.1%	27.7%	0.0%	1.7%	0.0%	1.4%	56.6%
1998	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%	4.4%	63.5%	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%	15.3%				0.0%	0.0%	0.0%	0.0%	2.7%	50.6%	0.0%	2.9%	0.0%	0.0%	28.5%
2001	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	2.2%	0.0%	0.0%				2.9%	15.5%				3.3%	0.0%	0.0%	0.0%	3.8%	44.3%	0.0%	0.4%	0.0%	23.9%
2002	0.0%	0.0%	0.0%	12.9%	0.0%	11.6%	0.0%	0.0%				0.0%	11.6%				0.0%	0.0%	0.0%	0.0%	1.8%	15.6%	0.0%	3.2%	0.0%	0.0%	43.2%
2003	0.0%	0.0%	0.0%	7.1%	0.0%	0.0%	9.5%	0.0%				0.0%	16.7%				0.0%	0.0%	0.0%	0.0%	6.8%	41.6%	0.0%	0.0%	0.0%	0.0%	18.3%
2005	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%				1.6%	2.8%				7.9%	0.0%	0.0%	0.0%	1.2%	54.3%	0.0%	0.0%	0.0%	0.0%	27.7%
2006	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	0.0%	0.0%				1.6%	3.2%				0.0%	0.0%	0.0%	0.0%	1.7%	55.5%	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	North S ²	Central S ¹	Georgia St. S	Juan de Fuca S	WCVI Inside S ²	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%	0.1%	0.8%	1.3%	0.4%	0.0%				1.1%	1.5%				2.2%	1.9%	0.0%	0.0%	1.0%	7.2%	1.6%	0.1%	0.5%	0.0%	80.3%
1996	0.0%	0.0%	0.0%	0.8%	0.3%	0.6%	0.0%	0.0%				0.6%	1.7%				0.2%	0.3%	0.0%	1.1%	1.2%	11.2%	0.8%	0.0%	0.0%	0.0%	81.1%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				0.0%	5.4%				2.3%	2.3%	0.0%	0.7%	0.6%	10.5%	13.7%	0.0%	10.0%	0.0%	54.5%
1998	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%				0.7%	0.6%				1.7%	6.1%	0.0%	0.0%	0.8%	12.4%	1.2%	0.0%	0.0%	0.0%	75.4%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				0.3%	0.5%				1.6%	0.0%	0.0%	0.0%	0.7%	24.6%	0.0%	0.6%	0.0%	0.0%	71.8%
2000	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%				0.5%	2.9%				0.9%	3.2%	0.0%	0.0%	1.1%	30.5%	0.0%	0.0%	0.0%	0.0%	59.8%
2001	0.0%	0.0%	0.0%	0.0%	0.8%	0.1%	0.0%	0.0%				0.2%	3.2%				2.5%	1.3%	0.0%	0.0%	1.8%	19.9%	0.0%	0.7%	0.0%	0.0%	69.5%
2002	0.0%	0.0%	0.0%	2.3%	0.5%	1.2%	0.0%	0.0%				0.5%	1.7%				0.7%	3.8%	0.0%	0.4%	0.4%	5.9%	0.0%	1.4%	0.4%	0.0%	80.7%
2003	0.1%	0.0%	0.0%	1.9%	0.0%	0.8%	0.5%	0.0%				0.6%	1.4%				2.9%	2.5%	0.0%	0.0%	2.1%	18.6%	0.0%	0.4%	0.0%	0.0%	68.2%
2004	0.0%	0.0%	0.0%	2.2%	0.0%	2.0%	0.0%	0.0%				2.2%	1.7%				0.0%	0.0%	0.0%	0.0%	1.0%	23.1%	0.0%	1.1%	0.0%	0.0%	66.7%
2005	0.0%	0.0%	0.0%	1.1%	0.0%	3.3%	0.0%	0.0%				3.1%	3.5%				1.2%	9.4%	0.0%	0.0%	0.5%	25.0%	0.0%	0.4%	0.0%	0.0%	52.6%
2006	0.0%	0.0%	0.0%	1.5%	0.0%	1.8%	0.0%	0.0%				0.0%	2.9%				2.2%	7.1%	0.0%	0.0%	0.5%	17.8%	0.0%	0.4%	0.0%	0.0%	65.9%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	6.6%	0.0%	0.0%				0.0%	0.0%				14.7%	9.5%	0.0%	0.0%	0.2%	21.9%	0.0%	1.5%	0.0%	0.0%	45.6%
2008	0.0%	0.0%	0.0%	0.8%	0.5%	0.0%	0.0%	0.0%				2.0%	1.2%				1.4%	3.2%	0.0%	0.0%	0.8%	24.0%	0.0%	1.6%	0.3%	0.0%	64.2%

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			
	T	S	N	T	S ¹	T	S ³	Canada										US								
								Georgia St. T	North S ²	Central S ¹	Georgia St. S	Juan de Fuca S	WCVI Inside S ²	Terminal S	Nicola Mouth S	Lower Shuswap S	North/Central N	Terminal Commercial N	Terminal Native N	Other N	T	S		N		
1995	23.7%	5.3%	0.0%	16.8%	9.5%	4.7%	0.0%	0.0%				0.0%	2.1%			0.8%	0.0%	0.0%	0.3%	2.1%	4.2%	3.7%	0.0%	0.0%	5.3%	21.6%
1996	18.8%	0.0%	0.0%	0.5%	5.1%	0.3%	1.7%	0.0%				0.9%	2.4%			1.4%	0.0%	0.0%	0.2%	3.8%	2.7%	0.5%	0.0%	0.0%	0.0%	61.8%
1997	20.9%	0.0%	1.5%	14.2%	8.0%	0.7%	0.0%	0.0%				3.9%	3.6%			0.0%	0.0%	0.0%	0.2%	12.9%	10.8%	4.0%	0.0%	0.0%	4.2%	15.0%
1998	23.4%	9.5%	0.4%	9.5%	11.2%	0.0%	0.1%	0.0%				5.0%	1.6%			0.0%	0.0%	0.7%	0.0%	3.7%	4.6%	0.3%	0.0%	0.0%	1.0%	28.9%
1999	32.0%	13.6%	0.0%	1.0%	14.6%	0.0%	0.0%	0.0%				4.8%	1.2%			0.0%	0.0%	0.7%	0.0%	1.0%	6.9%	0.0%	0.0%	0.0%	0.0%	24.1%
2000	10.9%	10.2%	0.0%	0.0%	5.4%	0.0%	0.0%	0.0%				2.6%	1.2%			1.4%	0.0%	0.0%	0.0%	3.1%	3.4%	0.0%	0.0%	0.6%	0.1%	61.0%
2001	7.5%	0.3%	1.4%	2.2%	8.4%	0.0%	0.0%	0.0%				2.9%	1.9%			0.2%	0.0%	4.4%	0.0%	1.0%	3.8%	0.6%	0.1%	0.0%	0.2%	65.1%
2002	18.0%	3.4%	0.0%	12.7%	8.0%	1.5%	0.0%	0.0%				1.3%	1.6%			0.0%	0.0%	0.5%	0.0%	3.0%	6.1%	0.0%	0.0%	0.0%	0.0%	43.8%
2003	10.9%	2.3%	2.3%	9.7%	8.4%	0.0%	0.3%	0.0%				0.8%	4.9%			1.5%	0.0%	0.3%	0.0%	1.7%	1.9%	0.0%	0.4%	0.0%	0.7%	54.2%
2004	17.8%	2.3%	0.0%	9.3%	12.3%	0.9%	0.0%	0.0%				4.0%	0.6%			1.1%	0.0%	0.6%	0.0%	5.5%	5.9%	0.0%	0.3%	0.0%	1.3%	38.4%
2005	15.0%	0.9%	0.0%	12.3%	17.6%	0.4%	3.2%	0.0%				2.1%	2.2%			2.8%	0.0%	1.0%	0.0%	0.4%	4.8%	0.0%	0.2%	0.0%	0.4%	36.7%
2006	11.9%	2.0%	0.0%	13.0%	15.4%	0.3%	1.0%	0.0%				5.9%	1.3%			2.4%	0.0%	0.4%	0.0%	1.0%	5.4%	0.0%	0.2%	0.0%	0.8%	39.0%
2007	6.5%	11.3%	0.3%	3.8%	17.3%	0.0%	0.8%	0.0%				1.3%	2.2%			4.5%	0.0%	0.0%	0.0%	0.4%	6.2%	0.0%	0.0%	0.0%	0.0%	45.3%
2008	8.9%	0.5%	0.0%	7.6%	9.4%	0.0%	1.7%	0.0%				3.2%	2.1%			0.6%	0.0%	2.5%	0.0%	0.3%	1.9%	0.0%	0.0%	0.0%	0.0%	61.2%

