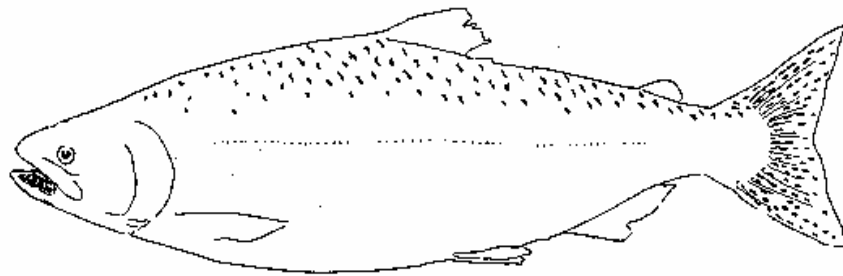


# 2007

**Information Document to Assist  
Development of a**

# **Fraser Chinook Management Plan**



## RECORD OF REVISIONS

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#	Date	Page	Subject	Revision Details	Contact
E	Feb. 21	38	Recreational Catch	Figure Corrected.	
E	Feb. 21	43	Recreational Catch	Mabel Lake corrected	

### ADDITIONAL NOTES:

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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 commercialization of the British Columbia fishing industry.

This information document is intended to compliment the Southern BC Integrated Fisheries Management Plans for salmon. This document is necessary as Chinook fisheries in the Lower Fraser area generally start in March, the estimate of aggregate abundance used to determine allowable harvest levels for Chinook is also available in March but the Integrated Fishery Management Plans are usually not finalized until May or June of a given year.

Fisheries and Oceans Canada will continue to consult with First Nations, recreational and commercial fishers to further co-ordinate Chinook fishing plans for 2007. Further consultation will occur as sector specific plans are finalized.

## 2. Lifecycle

There are several distinctly different life histories exhibited by Fraser River Chinook salmon. Chinook salmon spawn in numerous tributary systems throughout the Fraser watershed from just above the tidal limits 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 then, depending on their freshwater rearing pattern, may migrate immediately to the estuary (e.g. Harrison), spend between 60 to 150 days in freshwater (e.g. Maria Slough and Lower Shuswap) or may spend up to a year between their natal system and downstream rearing areas before their migration to the coast.

The 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 populations utilizing offshore marine waters, while others 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, they may be subject to numerous fisheries. Offshore migrants such as the Interior spring and summer yearlings are less vulnerable to coastal fisheries than Lower Fraser fall stocks and the 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. 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.

### 3. General Context

#### 3.1. Policy Framework for the Management of Pacific Salmon Fisheries

Salmon management programs in 2007 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*, *A Policy for Selective Fishing*, *A Framework for Improved Decision Making in the Pacific Salmon Fishery*, and *Fishery Monitoring and Catch Reporting Framework*.

The WSP, which was approved in 2005, sets out a process for the protection, preservation and rebuilding of wild salmon and their marine and freshwater ecosystems for the benefit of all Canadians. The policy provides for the identification of genetically discrete groupings of stocks (called "Conservation Units") and the identification of upper and lower abundance benchmarks that are a measure of the status of each of these stock groupings.

A Conservation Unit is defined as a group of wild salmon that is sufficiently isolated from other groups that, if lost, is very unlikely to re-colonize naturally within an acceptable timeframe (e.g. a human lifetime or a specified number of salmon generations). A PSARC working paper describing the conservation units and the methods used to determine which salmon fit into a conservation unit is anticipated in late spring, 2007.

Other features of the WSP include the monitoring of habitat status and a process for public engagement in the establishment of upper abundance benchmarks that reflect social and economic values.

*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 fishing sectors and within the commercial fishery gear types.

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: [www-comm.pac.dfo-mpo.gc.ca/pages/consultations/consult\\_e.htm](http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/consult_e.htm).

A discussion paper outlining the potential approaches for commercial salmon fisheries to address the objectives set out in the *Fishery Monitoring and Catch Reporting Framework* were released for consultation in the fall of 2003. Monitoring programs will continue in 2007 to assess harvests (both target and non-target species) as well as other non-harvest mortalities.

In April 2005, the Department announced a blueprint for fundamental reform of Pacific Fisheries. This was in response to recognition of conservation concerns, very poor economic returns in the salmon fishery, and recommendations included in reports from the Joint Task Group (Drs P. Pearse and J. McRae) and the First Nations Panel (FNP). Both the JTG and FNP reports call for improved co-management and a clear process based on voluntary licence retirement for re-allocating fish stocks to First Nations. Both reports also call for a revised approach to the management of salmon to begin as soon as possible. The reports also make a number of other recommendations which are intended to improve the environmental and economic performance of the fishery.

### **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 has met with mixed success; some populations are slowly rebuilding, while others remain depressed.

Starting in 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 gillnet fishery, and measures required in pass-through fisheries to protect specific stocks.

The PST was revised in 1999. Chinook management changed so that fishing levels would vary in response to the annual production of Chinook salmon (aggregate abundance-based management AABM). If the ocean abundance of Chinook was poor, then the allowable harvest rates and catches would be reduced so that spawning escapements were protected. However, if the ocean abundance of Chinook was very good, then harvest rates and catches could increase, but only to a level that still protected spawning escapements.

The 1999 PST Annexes specifies 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 will be managed to an overall bilaterally-agreed harvest rate (catch will vary 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 were 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 were greater than the goal, then the harvest rates (and catch) in ISBM fisheries could 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 is the necessity for a pre-season estimation of Chinook abundance in the ocean, and the need for agreed 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 is the responsibility of each management agency but the technical basis for establishing a goal will be reviewed by the PSC Chinook Technical Committee.

### **3.3. Special Concerns for 2007**

Survival rates for many stocks of Chinook salmon in the Pacific Northwest are substantially lower than they were in the 1980's. Of particular concern are some of the earliest returning populations (e.g. Coldwater River, Spius Creek and Upper Chilcotin River). Escapements to these three early timed populations were very low in both 2005 and 2006. There is an increasing likelihood that conservation concerns may develop if these populations continue to display very low escapements in upcoming years.<sup>1</sup>. In addition there are several other early timed stocks, Louis Creek, Cottonwood and Westroad, that appear to be in a declining trend as well, although the information is less certain.

Migration characteristics of these stocks do not coincide with periods of heavy fishing activity throughout most of their migratory route. These stocks are usually not affected by adverse weather conditions (high water, high water temperature) but have been found to display low productivity. Review of recent data suggests that the First Nation fishery

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<sup>1</sup> PSARC Research Document 2001/134 Summary of stock assessment information for selected early returning Chinook salmon populations of the Fraser River watershed.



in the lower Fraser River exerts the highest harvest rate on these early timed Chinook stocks (Bailey et al. CSAS 2001/134).

A review of the status of four early timed stocks within the Fraser River spring run Chinook aggregate (i.e., Upper Chilcotin, Coldwater, Spius, Birkenhead) was undertaken by the Pacific Scientific Advice Review Committee (PSARC) in 2001. Recommendations resulting from this review were to manage Canadian domestic Chinook fisheries up to the end of April each year in a manner that would not exceed an exploitation rate of 33% on these four stocks.

The Department has been managing the spring timed Chinook stocks (which includes the early timed component of this stock aggregate) using a fishing plan that has been reasonably consistent for years 2001 to 2006. Catches and associated harvest rates have varied during this time period. Fishing plans for the entire area need to be coordinated to ensure that differing management actions such as new gear and/or separate fishing times do not result in an increased harvest rate on early timed Chinook stocks.

Some lower Fraser First Nations have changed their method of fishing from set gill nets to drift gill nets. The information on changes in catch per unit effort is currently being analyzed. The analysis is expected to show that larger, more mobile nets have the potential to increase catch per unit effort and therefore, also the harvest rate.

Requests have been received from some lower Fraser First Nations for separate fishing times. The harvest rate impact of providing separate fishing times for First Nation groups in the lower Fraser canyon area must be determined. It is likely that separate fishing times in the canyon would lead to an increased harvest rate as the most productive sites would be fished for longer periods of time.

As of January 26, 2007, lower, middle and upper Fraser and Thompson River watershed snow pack levels were tracking at above normal levels as determined by monitoring stations in these areas. Further updates on this topic can be found at the following web address: <http://www.env.gov.bc.ca/rfc/>

## 4. Management Objectives

### 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 returns decline below sustainable levels, management actions are taken which may include reducing the impact of fisheries on specific stocks, strategic enhancement and habitat restoration.

Fisheries openings and closures are designed to address conservation requirements first. Fishing times are adjusted to achieve this requirement, as information regarding run size, harvest rates, and escapement becomes available.

### 4.2. Aboriginal fisheries for food, social and ceremonial purposes

**The objective is to manage fisheries to ensure that, subject to conservation needs, first priority is accorded to First Nations for opportunities to harvest fish for FSC purposes and any treaty obligations.**

Consultations are on-going between Resource Management staff and First Nations, both within the Fraser River Watershed and outside the Watershed. Fishery plans are based upon stock conservation requirements and needs indicated by all Fraser River First Nations.

### 4.3. International Allocation

**The objective is to manage Canadian treaty fisheries to ensure that obligations within the PST are achieved.**

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) considering the status of each of the stocks migrating through these areas. 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.**

The Allocation Policy for Pacific Salmon can be found online at:  
[www-comm.pac.dfo-mpo.gc.ca/publications/allocation/AllocationPolicyoct201.htm](http://www-comm.pac.dfo-mpo.gc.ca/publications/allocation/AllocationPolicyoct201.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 timing however more recently, following a review of Chinook stock structure in 2002, they have been grouped based on life history. Until WSP Conservation Units are confirmed, the five interim management units are:

- Fraser spring-run age 4<sub>2</sub>
- Fraser spring-run age 5<sub>2</sub>
- Fraser summer-run age 5<sub>2</sub>
- Fraser summer-run age 4<sub>1</sub>
- Fraser fall-run age 4<sub>1</sub>

Run timing is indicated by the words, spring, summer and fall. Life history is indicated by a number such as: 4<sub>2</sub>. The large number represents the total age of the fish from its deposition in the gravel as an egg to its return to spawn. The subscript number represents the number of winters the fish spent in freshwater during the juvenile stages of their life history. Interim management units are outlined in Table 1.

Watersheds may have more than one population with different life history characteristics (e.g., run timing, time spent in freshwater, etc.).

**Table 1: Interim Management Units for Fraser River Chinook salmon**

Management Unit	Sample Streams	Indicator Stock
Fraser spring-run age 4 <sub>2</sub>	Bonaparte River, Bessette Creek, Coldwater River, Deadman River , Nicola River, and Spius Creek	Nicola River
Fraser spring-run age 5 <sub>2</sub>	Birkenhead River, Chilcotin River, upper Chilcotin River, Westroad River, Cottonwood River, Elkin Creek, Horsefly River, upper Cariboo River, upper Pitt River, Fraser River mainstem tributaries above Prince George (Bowron, Willow, Slim, McGregor etc.), spring runs of North Thompson and Salmon River in South Thompson	Dome Creek
Fraser summer-run age 5 <sub>2</sub>	Chilko River, Quesnel River, Stuart River, Taseko, Lower Cariboo River, and the Clearwater River	Chilko River (proposed)

Management Unit	Sample Streams	Indicator Stock
Fraser summer-run age 4 <sub>1</sub>	Lower Shuswap River, Mid Shuswap River, Lower Adams River, Little River, South Thompson River, Lower Thompson River (below Kamloops Lake), and Maria Slough	Lower Shuswap River
Fraser fall-run age 4 <sub>1</sub>	predominantly fish of Harrison River origin (those natural spawners returning to the Harrison River, and transplanted populations to the Chilliwack, Chehalis, and Stave Rivers)	Chilliwack River

Long term escapement trends for each management unit are illustrated in Appendix B and C.

## 5.2. Lower Fraser River Stocks

Lower Fraser River Chinook stocks are numerically dominated by the fall returning, white-flesh Harrison River stock group, also known as the Fraser fall-run. The Fraser fall-run stock group includes the original natural population of fall returning Chinook to the Harrison River, and transplanted Harrison origin populations returning to the Chilliwack, Chehalis, and Stave Rivers. The Fraser fall-run stock group is unusual in that upon fry emergence from the gravel they migrate immediately to the estuary where they rear for three to six weeks before moving offshore instead of staying 60-150 days in freshwater as is typical of most stocks with an ocean-type life history.

In addition to the fall-run Chinook populations there are also relatively small, unique populations of spring and summer-run Chinook salmon returning to the lower Fraser River. These can be either red or white-fleshed stocks that typically exhibit a stream-type life history (i.e., Chinook fry that over-winter in fresh water and migrate to the ocean in their second spring) - Birkenhead, upper Pitt and spring and summer-run Chilliwack River populations are examples of this life history. Chinook returning to Maria Slough are distinct in the lower Fraser River in that they exhibit a summer-run ocean-type life history pattern.

The Chilliwack River watershed has two or possibly three distinct stock groups:

- a spring-run population that spawns between Slesse Creek and the Chilliwack Lake outlet,
- a summer-run population that predominately spawns in the upper reaches of the lower Chilliwack River above Slesse Creek, and
- a transplanted Harrison-origin fall-run population that predominately spawns downstream of the Slesse Creek confluence.

Birkenhead Chinook are an early timed spring-run population that is thought to begin returning to the Fraser River as early as February. Peak migration into the Fraser is thought to occur in early April. DNA analysis of Albion Test Fishery catch data indicates Birkenhead Chinook continuing to be present in the lower Fraser River to mid-May.

These fish are subject to First Nations fisheries in the Fraser mainstem and to First Nation fisheries and a non-retention recreational fishery in the Birkenhead and Lillooet Rivers. Recreational fishing for Chinook 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 1<sup>st</sup> to September 15<sup>th</sup> each year. This closure is to protect these Chinook during their critical spawning time. In addition, Birkenhead Chinook are far north migrators and are taken in Alaskan and northern troll fisheries and northern marine recreational fisheries.

### **5.3. Interior Fraser River Stocks**

Chinook salmon in the interior Fraser River (above Hope) comprise a large and complex group of spawning populations. Interior Fraser Chinook have historically been divided into three major geographical regions:

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

Within these regions, two migration times are recognized: early or spring-run, and summer-run.

### **5.4. Stock Assessment Methods**

Assessment of the lower Fraser River Chinook spawning stocks rely on visual surveys, a mark-recapture project, and the coded-wire tagging of hatchery produced fish.

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

In the BC Interior, assessment of these large stock aggregates is largely formed by annual estimates of escapement by aerial surveys, mark-recapture (Nicola River, Louis Creek, and lower Shuswap River), and electronic counter (Deadman River). Trends in these spawning escapements, comparisons of spawning abundance to Wild Salmon Policy benchmarks, and the relative distribution of spawners among rivers are all used to assess stock status.

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

## **5.5. Forecasts**

Forecasts of the next year's pre-fishery ocean abundance and expected escapement of Fraser fall-run (Harrison and Chilliwack rivers) Chinook are developed for use in the Chinook Technical Committee's coastwide modeling work. This is the only stock group in the Fraser River, and only one of two Canadian Chinook stocks, for which a forecast is calculated. Quantitative forecasts for most Fraser River Chinook are not prepared by DFO. The Chinook Technical Committee coastwide model calculates a forecast of ocean abundance for these stocks in the aggregate.

A forecast for 2007 is not available at this time, but will be by mid to late March. Forecasts are not adjusted in-season since there is insufficient information for updates (e.g. CWT recoveries in southern U.S. fisheries are not reported in-season).

Additional technical information on the Harrison River Chinook, stock assessment, and forecasting can be found in Appendix J.

## **5.6. Escapement Objectives**

The escapement goals currently being used were set in 1986 following negotiation of the original Pacific Salmon Treaty in 1985. While there were a variety of methodologies that could have been used to determine escapement goals, it was agreed to establish the goals at twice the average escapement observed during the period 1979 to 1982. This strategy was to be used until 1998 at which time the goals were to be reviewed. Scientists are now evaluating current information and with the implementation of the Wild Salmon Policy, discussions have commenced regarding identification of Conservation Units. Following this, lower (conservation) and upper (target) benchmarks will be set based on input from a broad spectrum of interests.

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

## **5.7. Albion Test Fishery**

Since 1981, Fisheries and Oceans Canada (DFO) has conducted a Chinook test fishery at Albion, British Columbia (near Fort Langley) from early April to late-October. The test fishery is conducted each year with a drifted gillnet at a specific site by the Albion ferry crossing in the Fraser River.

For each sampling event, two 30-minute sets are made daily - just prior to and after daylight high tide. The original net was 8-inch mesh, but beginning in 1997 a multi-panel net was used on alternate days. The multi-panel net consisted of panels of five, six, seven, eight, and nine inch mesh, and was fished identically to the standard net. The purpose of the multi-panel net was to provide a more accurate sample of the Chinook stock assemblages passing the test fishing area by including both smaller and larger mesh panels. Intuitively, we expected the catch in the multi-panel net to more fully represent the wide range of body sizes of Fraser River Chinook stocks.

Analysis of the 1997 to 2001 data was initiated in 2001. The primary objective was to identify the new information the multi-panel net provided, particularly as it pertained to in-season management and stock assessment, and assess which net best indexed in-river Chinook abundance. The secondary objective of the analysis was to establish a relationship between the catch of the standard Chinook (8 inch) and the multi-panel nets in order to provide uniform relative abundance estimates. The study estimated population specific migration timing and aggregated population abundance indices by using DNA and CWT information to estimate the population origin of individual fish. This analysis indicated that the test fishery adequately measured in-river abundance (Parken et al. 2004).

The operation of the test fishery in 2006 was the same as in 2005; alternate days fishing with the standard 8 inch mesh net and the multi-panel net. The total 2006 catch from both nets from April 1, 2006 to October 20, 2006 was 1334 Chinook. The cumulative catch per unit effort (CPUE) for the 8 inch net from April 1 to October 20 was 148.22 (adjusted for days the multi-panel net was fished). This value is approximately 50% of the long term average. 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>.

Legal decisions in 2006 from cases involving the use of fish to fund departmental activities may significantly affect test fishing activities. The implications to the operation of the Albion test fishery have not yet been resolved.

## **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. 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 5<sub>2</sub>), Slim (Spring-run 5<sub>2</sub>), Finn (Spring-run 5<sub>2</sub>), Chilko (Summer-run 5<sub>2</sub>) and Quesnel (Summer-run 5<sub>2</sub>), stocks. Between 1981 and 1985, some upper Pitt (Spring run 5<sub>2</sub>) 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.

## **6.2. 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.

## **6.3. Birkenhead Hatchery**

The Birkenhead Hatchery on the Birkenhead River was established in 1977. 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. Historical CWT tag returns indicated 15 - 25% contribution of enhanced Chinook to the run. As Birkenhead Chinook have a five year life cycle, 2007 will likely be the last year we will see returns from this hatchery enhancement program.

## **6.4. Interior Fraser Chinook Enhancement**

Since the early 1980's, the main hatcheries enhancing upper Fraser River Chinook have been the Eagle, Shuswap, Clearwater, and Spius (all Thompson); the Quesnel (mid-Fraser); and Stuart (upper Fraser). Since the early 1990's, the Clearwater, Eagle, Quesnel, and Stuart facilities have been closed. Some enhancement still occurs throughout the watershed, mostly linked to stock assessment and the production of coded-wire tag mark groups. 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).

# **7. First Nations Fisheries**

## **7.1. 2006 Fishery Summary**

First Nations both in and outside the Fraser River are provided with an opportunity to harvest Fraser River Chinook. The number of fishing days is dependent upon the conservation needs of Chinook stocks and other species, such as sockeye, wild steelhead and Interior Fraser coho salmon. Alterations to fishing patterns, reached via consensus, are subject to ensuring escapement requirements are met.

Once sockeye enter the Fraser River, management actions are driven by considerations for those stocks and Chinook are generally harvested as by-catch. Conservation concerns for wild steelhead and coho salmon have resulted in net fisheries being curtailed from early September to mid October in recent years. There is no information available that would suggest this pattern will change in the near future.



Stock identification information indicates that those Chinook stocks entering the river from February to July 15 are bound for tributary systems in the lower Thompson basin, the middle and upper Fraser basins, as well as the Birkenhead River in the Harrison River system. These stocks are understood to have a low productivity and individual stocks range in size from 100 to > 10,000 spawners.

Pre-season consultations with Lower Fraser First Nations in 2006 resulted in a fishing regime, reached via consensus, that was designed to reduce the impacts on the earliest timed Chinook stocks.

In 2006, selective Chinook fisheries took place in those times when Early Stuart sockeye were migrating through the river. There were no targeted fisheries on Early Stuart sockeye as these fish were forecast to return at numbers well below the cycle average. In the Lower River (downstream of Sawmill Creek) selective Chinook fisheries utilized 8 inch drifted gill nets and additional monitoring to ensure that impacts on sockeye were minimal. In the areas upstream of Sawmill Creek, the use of dip nets or rod and reel was authorized.

A table of First Nations fishery openings and catch for 2006 can be found in Appendix E.

## **7.2. Catch Monitoring**

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:

### *a) Below the Port Mann Bridge*

During fisheries for food, social, and ceremonial purposes, catch monitoring is undertaken by Aboriginal Fishery Officers and First Nations fishery monitors who collect hail information from the fishers. This information is compiled by each band and forwarded to DFO following the close of the fishery.

### *b) Port Mann Bridge to Sawmill Creek*

#### *i) Set net and drift net fishery between Port Mann Bridge and Mission:*

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

#### *ii) Set net and drift net fishery between Mission and Sawmill Creek:*

Monitors are stationed at main access points on the river during daylight hours, every day that the fishery is open to collect catch per unit effort (CPUE) and 24-hour effort surveys.

Sites include: Leq'a:mel, Island 22/Kilby, Skway, Scowlitz, Seabird, Agassiz Bridge, Hunter Creek, Chawathil Reserve, Coquihalla, and Yale Beach. A First Nations supervisor oversees the monitors at their sites, and ensures that they have the necessary data collection forms.

Helicopter over flights are used to conduct instantaneous gear counts between Mission and Sawmill Creek. These over flights are conducted once during the fishery and require one flight technician on each flight.

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.

*c) 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 FN directed chinook fisheries is conducted by FNs /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 to directed sockeye fisheries are enumerated.

*d) 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.

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

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

*f) 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.

*g) 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. 2007 Fishing Plan**

The objective of the 2007 harvest strategy for early season First Nations fisheries is to provide access to First Nations for food, social and ceremonial needs while addressing fishery exploitation rate concerns on early timed Fraser Chinook stocks. Fisheries in the latter part of the year are managed to protect other stocks of concern such as wild steelhead and Interior Fraser coho stocks

The following management approach is presented for consideration:

- In order to provide for clear migration of Early timed Fraser Chinook create a weekly window closure during which there would be no fishing for the period March 15 until April 30.

**Note:** First Nations fisheries for Chinook on the Lower Fraser generally start around March 15.

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

Selective fisheries may be considered during periods of increased Chinook abundance. 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 2006 licence conditions for selective fisheries will be considered during the review of selective fishing proposals.

## **8. Recreational Fisheries**

### **8.1. Fishery Summary**

The marine waters off the Pacific coast of British Columbia are generally open for harvest of Chinook salmon year round. Recreational harvest is constrained using daily and annual limits. 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; 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 4 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 1<sup>st</sup> 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 long term sustainability of Fraser Chinook stocks.

In 2006, the Lower Fraser River recreational fishery was open from May 1<sup>st</sup> to December 31.

In all non-tidal waters 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 downstream of the Agassiz-Rosedale Bridge, an adult Chinook is defined as being over 62 cm.

Details on recreational Chinook opportunities may be found online at:

[http://www.pac.dfo-mpo.gc.ca/recfish/default\\_e.htm](http://www.pac.dfo-mpo.gc.ca/recfish/default_e.htm)

## **8.2. Catch Monitoring**

DFO obtains most of its catch information through the Creel Survey Program which is carried out in recreational fisheries that have displayed important catch and effort characteristics in past years. This program incorporates surveys by land (access point and roving surveys) and air of active fishermen.

In 2006, the lower Fraser River was surveyed between Sumas and Hope from May 1<sup>st</sup> to October 9<sup>th</sup>, and the Chilliwack River was surveyed from September 15<sup>th</sup> to November 15<sup>th</sup>. While Nicomen Slough and Norrish Creek were surveyed from October 9<sup>th</sup> to November 30<sup>th</sup>, anglers were not allowed to retain Chinook in these two systems.

Chinook salmon recreational openings in specific sections of the Fraser River upstream of Sawmill Creek, the Bridge River, the lower Shuswap River, Mabel Lake and the Thompson River at Spences Bridge are also surveyed during their open times. Preliminary catch numbers are available in Appendixes G, H, and I.

The Strait of Georgia (STG) creel operates from May to October and covers Areas 13 to 19, 28, 29 and that portion of Area 20 east of Sherringham Point. In most years, the Victoria portion of Area 19 is creeled for the full year, however, in 2006 the November period was not covered due to budgetary concerns.

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 27, 121 and 123 to 127) are covered by the West Coast (WC) creel program which operates from June to September. Fishing effort drops markedly after Labour Day.

The Johnstone Strait (Area 12) creel program goes from July to August, the time period of most effort.

Information on creeled areas is provided in Appendix F.

### **8.3. 2007 Fishing Plan**

For 2007, the Department will be consulting on the following:

- Allowing retention of Chinook on the Fraser River downstream of the Alexandra Bridge as of May 1.
- The proposed daily limit is 4 Chinook, only one of which may be an adult\*. The possession limit is two times the daily limit. The gear permitted is one line per angler, with a single, barbless hook restriction in place. A bar rig is also permitted but only in those waters downstream of the Mission Bridge.

\*An adult Chinook is defined as being over 50 cm except from September 1 to December 31, in those waters downstream of the Agassiz-Rosedale Bridge when an adult Chinook is defined as being over 62 cm.

Tables outlining the proposed tidal and non tidal recreational Chinook opportunities in the Strait of Georgia and Fraser River watershed for the 2007 fishing season are provided in Appendix G.

## **9. Commercial**

### **9.1. Overall Commercial Fishery Summary**

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 gillnet) in Johnstone Strait, Juan de Fuca Strait, Fraser River and Alaska. 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 gillnet exploratory fishery) have occurred within the Fraser River since 1980.

During the last seven 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 has been taken in the Area F commercial troll fishery in northern B.C. 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.

## **9.2. Catch Monitoring**

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 H.

## **9.3. Area E Gillnet – Fraser River**

Directed gillnet fisheries for Chinook within the Fraser River have been closed since 1980 in order to rebuild stocks. Retention of Chinook by-catch is permitted during the in-river commercial gillnet sockeye fisheries that take place from late July to early September and chum fisheries in October and November.

In 2004, Area E Gillnet Association (AEGA) submitted a multi-year proposal to conduct a limited opportunity "exploratory" Chinook-targeted fishery. The planned timing of this fishery was late July to mid-August, within the peak abundance timing period of the summer run Chinook aggregate. Fisheries were planned to occur during times when a commercial sockeye TAC was available for harvest.

Plans to continue with year two of this proposal in 2005 and 2006 were cancelled.

During pre-season discussions with AEGA advisors, the possibility of continuing the chinook exploratory program in 2007 will be reviewed. DFO staff will continue evaluating the status of chinook stocks and reviewing the impacts of this fishery. 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.

#### **9.4. Area G Troll – West Coast of Vancouver Island**

Under the Pacific Salmon Treaty, West Coast of Vancouver Island chinook fisheries are managed through an Aggregate Abundance Based Management model. Fisheries are prosecuted on an aggregate of different U.S. and Canadian chinook stocks. Abundance forecasts provide estimates for 2 years in advance. The fall 2005 stock information was used to forecast the aggregate abundance of all Chinook stocks for fall 2006 through to fall 2007.

The 2006 forecast information provides for a domestic surplus of approximately 160,400 Chinook for the 2006-2007 chinook year. (October 1, 2006 to September 30, 2007). For planning purposes, the domestic harvest levels are estimated to be:

- First Nations FSC – 5,000 pieces
- Recreational – in the range of 40,000 to 50,000 pieces
- Area G Commercial – in the range of 120,000 to 110,000 pieces

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. It is possible that in April 2007, the aggregate chinook abundance will increase; which in turn will increase the number of chinook available for domestic harvest requirements.

#### **5. Area H Troll – Strait of Georgia**

Area H trollers are planning to submit a Chinook sampling program, similar to previous years, to the Department for consideration. The objectives of the Area H proposal are to:

- Determine areas and times where stocks of concern can be avoided while targeting abundant stocks by gathering stock composition information;
- Gather catch and biological information on Chinook stocks focusing on months where significant data gaps are thought to exist; and
- Use the information to investigate the feasibility of a future small troll fishery for Area H.

The focus for 2007 will be on Area 29 and the terminal (near Fraser River mouth) assessment of the South Thompson and Harrison Chinook by sampling in August and September. The Area H Association will be paying for all costs of analyzing the DNA samples and providing a written report to the Department.

The Area H Chinook sampling program was designed to determine stock composition in a variety of areas during different time periods. This project has been reduced to focus on the more abundant stocks in the Fraser River (i.e. South Thompson and Harrison origin) to gather Chinook stock composition through DNA sampling, to confirm the impacts on by-catch while determining the viability of troll harvest in the terminal area of the Fraser River. All sampling and analysis is funded by Area H. The data generated can then be

used in future discussions and consultations regarding the possibility for a limited catch controlled fishery when and if stocks and access policy warrant.

### **9.5. Area F Troll – North Coast**

Prior to 2005, the Salmon Licence Area F (Northern Troll) fishery was managed under a limited entry licensing system with the total harvest controlled largely through fishery openings and closures. The fishery itself was operated in a competitive "derby" style where all licensed fishers are entitled to fish in order to maximize their harvest during the open periods.

In 2005 and 2006, a demonstration fishery was conducted to test the feasibility and the benefits of changing the management of the fishery to an Individual Transferable Quota (ITQ) system. The implementation of this system directly controlled the total harvest by setting limits on the harvest by individual fishers.

A Chinook allocation to the fleet is calculated based on the Aggregate Abundance Based Management model. For 2006, that allowable catch of chinook for the combined North Coast Troll and Queen Charlotte Islands recreational fishery was 223,200 pieces. The pre-season estimate of recreational catch was 70,000 pieces, leaving 153,200 fish as the pre-season troll allocation. The North Coast trollers landed 158,363 Chinook in 2006 and the Queen Charlotte Island recreational catch was 64,500 fish for a total Chinook catch of 222,863.

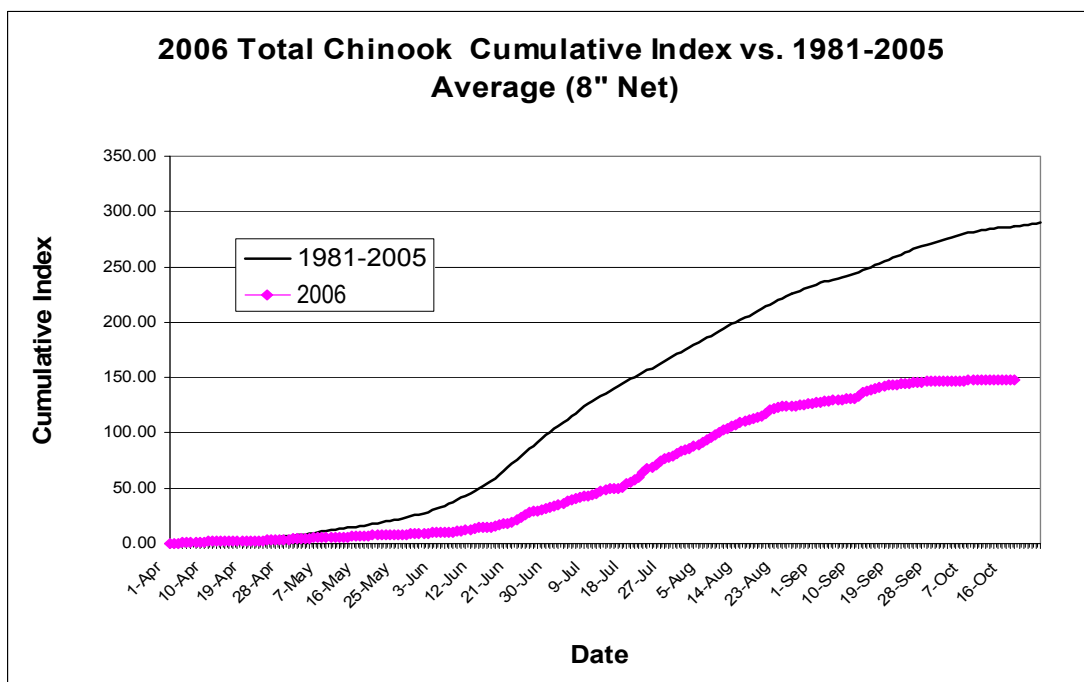
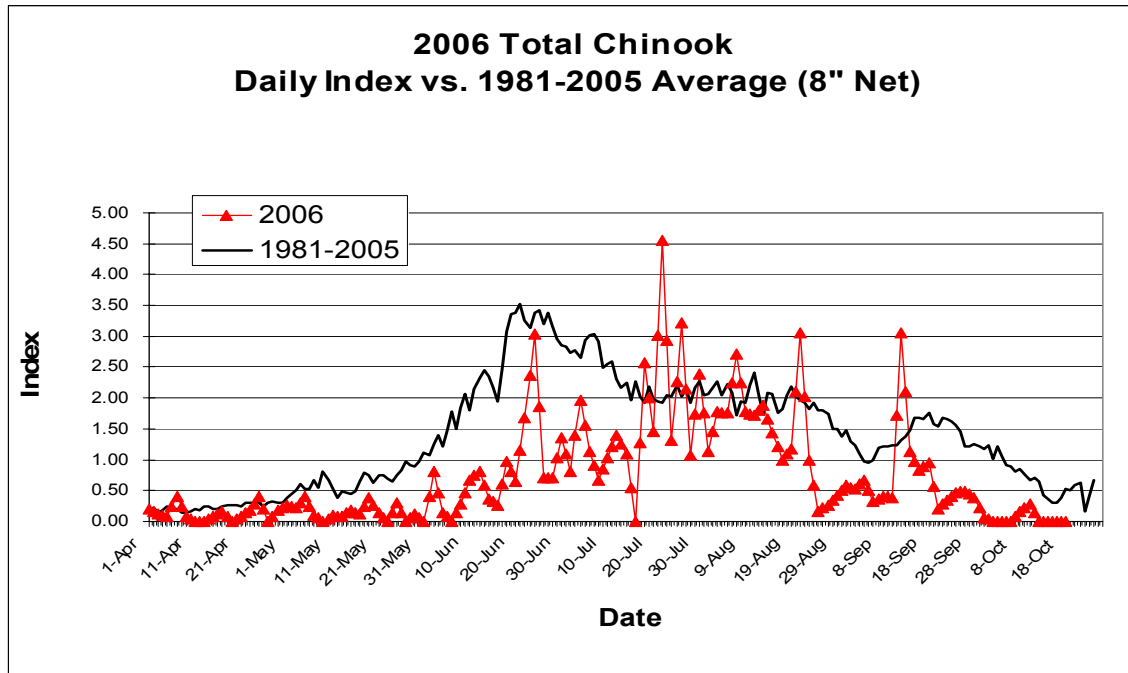
Chinook catches in the North Coast troll fishery were sampled and DNA analyses were conducted. This fishery is constrained by a management objective designed to limit the exploitation of Chinook stocks originating from the West Coast of Vancouver Island. Due to these constraints the fishery generally does not open until mid-May to early June and closes in September. Based on this analysis approximately 45% of the 2006 Area F Troll Chinook catch originated from the Fraser River system. With the majority of the Fraser Chinook (88%) originating from the South Thompson River.

Results from the 2006 Area F Sampling Program are presented in Appendix H.



## Appendix A: Albion Test Fishery

The following figures summarize catches in the Albion Chinook test fishery for 2006 and compare these catches with data averaged from previous years. Figure 1 gives the daily catch per unit effort (CPUE) and compares it to the average of the historical data from 1981-2005. Figure 2 give cumulative CPUE and compares it to average cumulative CPUE from 1981 - 2005. The advantage of viewing CPUE cumulatively is a better understanding of the total success of the year's fishery as compared to the historical average.



## Appendix B: Chinook escapement estimates to tributaries in the lower Fraser River

Early timed stocks are highlighted and indicator stocks are presented in bold italics.

Year	Chilliwack River	Maria Slough	Upper Pitt River	Stave River	<i>Harrison River</i>		Birkenhead River	Lillooet River
					<i>Visual</i>	<i>M.R.</i>		
1971	25	75	7,500	n/o	<b>15,000</b>	<i>n/r</i>	250	n/r
1972	200	200	750	n/o	<b>15,000</b>	<i>n/r</i>	400	n/r
1973	100	200	750	n/o	<b>35,000</b>	<i>n/r</i>	200	n/r
1974	100	75	500	n/o	<b>35,000</b>	<i>n/r</i>	400	n/r
1975	100	75	300	n/o	<b>15,000</b>	<i>n/r</i>	200	400
1976	25	25	750	n/o	<b>7,500</b>	<i>n/r</i>	200	400
1977	25	200	700	n/o	<b>25,000</b>	<i>n/r</i>	600	400
1978	100	150	150	25	<b>15,000</b>	<i>n/r</i>	400	400
1979	50	75	250	n/r	<b>15,000</b>	<i>n/r</i>	200	750
1980	50	100	200	n/r	<b>10,000</b>	<i>n/r</i>	300	300
1981	25	20	325	n/o	<b>20,000</b>	<i>n/r</i>	100	300
1982	25	50	300	n/r	<b>22,000</b>	<i>n/r</i>	400	1,000
1983	8	50	300	n/r	<b>6,000</b>	<i>n/r</i>	550	650
1984	50	30	n/o	n/r	<b>15,000</b>	<b>120,837</b>	300	500
1985	1,492	200	n/o	n/r	<b>50,000</b>	<b>174,778</b>	200	200
1986	4,291	110	300	n/r	<b>35,000</b>	<b>162,596</b>	150	n/r
1987	16,790	4	350	n/r	<i>n/r</i>	<b>79,038</b>	80	n/r
1988	14,467	67	850	n/r	<i>n/r</i>	<b>35,116</b>	412	n/r
1989	2,933	50	375	n/r	<i>n/r</i>	<b>74,685</b>	415	200
1990	1,570	25	450	n/r	<i>n/r</i>	<b>177,375</b>	275	n/r
1991	8,392	n/r	150	n/r	<i>n/r</i>	<b>90,638</b>	242	n/r
1992	35,856	n/r	300	n/r	<i>n/r</i>	<b>130,411</b>	713	50
1993	17,834	n/r	175	n/r	<i>n/r</i>	<b>118,998</b>	241	n/r
1994	6,826	n/r	n/r	n/r	<i>n/r</i>	<b>98,334</b>	343	n/r
1995	29,820	n/r	n/r	n/r	<i>n/r</i>	<b>28,616</b>	162	n/r
1996	21,928	100	n/r	n/r	<i>n/r</i>	<b>56,809</b>	293	n/r
1997	79,717	100	n/r	n/r	<i>n/r</i>	<b>72,277</b>	573	n/r
1998	78,780	150	n/r	1,046	<i>n/r</i>	<b>188,420</b>	565	n/r
1999	74,945	198	n/r	600	<i>n/r</i>	<b>106,995</b>	147	n/r
2000	70,983	266	n/r	550	<i>n/r</i>	<b>125,854</b>	404	n/r
2001	68,247	400	n/r	822	<i>n/r</i>	<b>113,777</b>	624	n/r
2002	58,852	1,200	276	1,000	<i>n/r</i>	<b>89,968</b>	463	n/r
2003	56,995	823	171	1,000	<i>n/r</i>	<b>247,121</b>	427	n/r
2004	67,952	n/r	n/r	1,000	<i>n/r</i>	<b>128,944</b>	180	n/r
2005	39,429	444 *	341 *	1,200	<i>n/r</i>	<b>86,730</b>	1,425 *	n/r
2006	not yet avail.	425 **	248 **	1,500 *	<i>n/r</i>	<b>50,942 **</b>	1,162 **	n/r

**M.R.** mark-recapture study design

**n/r** none recorded (escapement program did not proceed)

**n/o** none observed

\* Near Final

\*\* Preliminary

## Appendix C: 1993-2006 Chinook escapement estimates to tributaries in the BC Interior

<b>C.T.C. Indicator Stream</b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>	<b><u>1997</u></b>	<b><u>1998</u></b>	<b><u>1999</u></b>	<b><u>2000</u></b>	<b><u>2001</u></b>	<b><u>2002</u></b>	<b><u>2003</u></b>	<b><u>2004</u></b>	<b><u>2005</u></b>	<b><u>2006</u></b>
<b>Spring - Run Age 1.3 ( 5 sub 2 )</b>														
Upper Pit River	175	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	276	171	N/R	341	N/A
Birkenhead River*	241	343	162	293	573	565	147	404	624	463	427	180	1425	1162
Bridge River	950	615	851	1900	1968	626	898	769	198	969	N/I	1115	183	109
Chilcotin River	3100	6354	3480	2285	4000	1636	2896	2971	1574	2092	3396	1064	1509	1027
Cottonwood River	4470	4690	2100	1750	3329	2592	641	1208	781	1352	1555	1241	646	740
Horsefly River	200	4154	185	400	115	43	137	174	281	380	246	375	509	345
Westroad River	3200	6150	6050	4615	7206	3827	984	1600	1924	1620	2966	1366	846	1052
Bowron River	6140	9104	8316	4577	7334	7618	3455	3220	5491	8719	10059	8160	4074	3876
Fraser R. ( Tete Juane )	3300	4240	6000	4100	2935	2586	2081	2262	4976	3913	3048	2062	2535	2142
Goat River	55	293	400	440	354	302	89	212	411	820	569	174	151	158
Holmes River	2100	1877	2600	2775	3203	2362	523	1795	1018	3740	4110	1376	821	1458
Horsey River	130	unk	120	20	75	57	14	128	78	308	288	62	34	146
McKale River	N/A	N/A	N/A	N/A	N/A	20	present	32	9	81	49	68	78	11
McGregor Tributaries	unk	1851	2412	3461	2505	4471	1870	2449	2420	3751	4103	3253	1310	1333
Chilako Creek	25	119	200	624	186	39	115	20	7	229	N/I	106	202	168
Endako River	20	200	125	167	43	191	171	160	275	292	N/I	N/I	252	118
Ormond Creek	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/I	N/I	N/I	N/I
Nevin Creek	N/A	N/A	N/A	N/A	N/A	161	46	62	57	132	385	238	77	174
Slim Creek	1300	2473	4634	2268	3130	2664	1235	2112	2876	3021	3676	2284	2161	2204
Swift Creek	1000	886	1700	1500	1200	1098	375	486	982	1535	835	520	335	643
Walker Creek	150	240	101	426	122	392	206	252	177	381	543	277	103	234
Torpy River	1000	1921	1590	1055	1042	2293	1819	1468	1755	2565	4457	2730	1027	1221
Willow River	600	1170	817	1612	1961	2041	717	1314	893	1033	1980	1887	1012	1206
Barriere River	50	44	21	unk	unk	N.I.	present	77	362	377	131	306	220	215
Finn Creek	1300	1837	810	1569	725	632	524	1511	1115	650	45	538	185	157
Eagle River	1100	1200	700	780	915	N.I.	624	1085	1397	1458	1583	867	427	521
Salmon River ( Prince George )	25	729	901	1054	1200	1362	823	634	478	429	2395	1681	668	544
Salmon River ( Salmon Arm )	1850	800	700	727	252	284	350	357	1362	1003	89	395	307	554
<b>Stock Aggregate Totals</b>	<b>32481</b>	<b>51290</b>	<b>44975</b>	<b>38398</b>	<b>44373</b>	<b>37862</b>	<b>20740</b>	<b>26761</b>	<b>31521</b>	<b>41589</b>	<b>47106</b>	<b>32325</b>	<b>21438</b>	<b>20247</b>

\* historical estimates to the Birkenhead River are currently under review.

<b>C.T.C. Indicator Stream</b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>	<b><u>1997</u></b>	<b><u>1998</u></b>	<b><u>1999</u></b>	<b><u>2000</u></b>	<b><u>2001</u></b>	<b><u>2002</u></b>	<b><u>2003</u></b>	<b><u>2004</u></b>	<b><u>2005</u></b>	<b><u>2006</u></b>
<b>Spring Run Age 1.2 ( 4 sub 2 )</b>														
Deadman River	1200	1591	540	1506	934	665	350	787	780	1940		1159	417	1234
Spius Creek	900	150	500	500	450	300	52	668	603	1012	1170	1866	291	529
Coldwater River	1500	275	1050	1500	400	300	267	497	781	1394	1195	1018	183	478
Nicola River	4000	7970	6500	16400	7614	1211	7263	8808	7771	11643	14574	7850	2926	3863
Louis Creek	20	510	800	420	480	377	183	611	349	481	198	105	63	297
Bessette Creek	270	100	280	400	N.I.	150	404	360	323	350	N/O	182	18	241
<b>Stock Aggregate Totals</b>	<b>7890</b>	<b>10596</b>	<b>9670</b>	<b>20726</b>	<b>9878</b>	<b>3003</b>	<b>8519</b>	<b>11731</b>	<b>10607</b>	<b>16820</b>	<b>17137</b>	<b>12180</b>	<b>3898</b>	<b>6642</b>
<b>Summer Run Age 1.3 ( 5 sub 2 )</b>														
Portage Creek	330	36	N/R	300	N/R	18	200	46	248	445	158	103	86	248
Seton River	150	69	N/R	N/I	N/R	N/I	N/I	N/I	N/O	6	5	N/I	Present	N/I
Chilko River	6343	5665	10461	17000	16272	14549	8920	9171	10891	11027	21625	16287	7668	5201
Quesnel River	5028	1549	3073	3100	3185	4906	1620	1718	2418	5520	5265	3356	3230	2665
Cariboo River	2480	2000	817	1850	1800	936	573	744	503	1097	2198	351	526	949
Stuart River	1000	2420	3730	7415	6221	4642	3875	1875	1954	Present	Present	Present	Present	Present
Nechako River	664	1144	1689	2040	1954	1868	1917	N/A	9331	5546	4077	5189	3217	7376
Stellako River	N/R	10	N/R	N/R	N/R	15	18	N/R	N/R	N/R	N/O	N/I	231	0
Clearwater River	2700	5450	5100	7780	7830	7007	3837	4563	5051	5689	6234	4622	3519	3768
Raft River	190	935	1371	870	1230	309	712	936	237	443	311	741	109	141
North Thompson River	2400	4164	N.I.	2375	2130	2156	3375	2732	3175	2200	1989	N/I	N/I	N/I
<b>Stock Aggregate Totals</b>	<b>21285</b>	<b>23337</b>	<b>26241</b>	<b>42430</b>	<b>40622</b>	<b>36388</b>	<b>24847</b>	<b>21739.4</b>	<b>33560</b>	<b>31522</b>	<b>41699</b>	<b>30546</b>	<b>18586</b>	<b>20100</b>

<b>C.T.C. Indicator Stream</b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>	<b><u>1997</u></b>	<b><u>1998</u></b>	<b><u>1999</u></b>	<b><u>2000</u></b>	<b><u>2001</u></b>	<b><u>2002</u></b>	<b><u>2003</u></b>	<b><u>2004</u></b>	<b><u>2005</u></b>	<b><u>2006</u></b>
<b>Summer Run Age 0.3 ( 4 sub 1 )</b>														
Maria Slough	N/R	N/R	N/R	100	100	150	198	266	400	1200	823	N/R	439	314
Adams River	800	1800	1900	2200	3400	4182	2029	2266	5890	3674	2496	2216	3837	6344
Little River	unk	400	150	3000	1850	1246	1163	2043	9885	3680	2488	6000	7504	8590
Lower Shuswap River	6000	10150	10000	19000	13100	16704	24691	20409	18349	19327	21380	13329	12927	28828
Middle Shuswap River	2500	4000	3000	5000	3800	4474	2449	2617	3022	5442	4799	1415	1883	5468
Thompson River (Below Kamloops Lake)							2015	3205	6904	18927	N/A	10010	Present	23646
South Thompson River	4000	3000	5500	21600	27000	41277	22675	17560	36740	51298	38178	38592	61837	103387
<b>Stock Aggregate Totals</b>	<b>13300</b>	<b>19350</b>	<b>20550</b>	<b>50900</b>	<b>49250</b>	<b>68033</b>	<b>55220</b>	<b>48366</b>	<b>81190</b>	<b>103548</b>	<b>70164</b>	<b>71562</b>	<b>88427</b>	<b>176577</b>
<b>Late Run Age 0.3 ( 4 sub 1 )</b>														
Harrison River, Falls														
<b>Non CTC Indicator Streams</b>														
<b>Spring - Run Age 1.3 ( 5 sub 2 )</b>														
Baker Creek	300	250	250	150	292	420	47	282	268	420	423	N/I	N/I	51
Dome Creek	575	530	550	571	625	400	309	198	49	450	444	270	224	248
East Twin Creek	N/I	N/I	N/I	N/I	N/I	64	N.I.	18	35	51	52	62	12	25
Holliday Creek	N/I	N/I	N/I	N/I	N/I	N	N.I.	15	74	126	48	54	17	72
Humbug Creek	N/I	N/I	N/I	N/I	N/I	N/I	N.I.	26	22	85	35	N/A	N/I	N/I
Kazchek Creek	N/I	N/I	N/I	N/I	N/I	0	present	Present	N/O	N/O	6	8	N/I	N/I
Kenneth Creek	N/I	N/I	N/I	N/I	N/I	132	17	65	58	338	148	N/A	N/I	N/I
Kuzkwa	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	215	300	345	245		N/A
Naver Creek	250	250	150	150	777	994	57	231	240	281	489	N/I	N/I	236
Narcosli Creek	250	350	250	150	757	254	161	145	383	129	382	N/I	N/I	89
Pinchi Creek	N/I	N/I	N/I	N/I	N/I	N/I	present	45	14	Present	15	25		N/A
Ptarmigan Creek	N/I	N/I	N/I	N/I	N/I	58	103	49	8	66	140	N/A	N/I	N/I
	<b>1375</b>	<b>1380</b>	<b>1200</b>	<b>1021</b>	<b>2451</b>	<b>2322</b>	<b>694</b>	<b>1074</b>	<b>1366</b>	<b>2246</b>	<b>2104</b>	<b>664</b>	<b>29</b>	<b>721</b>

**Spring - Run Age 1.3 ( 5 sub 2 ) Cont....**

**C.T.C. Non Indicator Stream**

	<u>1993</u>	<u>1994</u>	<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>
Small Creek	N/I	N/I	N/I	N/I	N/I	115	66	34	48	268	212	6	15	77
Snoeshoe Creek	N/I	N/I	N/I	N/I	N/I	N	N	N/I	N/I	165	66	N/I	N/I	N/I
Fraser River (Tete Juane)	3300	4240	6000	4100	2935	2586	2081	2262	4976	3913	3048	2062	2535	2142
Upper Cariboo River	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	407	198	367	N/I	N/I	477
West Twin Creek	N/I	N/I	N/I	N/I	N/I	24	N.I.	34	14	22	108	40	58	75

**3300 4240 6000 4100 2935 2725 2147 2330 5445 4566 3801 2108 2608 2694**

**Stock Aggregate Totals**

**4675 5620 7200 5121 5386 5047 2841 3404 6811 6812 5905 2772 2637 3415**

**Spring Run Age 1.2 ( 4 sub 2 )**

**2001 2002 2003 2004 2005 2006**

Bonaparte River	1500	4283	4157	4391	10084	1864	1954	5258	6150	8216	8470	7990	3516	3995
	4000	7970												

**Stock Aggregate Totals**

**5500 12253 4157 4391 10084 1864 1954 5258 6150 8216 8470 7990 3516 3995**

**Summer Run Age 1.3 ( 5 sub 2 )**

**2001 2002 2003 2004 2005 2006**

Adams River ( Upper )	unk	unk	128	220	275	100	107	60	109	46	150	238	N/I	165
Blue River	8	48	35	0	0	110	11	235	88	480	329	152	N/I	212
Chilcotin River ( Upper )	200	450	262	735	360	617	285	229	243	523	678	220	97	158
Eagle River	1100	1200	700	780	915	N.I.	624	1085	1397	1458	1583	867	426	521
Elkin Creek	450	508	786	1250	806	651	417	394	458	420	1038	N/I	N/I	N/I
Lemieux Creek	N/I	N/I	N/I	N/I	N/I	N/I	216	115	117	155	N/O	194	28	297
Lion Creek	12	150	65	95	N.I.	N.I.	34	0	3	N/O	N/I	N/I	N/I	N/I

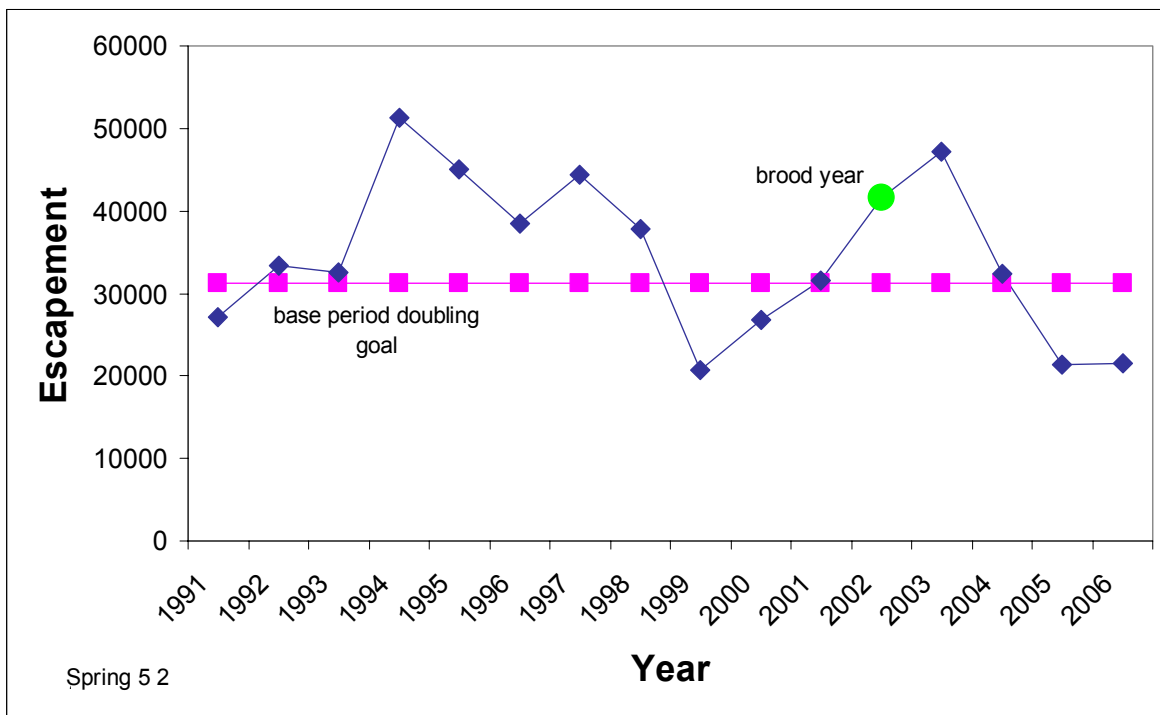
**Stock Aggregate Totals**

**1770 2356 1976 3080 2356 1478 1694 2119 2415 3082 3778 1671 551 976**

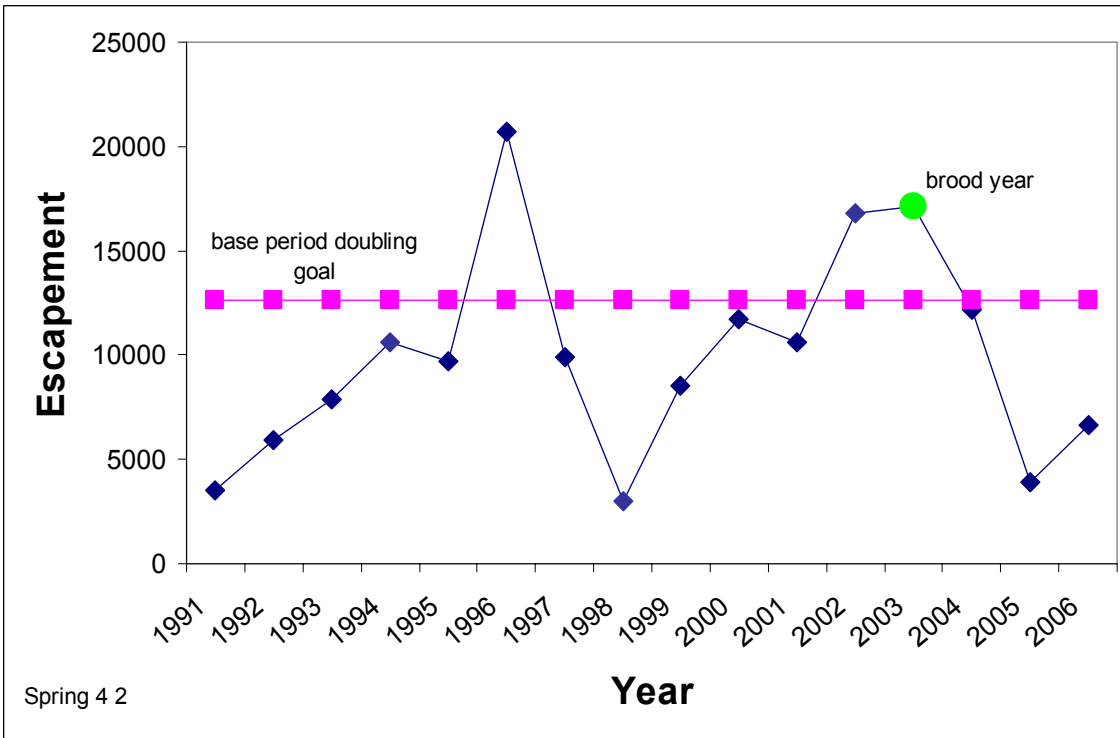
## Appendix D: CTC Indicator Stocks

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 L).

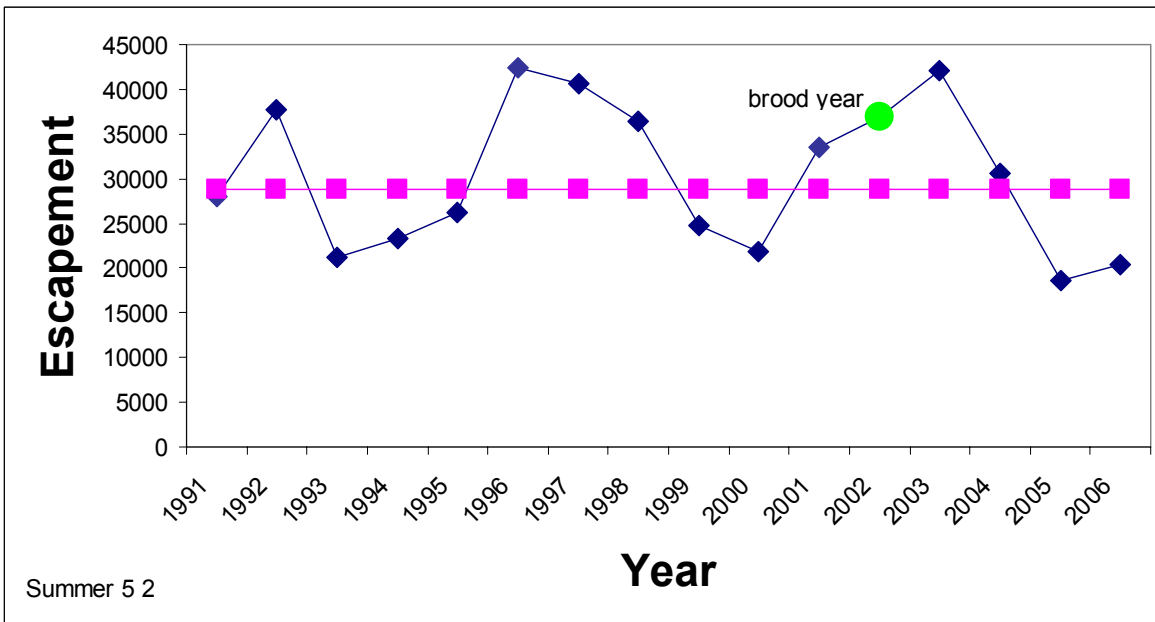
### Fraser Spring Run 5<sub>2</sub> (CTC Indicator Stocks)



### Fraser Spring Run 4<sub>2</sub> (CTC Indicator Stocks)

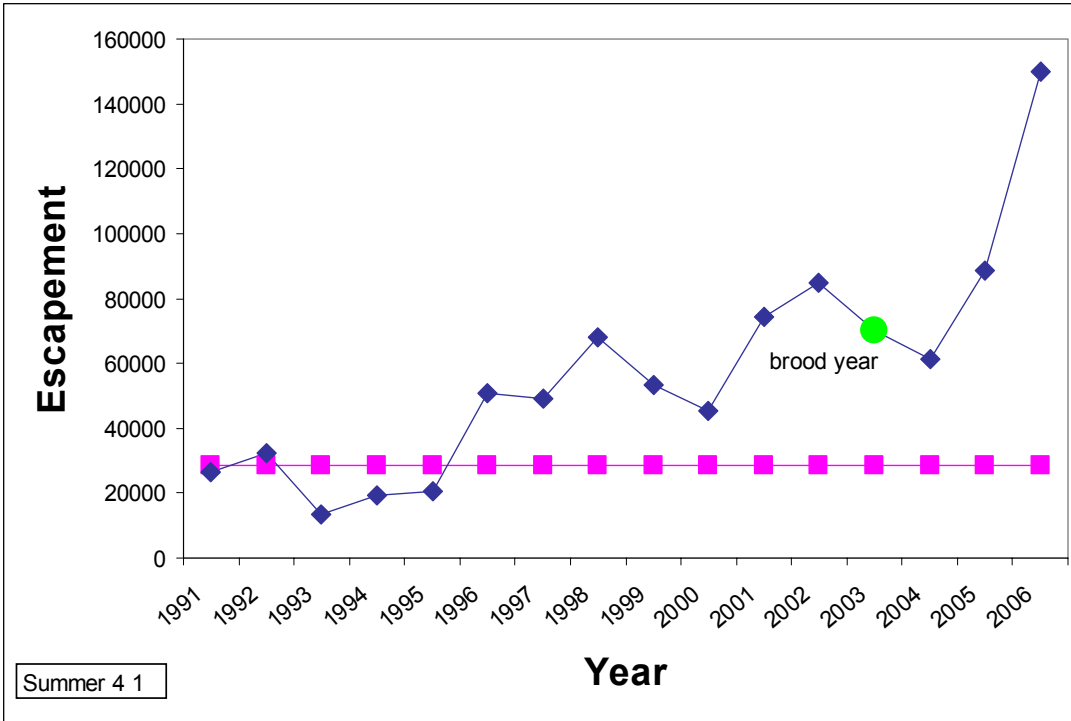


### Fraser Summer Run 5<sub>2</sub> (CTC Indicator Stocks)

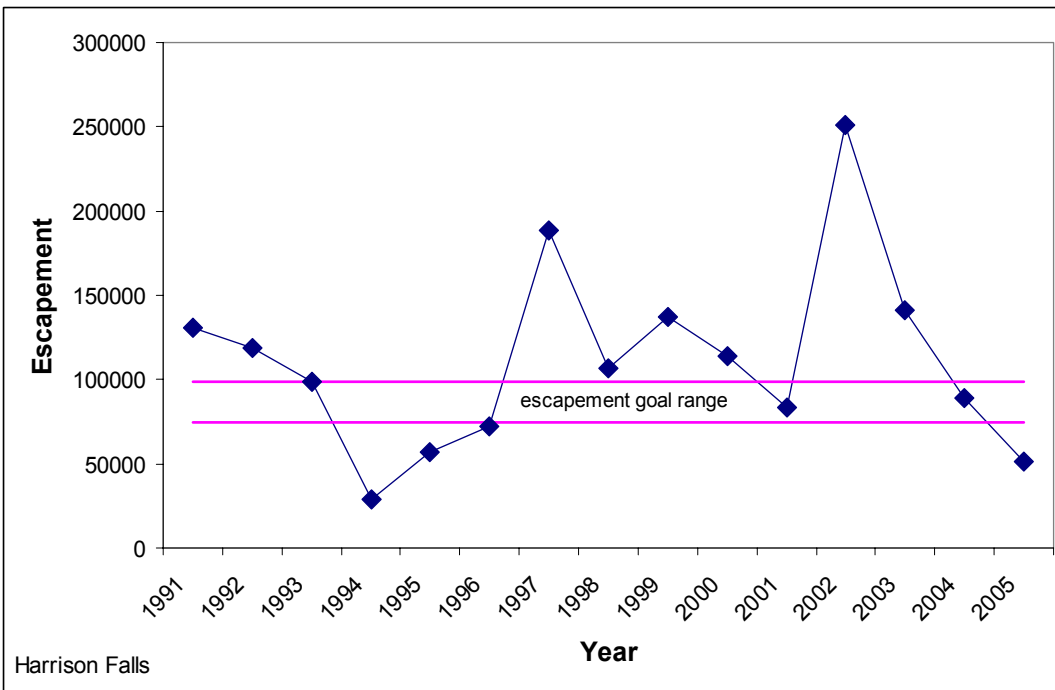




**Fraser Summer Run 4<sub>1</sub> (CTC Indicator Stocks)**



**Harrison Fall Run 4<sub>1</sub> (CTC Indicator Stocks)**



## Appendix E: Fraser River First Nations Fishing Times and Catch by Area

### 2006 Fraser River First Nations Fishing Times:

Area and Gear	Dates	Hours per Week
<b>Mouth to Pt Mann Bridge-drift net</b>	Mar. 26 - Apr. 9	24 hours per week
	Apr. 16 - Apr. 23	36 hours per week
	Apr. 30 - June 25	48 hours per week
<b>Mouth to Pt Mann Bridge – drift net</b>	July 2 - July 23	48 hours per week*
<b>Pt Mann Bridge to Sawmill Creek-drift net</b>	Mar. 19 - Apr. 23	10 hours per week
	Apr. 30 - June 25	12 hours per week
<b>Emory Creek to Yale Creek-drift net</b>	July 2-16	30 hours per week*
<b>Kanaka Creek to Mission Bridge-drift net</b>	July 9	12 hours per week*
<b>Kanaka Creek to Emory Creek-drift net</b>	July 16-23	24 hours per week*
<b>Jone’s Hill to Jespersen’s-drift net</b>	July 17-23	36 hours per week*
<b>Pt Mann Bridge to Sawmill Creek- set net</b>	Mar. 19 - Apr. 23	24 hours per week
	Apr. 30 - June 25	48 hours per week
<b>Sawmill Creek to Texas Creek and the Thompson River – set net</b>	April 5 - May 28	4 days per week
	May 28 -July 2	7 days week
	July 2-July 27	7 days per week**
	July 27-Sept. 20	7 days per week
	Sept. 20 – Oct. 8	7 days per week**
<b>Texas Creek to Deadman Creek – set net</b>	April 5 – Jul 2	7 days per week
	July 2-July 27	7 days per week**
	July 27- Sept. 27	7 days per week
	Sept. 27 – Oct. 8	7 days per week**
<b>Deadman Creek upstream – set net</b>	April 5- June 13	Closed ***
	June 13 - July 5	7 days per week
	July 5- Aug 5	7 days per week**
	Aug 5- Dec 31	7 days per week

A table of catches for 2006 can be found in Appendix E.

\* Selective fisheries for chinook used 8” mesh drifted gill nets.

\*\* Selective fisheries for chinook used dip nets or rod and reel.

\*\*\* Little interest by FN’s to fish as few Chinook in this area until after June 20

**2006 Annual Summary of First Nations Fisheries Chinook Catch by Area in the Fraser River Mainstem and Tributaries**

AREA	Chinook (directed fisheries)	Total Chinook
<b>Mainstem Fraser</b>		
Below Port Mann Bridge	1884*	2696
Port Mann Bridge to Mission	1154*	2059
Mission to Hope	2446*	6095
Hope to Sawmill Creek	3528*	7078
Sawmill Creek to Texas Creek	1415 <sup>a</sup>	1746
Texas Creek to Kelly Creek	464 <sup>a</sup>	593
Kelly Creek to Deadman Creek	0 <sup>a</sup>	1
Deadman Creek to Marguerite Ferry	6 <sup>b</sup>	13
Naver Creek to Shelly & Nechako R to Isle Pierre	290 <sup>c</sup>	315
<b>Mainstem Subtotals</b>	<b>11187</b>	<b>20597</b>
<b>Tributaries</b>		
Harrison River	0*	71
Lillooet River System	unknown	unknown
Thompson River downstream of Bonaparte River confluence	0 <sup>d</sup>	240
Thompson River upstream of Bonaparte River confluence	5 <sup>d</sup>	1292
Chilcotin River System	n/m <sup>d</sup>	20
Nechako River System upstream of Isle Pierre	n/m <sup>c</sup>	0
Stuart River System	n/m <sup>c</sup>	2
Tributary Subtotal	<b>5</b>	<b>1625</b>
<b>Totals</b>	<b>11193</b>	<b>22222</b>

\* This number represents the catch to July 25, 2006 (i.e.: First Nations directed Chinook fishery). After that date, Chinook were taken as by-catch in sockeye and chum directed fisheries.

<sup>a</sup> This number represents the catch to July 27<sup>th</sup> in First Nations directed Chinook fisheries.

<sup>b</sup> This number represents the catch to August 1<sup>st</sup> in First Nations directed Chinook fisheries.

<sup>c</sup> This number represents the catch to August 6<sup>th</sup> in First Nations directed Chinook fisheries.

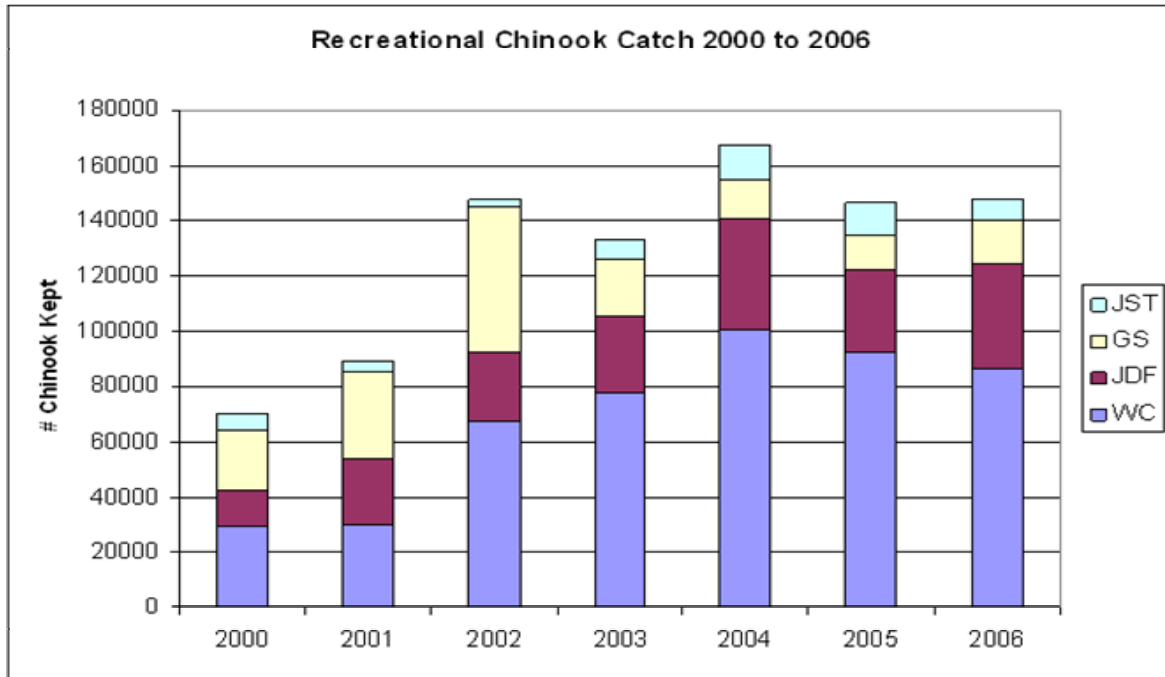
<sup>d</sup> This number represents the catch to July 2<sup>nd</sup> in First Nations directed Chinook fisheries.

n/m – no monitoring conducted at that time.

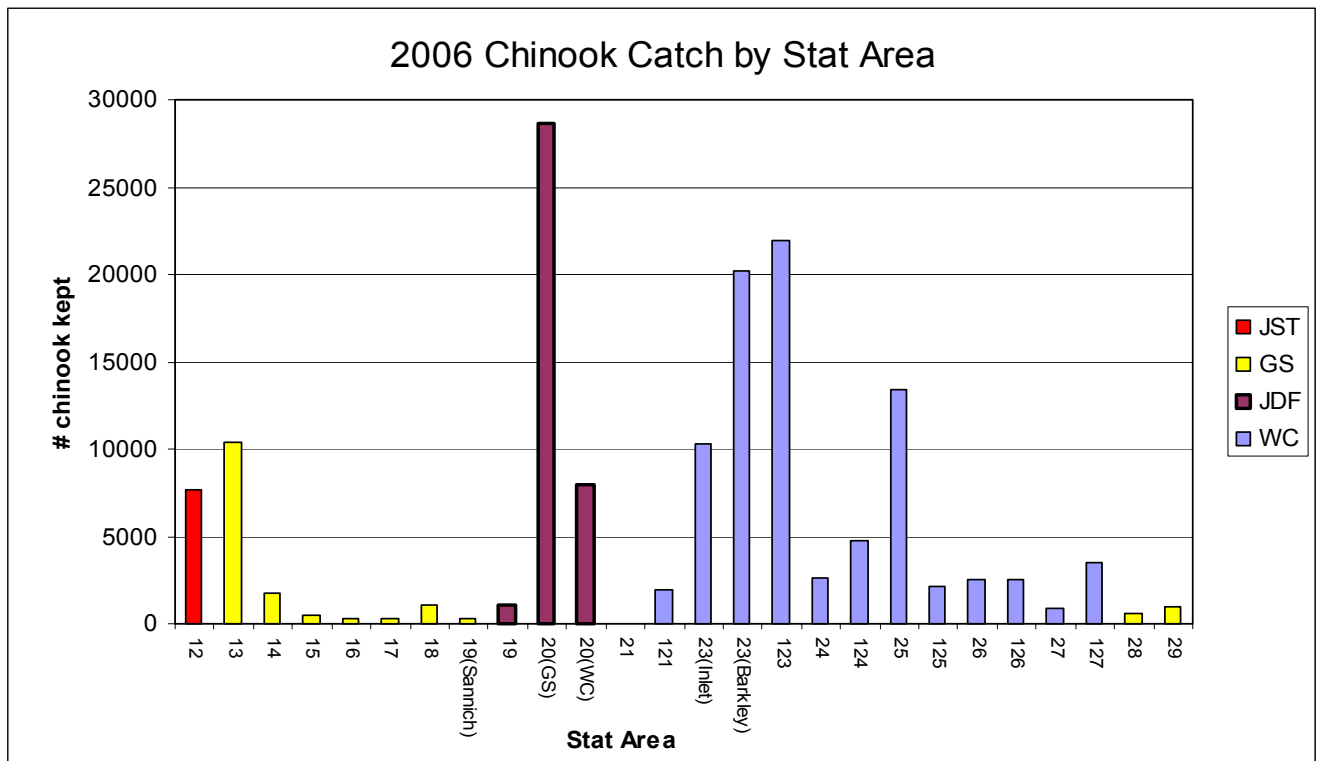
Please note, the Fraser River is permanently closed from Williams Creek to Petch Creek. Kelly Creek to Barney Creek and The Lillooet River System was not monitored. The Harrison River upstream of the Highway 7 Bridge was also closed.

## Appendix F: 2006 Recreational Catch Data

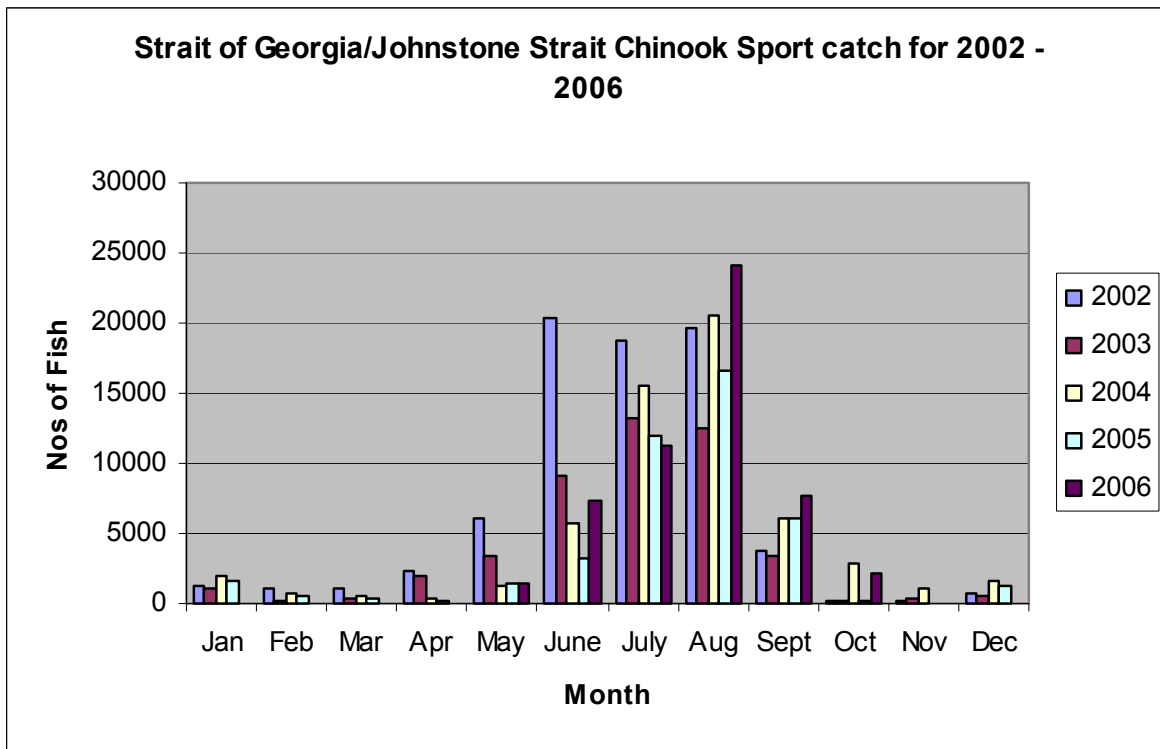
**Figure 1: 2000 to 2006 South Coast Marine Creel Survey Chinook Catch Estimates by Month**



**Figure 2: 2006 Recreational Chinook Catch by Area**

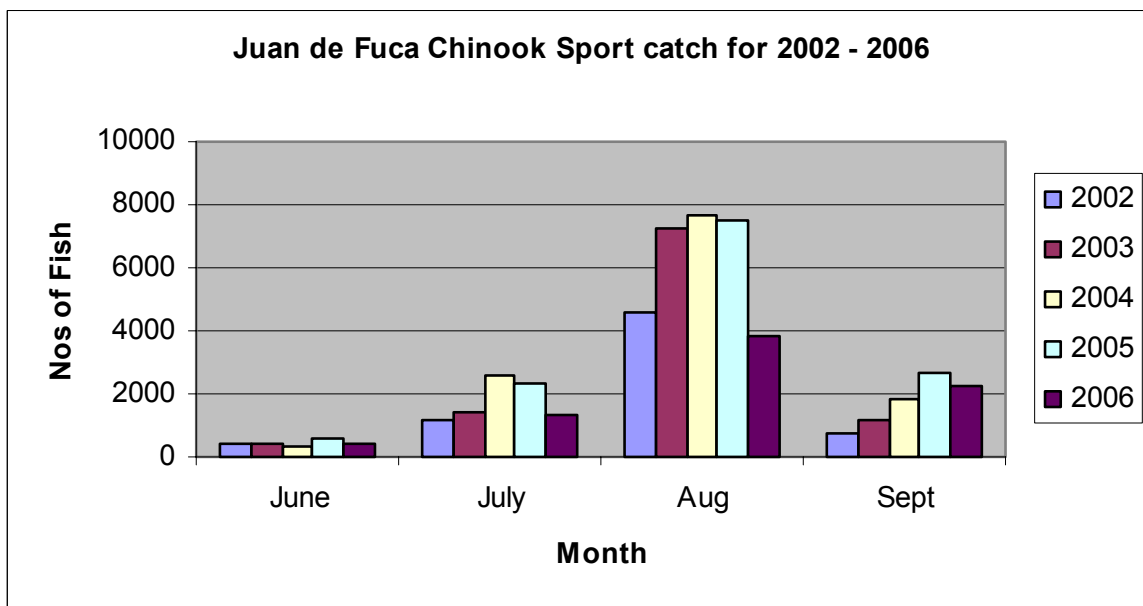


**Figure 3: 2002 – 2006 Recreational Chinook Catch by Month for Strait of Georgia and Johnstone Strait (Areas 12 to 19, 28 and 29 and a portion of Area 20)\***

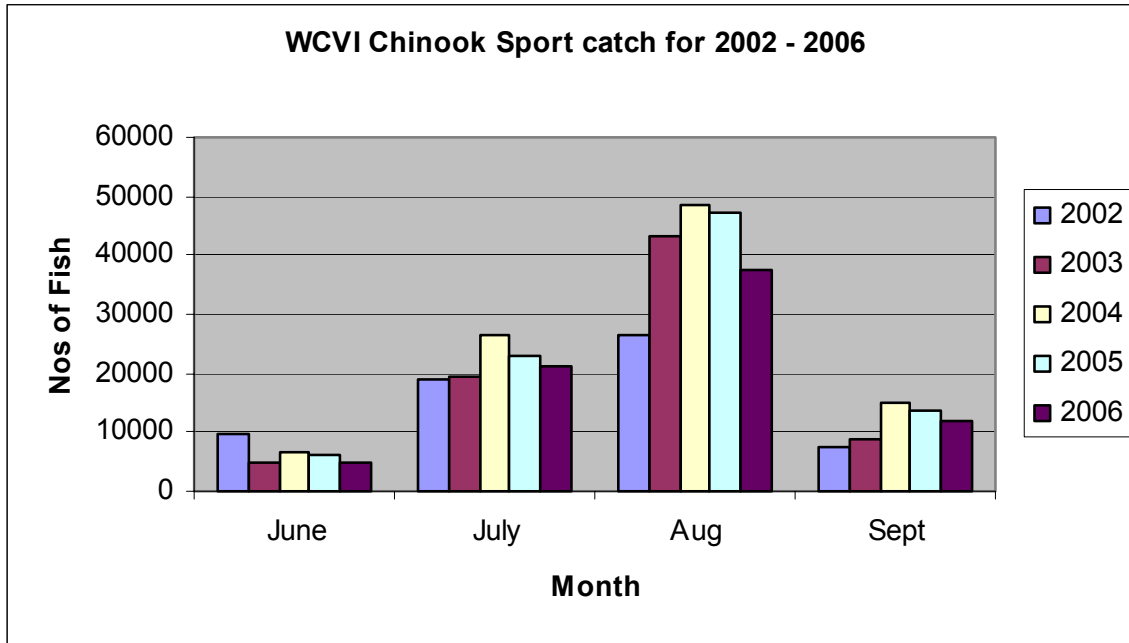


\*east of Sherringham Point

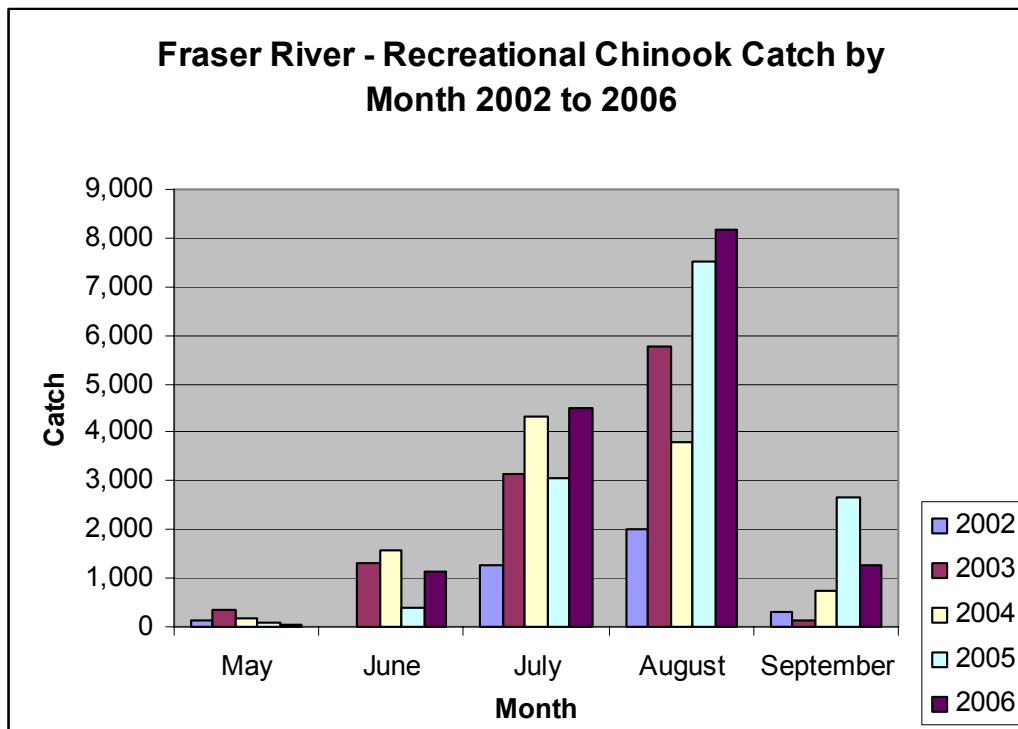
**Figure 4: 2002 - 2006 Recreational Chinook Catch by Month for Juan de Fuca (that portion of Area 20 west of Sherringham Point)**



**Figure 5: 2002 - 2006 Recreational Chinook Catch by Month for West Coast of Vancouver Island (23 to 27, 121 and 123 to 127)**



**Figure 6: 2002 – 2006 Recreational Chinook Catch by Month for the Fraser River from the Confluence with the Sumas River upstream to Hope, BC.**



## Preliminary 2006 Chinook Recreational Openings and Catch - Lower Fraser River Area

Table 1 below describes where and when recreational anglers were allowed to retain Chinook on the Fraser River in 2006. Fishing was permitted during daylight hours only (from one hour after sunset to one hour before sunrise). The daily limit was four Chinook per day of which only one could be an adult. 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 downstream of the Agassiz-Rosedale Bridge, an adult Chinook is defined as being over 62 cm. The Fraser River mainstem creel survey took place from May 1<sup>st</sup> to October 9<sup>th</sup>, 2005 and covered the area from Sumas to Hope.

Dates	Area	Daily Limit
May 01-Aug 31	Tidal waters of the Fraser River, and non-tidal waters of the Fraser River downstream from the confluence with Sawmill Creek.	4 per day, only one of which may be greater than 50 cm.
Sep 01-Dec 31	Tidal waters of the Fraser River and non-tidal waters of the Fraser River downstream from a line drawn between two triangular white boundary signs on either side of the Fraser River approximately 3 km upstream of the confluence with the Harrison River (Jespersion's Bar)	4 per day, only one of which may be greater than 62 cm.
May 01-Aug 31	From Jespersion's Bar line (described above) to Highway No. 1 Bridge at Hope BC	4 per day, only of which may be greater than 50 cm.
Sep 01-Sep 06	From Jespersion's Bar line (described above) to Highway No. 1 Bridge at Hope BC	4 per day, only of which may be greater than 62 cm.
Oct 10-Dec 31	From Jespersion's Bar line (described above) to Highway No. 1 Bridge at Hope BC	4 per day, only of which may be greater than 62 cm.
Sep 01-Sep 06	From Agassiz Rosedale Bridge to Highway No. 1 Bridge at Hope, BC	4 per day, only of which may be greater than 50 cm.
Oct 10-Dec 31	From Agassiz Rosedale Bridge to Highway No. 1 Bridge at Hope, BC	4 per day, only of which may be greater than 50 cm.
May 01-Sep 08	From the Highway No. 1 Bridge at Hope, BC upstream to the confluence with Sawmill Creek	4 per day, only of which may be greater than 50 cm.
Oct 13 to Dec 31	From the Highway No. 1 Bridge at Hope, BC upstream to the confluence with Sawmill Creek	4 per day, only of which may be greater than 50 cm.

Recreational catch data from the Fraser River Creel is provided in Table 2.

Recreational catch data from the Chilliwack River Creek is provided in Table 3.

**Table 2. Fraser River recreational fishery assessment evaluation from May 1<sup>st</sup> to October 9<sup>th</sup>, 2006. Total harvest and release (weekend and weekday data combined). Sockeye estimates do not include August 1<sup>st</sup> and 2<sup>nd</sup>; sockeye opened on August 3<sup>rd</sup>.**

	May 1-31 chinook	June 1-30 chinook	July 1-31 chinook	August 1-31 sockeye	September 1-6 sockeye	September 7-30 chinook	October 1-9 chinook	Total 2006
Number of Interviews	158	556	2,741	4,702	804	917	357	<b>10,235</b>
Interview Hours	654	2,763	12,960	22,036	3,873	5,585	2,007	<b>49,878</b>
Number of Overflights	8	8	9	8	3	6	4	<b>46</b>
<b>ANGLER EFFORT</b>								
Estimated Effort (hours)	4,046	31,792	143,265	460,566	72,417	18,950	16,022	<b>747,058</b>
<b>ESTIMATED HARVEST</b>								
Chinook Adult	44	1,121	4,491	7,701	828	230	21	<b>14,436</b>
Chinook Jack	0	0	20	486	182	19	0	<b>707</b>
Coho Adult	0	0	0	0	0	0	0	<b>0</b>
Coho Jack	0	0	0	0	0	0	0	<b>0</b>
Sockeye	0	0	0	117,468	16,824	0	0	<b>134,292</b>
Pink	0	0	0	0	0	0	0	<b>0</b>
Chum	0	0	0	0	0	93	807	<b>900</b>
<b>ESTIMATED RELEASE</b>								
Chinook Adult	0	31	71	147	27	74	49	<b>399</b>
Chinook Jack	0	0	0	148	0	3	0	<b>151</b>
Coho Adult	0	0	0	18	0	46	26	<b>90</b>
Coho Jack	0	0	0	0	0	2	0	<b>2</b>
Sockeye	0	30	5,374	13,117	2,850	2,241	31	<b>23,643</b>
Pink	0	0	0	0	0	0	0	<b>0</b>
Chum	0	0	0	0	0	143	6943	<b>7,086</b>



In 2006, recreational anglers were permitted to retain Chinook on the Chilliwack River from Slesse Creek downstream to boundary signs near the confluence with the Fraser River from July 1 to December 31. Fishing was permitted during daylight hours only (from one hour after sunset to one hour before sunrise). The daily limit was four Chinook per day of which only one could exceed 62 cm in length. A creel program was run from September 15<sup>th</sup> to November 15<sup>th</sup>, 2006 on the Chilliwack River. Results from this creel are presented in the tables below.

**Table 3: Chilliwack River recreational fishery assessment final results from September 15 to November 15, 2006. Total catch and release (weekend and weekday combined).**

	<b>September 15-30</b>	<b>October 1-31</b>	<b>November 1-15</b>	<b>Total</b>
Number of Interviews	971	3,293	601	<b>4,865</b>
Interview Hours	3,096	11,199	1,904	<b>16,199</b>
Number of Overflights	4	9	3	<b>16</b>
Average Overflight Count	188	559	151	<b>299</b>
<b>ANGLER EFFORT</b>				
Estimated Effort (hours)	31,658	158,900	15,248	<b>205,806</b>
<b>ESTIMATED HARVEST</b>				
Chinook Adult	862	7,051	320	<b>8,233</b>
Chinook Jack	267	577	27	<b>871</b>
Coho Adult	217	1,351	721	<b>2,289</b>
Coho Jack	16	88	15	<b>119</b>
Sockeye	0	0	0	<b>0</b>
Pink	0	0	0	<b>0</b>
Chum	226	4,836	313	<b>5,375</b>
<b>ESTIMATED RELEASE</b>				
Chinook Adult	1,448	25,181	1,840	<b>28,469</b>
Chinook Jack	284	624	0	<b>908</b>
Coho Adult	164	3,082	1,988	<b>5,234</b>
Coho Jack	154	114	4	<b>272</b>
Sockeye	37	52	6	<b>95</b>
Pink	0	0	0	<b>0</b>
Chum	561	37,542	5,463	<b>43,566</b>

**Preliminary 2006 Chinook Recreational Catches – Upper Fraser River (1)**

<b>System</b>	<b>Time/Duration</b>	<b>Hours Fished</b>	<b>Total Annual Catch</b>
Bowron River	July 15 – Aug 15: 7days/week	N/A	No creel survey
Chilko River	July 25 - Aug 16: 7days/week	N/A	No creel survey
Fraser River at Prince George	Jul 10 – Aug 25: 7days/week	N/A	No creel survey
Fraser River (confluence of Seton / Fraser River downstream to Seton powerhouse)	July 1 - Sept. 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 - Sept 1: 7days/week	N/A	No creel survey
Bridge River	June 21 – Jul 14: 5 days/week (0600 - 2100 hrs)	675	63
Mabel Lake	noon July 25 to noon Sept 12: 7days/week	4725	301
North Thompson River (Clearwater River)	Aug 1 – Aug 31: 7 days/week	N/A	No Creel
Shuswap River (lower)	noon July 25 - noon Sept 12: 7days/week (0500 to 2200 hrs. daily)	14689	616
Shuswap River (middle)	noon July 25 - noon Aug 15: 7days/week	N/A	No Creel
South Thompson River	Aug 5 - Sept 22: 7days/week	N/A	No Creel
Thompson River (near Spences' Bridge)	Jul 22 - Aug 14: Sat/Sun/Mon only 0600 - 2100 hrs.	2175	329
Thompson River (near Martel)	Aug 22 - Sept 3: 7 days/week	N/A	No Creel

(1) Note: Due to budget constraints in 2006 creel surveys were not undertaken in some recreational fisheries. 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 G: Draft 2007 Chinook Recreational Fishing Plans

### Table 1: Freshwater Salmon Sport Fishing Regulations: Region 2: Lower Mainland

1. Unless otherwise stated in the table, the daily limit in all waters of Region 2 is zero (0).
2. The aggregate daily limit for all species of Pacific salmon (other than kokanee) from tidal and non-tidal waters combined is four (4).
3. All retained coho must measure 25 cm or more from tip of nose to tail fork, and all retained Chinook, chum, pink, and sockeye must measure 30 cm or more from tip of nose to tail fork.
4. A single barbless hook is in effect year round for all streams in Region 2.
5. There is an annual limit of 10 adult Chinook from all non-tidal waters. All retained adult Chinook must be recorded immediately on the back of your Provincial Non-tidal Angling licence. An "adult Chinook" in Region 2 is defined as being over 50 cm except in the following areas where an "adult Chinook" is defined as being over 62 cm:
  - a) the Fraser River between the CPR bridge at Mission to the powerline crossing approximately 1 km above the Aggasiz/Rosedale bridge from Sep 01 - Dec 31,
  - b) the Chilliwack/Vedder River (including the Sumas River) the Capilano River and the Harrison River.

WATERS	SPECIFIC AREA	SPECIES	DATES	LIMITS / GEAR
Chehalis River	From the logging bridge 2.4 km below Chehalis Lake to the confluence of the Harrison/Chehalis Rivers, including tributaries to that part	All	Sep 01-Dec 31	Daylight hours only.
		Chinook	Jan 01-May 31	<i>No fishing for Chinook.</i>
			Jun 01-Aug 10	4 per day, only 1 over 50 cm.
			Aug 11-Sep 15	<i>No fishing for Chinook.</i>
			Sep 16-Dec 31	4 per day, only 1 over 62 cm.
Chilliwack/Vedder River (including Sumas River)	Downstream from Slesse Creek including that portion of the Sumas River from the Barrow Town Pump Station downstream to boundary signs near the confluence with the Fraser River	All	Sep 01-Dec 31	Daylight hours only.
		Chinook	Jul 01-Dec 31	4 per day, only 1 over 62 cm.
Dewdney Slough - See Nicomen Slough				
Fraser River	Salmon closures are being considered from early September to mid-October to protect co-migrating Upper Fraser and Thompson River coho. Please contact your local DFO office for details.			
	From the downstream side of the CPR Bridge at Mission upstream to the Alexandria bridge, except Landstrom Bar (described below) which is closed to all angling from May 1 to Oct. 31.	All	Jul 01-Dec 31	Daylight hours only.
		Chinook	May 1-Dec 31	4 per day, only 1 over 50 cm.
Landstrom Bar is those waters of the Fraser River inside a line beginning at a fishing boundary sign on the eastern end of Landstrom Bar, then to a fishing boundary sign on the opposite bank, then to a fishing boundary sign at the southern end of Croft Island, then westerly to a fishing boundary sign on the nearest bank of the river, then following the river bank to the beginning point.				
Harrison River	From the Highway 7 bridge to the confluence with the Fraser River	All	Jul 01-Dec 31	Daylight hours only.
		Chinook	Sep 01-Dec 31	4 per day, 1 over 50 cm
Pitt River	Upper and Lower, including tributaries	Chinook	Jan 01-Dec 31	<i>No fishing for Chinook.</i>
Stave River	Downstream of B.C. Hydro Dam to the CPR Railway Bridge	Chinook	Jan 01-Dec 31	1 per day.
Sumas River - See Chilliwack River				
Vedder River - See Chilliwack River				

**Table 2: Freshwater Salmon Sport Fishing Opportunities: Region 3: Thompson-Nicola**

1. Unless otherwise stated in the table, the daily limit in all waters of Region 3 is zero (0).
2. The aggregate daily limit for all species of Pacific salmon (other than kokanee) from tidal and non-tidal waters combined is four (4).
3. A single barbless hook is in effect year round for all streams in Region 3.
4. There is an annual limit of 10 adult Chinook from all non-tidal waters. All retained Chinook must be recorded immediately on the back of your Provincial Non-tidal Angling licence. An "adult Chinook" in Region 3 is defined as being over 50 cm.

<b>WATERS</b>	<b>SPECIFIC AREA</b>	<b>SPECIES</b>	<b>DATES</b>	<b>LIMITS/GEAR</b>
Bridge River	Downstream from Road 40 bridge to the confluence of the Fraser River (see also Fraser River opportunity).	Chinook	Jun 21- Jul 16 Sun, Mon, Tue, Wed, Thur only 06:00 to 21:00 hours daily.	4 per day, only 1 over 50cm.
Clearwater River	From Clearwater Lake downstream to the confluence of the North Thompson River (except CLOSED from Murtle River downstream to 35km post from Aug 16 - 31 to protect Mahood R. Chinook).	Chinook	Aug 1-Aug 31	4 per day, only 2 over 50cm. Monthly quota is 4 over 50cm (includes adult Chinook caught and retained from North Thompson River).
Fraser River	Mainstem of the Fraser R. in Region 3 except for that portion of the Fraser R. described below	Chinook	Apr 1-Sep 17	4 per day, none over 50cm.
	From the confluence of the Seton River and the Fraser River, downstream to the BC Hydro turbine generator tailrace located approximately 1 km downstream of the town of Lillooet.	Chinook	Jul 1-Sep 10	4 per day, only 1 over 50cm.
	From the confluence with the Bridge River downstream to the BC Railway bridge, 2 km north of Lillooet (see also Bridge River opportunity).	Chinook	Jun 21-Jul 16 Sun, Mon, Tue, Wed, Thur only 0:600 to 21:00 hours daily.	4 per day, only 1 over 50cm.
Little Shuswap Lake - See South Thompson River				
North Thompson River	Downstream of Station Road Bridge in Clearwater to the Ferry crossing at Little Fort.	Chinook	Aug 1-Aug 31	4 per day, only 2 over 50cm. Monthly quota is 4 over 50cm (includes adult Chinook caught and retained from Clearwater River)
	Mainstem river.	Chinook	Sep 1-Sep 22	4 per day none over 50 cm .

<b>WATERS</b>	<b>SPECIFIC AREA</b>	<b>SPECIES</b>	<b>DATES</b>	<b>LIMITS/GEAR</b>
South Thompson River	From the green can buoy near outlet of Little River to 100m downstream of Campbell Creek.	Chinook	Aug 5-Sep 22	4 per day, only 2 over 50 cm. Monthly quotas are 6 over 50cm.
Thompson River	From Kamloops Lake downstream to the confluence with the Fraser River.	Chinook	Jun 1-Sep 21	4 per day, none over 50cm (retention of jack Chinook only) See exceptions below
	From the upstream side of the mouth of the Nicola River downstream to the Hwy 8 bridge at Spences Bridge.	Chinook	July 21 to August 13. Sat, Sun, Mon only, 06:00 to 21:00 hours only.	4 per day, only 1 over 50cm. Environmental conditions in Nicola River may result in closure. Check with your local DFO office for updates.
	From confluence with Bonaparte River to boundary sign approximately 1 km downstream. North Bank of the river only.	Chinook	To be determined in-season.	Opening dependent on number of Chinook returning to Bonaparte fish way by July 25. Check with your local DFO office for updates.
	From Hwy 8 bridge at Spences Bridge upstream to a fishing boundary sign located approximately 1 km downstream of Martel (west side of river only). These waters open to fishing are subject to change.	Chinook	Aug 22-Sep 03	4 per day, only 1 over 50 cm. Check with your local DFO office for updates.

**Table 3: Freshwater Salmon Sport Fishing Opportunities: Region 5a: Cariboo (Part A, Fraser River Watershed, Management Units 5-1 to 5-5 and 5-12 to 5-16)**

1. Unless otherwise stated in the table, the daily limit in all waters of Region 5 is zero (0).
2. The aggregate daily limit for all species of Pacific salmon (other than kokanee) from tidal and non-tidal waters combined is four (4).
3. All retained Chinook, must measure 30 cm or more from tip of nose to fork in tail (fork length).
4. A single barbless hook is in effect year round for all streams in Region 5.
5. There is an annual limit of 10 adult Chinook from all non-tidal waters. All retained Chinook must be recorded immediately on the back of your Provincial Non-tidal Angling licence. An "adult Chinook" in Region 5 is defined as being over 50 cm (fork length).

<b>WATERS</b>	<b>SPECIFIC AREA</b>	<b>SPECIES</b>	<b>DATES</b>	<b>LIMITS / GEAR</b>
Cariboo River	From confluence of the Quesnel River to the confluence of Seller Creek.	Chinook	Jul 27-Aug 18	4 per day, only 2 over 50cm.
Chilko River	From Chilko Lake downstream to boundary signs 1.5km upstream of Siwash bridge (12 km upstream from Chilcotin R. junction).	Chinook	Jul 25-Aug 16	4 per day, only 2 over 50cm. Monthly limit of 4 over 50 cm.
Quesnel River	downstream of Poquette Creek	Chinook	Jul 15-Sep 1	4 per day, only 2 over 50cm.

**Table 4: Freshwater Salmon Sport Fishing Opportunities: Region 7: Omineca-Peace**  
**Shaded areas are new or changed opportunities.**

1. Unless otherwise stated in the table, the daily limit in all waters of Region 7 is zero (0).
2. The aggregate daily limit for all species of Pacific salmon (other than kokanee) from tidal and non-tidal waters combined is four (4).
3. All retained Chinook, must measure 30 cm or more from tip of nose to fork in tail (fork length).
4. A single barbless hook is in effect year round for all streams in Region 7.
5. There is an annual limit of 10 adult Chinook from all non-tidal waters. All retained Chinook must be recorded immediately on the back of your Provincial Non-tidal Angling licence. An "adult Chinook" in Region 7 is defined as being over 50 cm (fork length).

<b>WATERS</b>	<b>SPECIFIC AREA</b>	<b>SPECIES</b>	<b>DATES</b>	<b>LIMITS / GEAR</b>
Bowron River	From Forestry Road bridge nearest to the Fraser River, upstream to the Bowron Forest Road bridge crossing near Haggen Creek.	Chinook	Jul 10-Aug 15	4 per day, only 2 over 50cm.
Fraser River	From power lines crossing the Fraser River near College Hts, upstream to the Northwoods Bridge crossing the Fraser River	Chinook	Jul 10-Jul 25	4 per day, only 1 over 50cm.
	Upstream of the Northwoods Bridge to the Gas Pipline Crossing, near Shelley.	Chinook	Jul 10-Aug 15	4 per day, only 1 over 50cm This is a proposed opening, consultation will occur prior to implementation. Check with your local DFO office.

**Table 5: Freshwater Salmon Sport Fishing Opportunities: Region 8: Okanagan**

1. Unless otherwise stated in the table, the daily limit in all waters of Region 8 is zero (0).
2. The aggregate daily limit for all species of Pacific salmon (other than kokanee) from tidal and non-tidal waters combined is four (4).
3. All retained Chinook, must measure 30 cm or more from tip of nose to fork in tail (fork length).
4. A single barbless hook is in effect year round for all streams in Region 8.
5. There is an annual limit of 10 adult Chinook from all non-tidal waters. All retained Chinook must be recorded immediately on the back of your Provincial Non-tidal Angling licence. An "adult Chinook" in Region 8 is defined as being over 50 cm (fork length).

<b>WATERS</b>	<b>SPECIFIC AREA</b>	<b>SPECIES</b>	<b>DATES</b>	<b>LIMITS / GEAR</b>
Mabel Lake	South of fishing boundary signs located on opposite shores approximately 1 km from Wap Creek.	Chinook	12:00 Jul 25- 12:00 Sep 12	4 per day, only 2 over 50 cm. Monthly quota is 4 over 50cm, including all Shuswap River and Mabel Lake Chinook.
Shuswap River	Between Shuswap Falls and Mabel Lake.	Chinook	12:00 Jul 25 - 12:00 Aug 15	4 per day, only 2 over 50 cm. Monthly quota is 4 over 50cm, including all Shuswap River and Mabel Lake Chinook.
	Upstream from signs above Mara Bridge to Mabel Lake.	Chinook	12:00 Jul 25 - 12:00 Sep 12 05:00-22:00 hours only	4 per day, only 2 over 50 cm. Monthly quota is 4 over 50cm, including all Shuswap River and Mabel Lake Chinook.

**Tidal Waters**

- 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.
- Barbless hooks are required for all salmon fishing.
- The aggregate daily limit (total daily limit) for all species of Pacific salmon from tidal or non-tidal waters combined is four.
- The minimum size limit for Chinook in Areas 13 to 18, 28 and 29 and in that portion of Area 19 north of Cadboro Point is 62 cm. The minimum size limit in all other waters is 45 cm.
- Substantial management measures are taken on Chinook fisheries on the West Coast of Vancouver Island and in the Strait of Georgia. Maps showing details of these measures can be found online at:  
<http://www.pac.dfo-mpo.gc.ca/recfish>

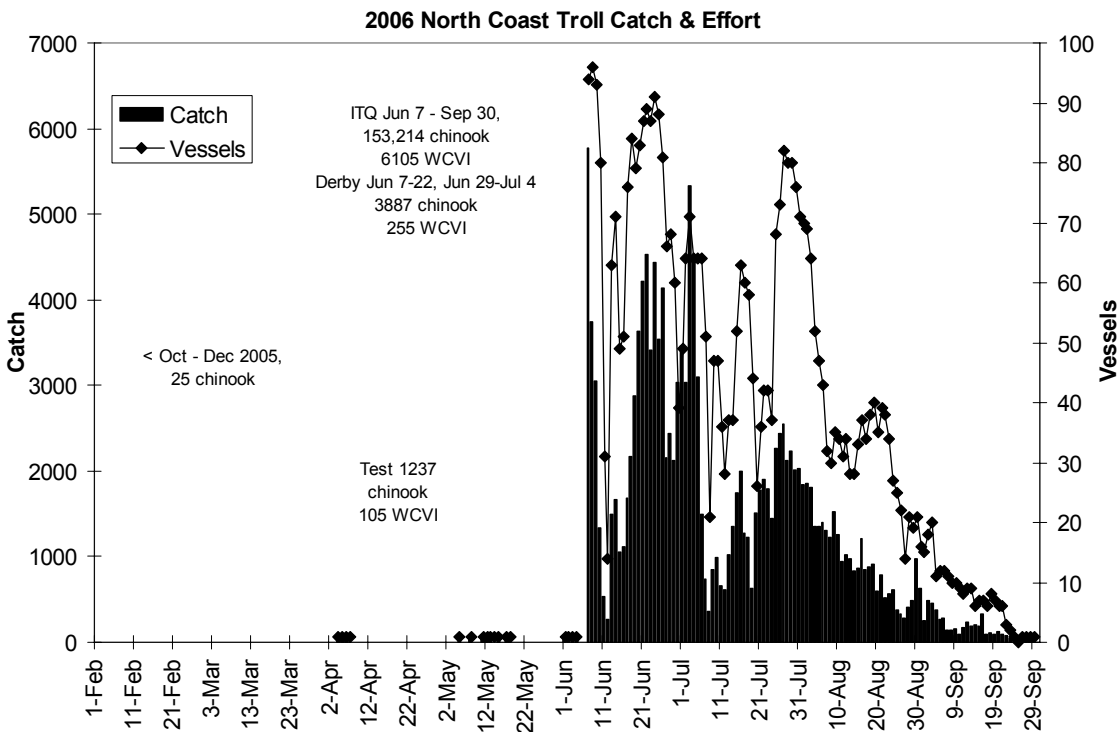
**Appendix H: 2006 Commercial Catches and Summary of 2004 Area H Sampling Program**

**Figure 1: Preliminary Estimates of 2006 Canadian Commercial Catch of Chinook Salmon by Gear Type and Salmon Licencing Area.**

Areas	Troll	Purse Seine	Gillnet	TOTAL
Area A		0		0
Area B		2,142		2,142
Area C			14,963	14,963
Area D			17,971	17,971
Area E			3,500	3500
Area F	158,338			158,338
Area G	105,358			105,358
Area H	0			0
<b>TOTAL</b>	<b>263,696</b>	<b>2,142</b>	<b>36,434</b>	<b>302,272</b>

Note: Area F Troll total includes 1,237 chinook taken in stock assessment fisheries.

**Figure 2: 2006 Area F Troll Chinook Daily Catch and Effort.**





**Figure 3: 2006 Area F Troll Chinook Catch by Stock Group and Area.**

Stock Group*	Area 1 catch	STD	Area 2W catch	STD	Total Catch	STD
Alaska	27	(57.6)	0	(0.4)	27	(57.6)
Alsek	25	(51.3)	1	(1.1)	26	(51.3)
Taku River	135	(166.9)	3	(3.1)	138	(167.0)
Stikine River	648	(376.9)	2	(2.5)	650	(376.9)
Yakoun River	1,020	(388.1)	0	(0.2)	1,020	(388.1)
Nass River	1,325	(466.4)	5	(2.5)	1,330	(466.4)
Skeena River and tributaries	4,539	(1034.5)	11	(4.2)	4,551	(1034.5)
Northern Mainland BC	5,152	(946.6)	10	(3.8)	5,162	(946.6)
West Coast Vancouver Island	6,393	(922.1)	72	(8.4)	6,465	(922.1)
East Coast Vancouver Island	2,369	(668.3)	18	(5.0)	2,388	(668.3)
Southern Mainland BC	115	(152.0)	1	(2.0)	117	(152.0)
Upper Fraser River	1,045	(418.1)	7	(2.9)	1,052	(418.1)
Middle Fraser River	3,532	(898.3)	10	(3.8)	3,541	(898.4)
North Thompson River	2,846	(736.8)	4	(2.5)	2,850	(736.8)
South Thompson River	62,707	(2294.9)	140	(11.1)	62,847	(2295.0)
Lower Thompson River	204	(147.2)	0	(0.5)	205	(147.2)
Lower Fraser River Spring	365	(253.1)	1	(1.0)	366	(253.1)
Lower Fraser River Summer	133	(131.4)	0	(0.3)	133	(131.4)
Lower Fraser River Fall	65	(120.4)	1	(1.5)	66	(120.4)
Puget Sound	923	(409.2)	3	(2.7)	927	(409.3)
Juan de Fuca Strait	8	(31.0)	2	(2.2)	11	(31.0)
Coastal Wash	7,790	(1169.2)	49	(7.6)	7,839	(1169.2)
Upper Columbia spring timed	103	(186.3)	0	(0.4)	103	(186.3)
Upper Columbia summer & fall timed	22,637	(1736.6)	243	(14.5)	22,880	(1736.7)
Snake River spring & summer timed	250	(275.4)	9	(4.3)	260	(275.4)
Snake River fall timed	2,159	(943.9)	26	(8.5)	2,185	(943.9)
Middle Columbia Spring timed	28	(62.6)	1	(0.9)	29	(62.6)
Upper Willamette	3,685	(774.4)	16	(5.0)	3,701	(774.4)
Lower Columbia	1,990	(617.3)	14	(4.9)	2,004	(617.4)
North and Central Oregon	23,716	(1697.7)	109	(11.4)	23,825	(1697.7)
Southern Oregon Coastal	1,446	(549.3)	8	(4.5)	1,454	(549.3)
Klamath & Trinity Rivers	25	(51.8)	1	(1.0)	25	(51.8)
Central Valley spring timed	29	(61.3)	0	(0.4)	29	(61.3)
Central Valley fall timed	130	(143.1)	0	(0.7)	131	(143.1)

\*Standard deviations (STD) appear in brackets.

**Note:** The catch assigned to stock groups represents 158,338 of the total 158,363 Chinook salmon caught from October 1, 2005 to September 30, 2006. 25 Chinook salmon caught in October 2005 were not sampled.

**Figure 4: WCVI Chinook Troll Fishery Preliminary Catch and Releases Estimates – Generated from the Department Fishery Operations System (FOS) October 2005 to September 2006**

Date	Areas	Chinook Retained	Chinook Released	Coho Released	Marked Coho Retained
Oct 03 to 11	123 to 127	12,198	1,032	1,272	0
Nov 07 to 08	123 to 127	2,156	541	27	0
Dec 05 to 08	23 to 27, 123 to 127	1,689	172	1	0
Jan 09 to 21	23 to 27, 123 to 127	1,468	131	32	0
Feb 08 to 11 & Feb 15 to 23	23 to 27, 123 to 127	5,154	523	13	0
March 10 to 13 & March 16 to 31	125 to 127, 23 to 27	7,883	294	0	0
April 1 to 15	125 to 127, 25 to 26	20,561	627	3	0
April 16 to 19	124 to 127, 25 to 26				
April 20 to 30	123 to 127, 23 to 27				
May 1 to 5	123 to 127, 23 to 27				
June 15 to 18	123 to 127	20,807	1,300	4,297	0
June 19 to 22	125 to 127				
Aug 25 to 31*	123 to 127	886	10	142	0
Sept 3	125 to 127	2,590	193	1,113	459
Sept 7 to 13	125 to 127	9,996	974	2,504	1,382
Sept 14 to 16	123 to 127	8,765	1,026	744	403
Sept 17 to 30	125 to 127	2,747	179	201	131
<b>TOTAL DIRECTED CHINOOK FISHERIES</b>		<b>103,978</b>	<b>7,345</b>	<b>10,519</b>	<b>2,375</b>
Aug 3 to 4**	111, 11, 12, 123 to 127	0	147	70	0
Aug 7 to 11***	111, 11, 12, 123 to 127	36	3,130	1,135	0
<b>TOTAL DIRECTED SOCKEYE FISHERIES</b>		<b>36</b>	<b>3,277</b>	<b>1,205</b>	<b>0</b>
<b>GRAND TOTALS</b>		<b>104,014</b>	<b>10,622</b>	<b>11,724</b>	<b>2,375</b>

**Notes:**

\* Experimental selective plug fishery

\*\*Fraser sockeye test fishery - preliminary catch estimate of 3,570 sockeye

\*\*\*Directed Fraser sockeye full fleet commercial fishery - preliminary catch estimate of 169,600 sockeye

## **Appendix I: Salmon Endowment Fund**

As part of the 1999 Pacific Salmon Treaty, the US and Canada established an endowment fund, the interest from which would be used for the benefit of Pacific salmon. More information on approved projects and application process can be found at:

[http://www.psc.org/news\\_restoration.htm](http://www.psc.org/news_restoration.htm)

### **Chinook related projects approved in 2006:**

- Campbell River Mainstem Chinook Enhancement
- Genetic Introgression Study of Gold River Chinook and Robertson Creek Hatchery Chinook
- South Fork Nooksack Early Chinook Stock Supplementation
- Determination of Genetic Variation within Deschutes River Fall Chinook Salmon
- Investigation of Lower Thompson Juvenile Chinook Carrying Capacity
- Mahogany Creek Culvert Replacement Project
- Low Flow Restoration and Fish Screening Improvements on Tributaries to the Lower Shuswap River
- Nicola Basin Stream Flow Recovery and Development of In-stream Flow Requirements
- Maria Slough Chinook Habitat Project
- Coldwater River Habitat Restoration
- Cowichan Coldwater Pump Facility
- Habitat-based Chinook Escapement Goal Calibration: Small West Coast Vancouver Island Rivers, BC
- Extension of the Chinook Salmon Microsatellite Baseline
- Thermal Marking of Cowichan Fall Chinook
- Genetic Baseline Additions of Washington Chinook Salmon Populations to Enhance Mixed Stock Fishery Analyses in the Southern Boundary Area.
- Nanaimo River Chinook Indicator Stream Surrogate
- Development of Allele Ladders for 13 Microsatellite Loci Approved by the PSC for Genetic Stock Identification of Chinook Salmon
- Burman River Chinook Escapement Goal Calibration
- Habitat-based Chinook Escapement Goal Calibration: Large, Clear Rivers and Small, Low Visibility Rivers in the Interior Fraser River Watershed, BC
- DNA Based Stock Composition of Catch and Released Chinook Salmon in the WCVI Troll Fishery
- Analysis of Chinook Thermal Marking
- Genetic Stock Identification of Chinook Mixtures at Bonneville Dam
- Lower Granite Falls Chinook Run Reconstruction Assistance

## **Appendix J: Additional Technical Information**

### **1. Harrison Chinook:**

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

The Chehalis hatchery enhances Harrison River fall returning Chinook through the collection of broodstock from the Harrison River and a small number of "swim-ins" to the hatchery. Production from both facilities is monitored through application and recovery of coded-wire tags (CWT's). The contribution from the Chehalis hatchery to the in-river escapement in the Harrison River is less well known than the Chilliwack hatchery's contribution to the in-river escapement of fall-run fish returning to the Chilliwack River system. This is due in part to the relatively small Chehalis hatchery contribution within the large natural spawning Harrison population, 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 Dome, Nicola, and Lower Shuswap exploitation rate indicator stocks. Spawning escapements are estimated quantitatively with representative sampling of CWTs 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 under consideration and the best available ones will be used to address this deficiency in order to estimate fishery impacts and reconstruct cohort abundances. Currently, Nicola River, Dome Creek, and Lower Shuswap River have CWTs and reliable escapement estimation programs; however, the utility of these programs to produce forecasts is limited by the lack of a reliable estimate of CWT removals from in-river fisheries.

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

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

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

#### **4. Other Stock Assessment Information:**

##### *a.) Coded Wire Tag Information*

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

##### *b.) DNA Analysis*

Over successive generations, distinct fish populations have adapted to fit and prosper in particular niches in their ecosystems. These specialized characteristics are frequently expressed as unique patterns in their genetic code. The Molecular Genetics Lab at the Pacific Biological Station utilizes 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 information needs for a habitat based assessment are more readily available in large spatial databases such as the Provincial Watershed Atlas and Terrain Resource Information Maps. Two biologically-based methods appear useful to establish escapement goals and both focus on estimating carrying capacity. Escapement goals will be based on each aggregate's management objectives. One method estimates spawner capacity from spawner density-habitat relationships developed from Fraser River populations (Parken et al. 2002<sup>1</sup>). Presently, the method is being ground-truthed with fish production and stock-recruitment data for the Nicola River. The second method relies on relationships between carrying capacity, estimated from stock-recruitment analyses, and habitat parameters such as watershed area (Parken et al. 2006<sup>2</sup>). The habitat and stock-recruitment data are from 25 populations ranging from Northwestern Alaska to 2coastal 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. 2000<sup>3</sup>; Parken et al. 2003<sup>4</sup>), further calibration of the current visual escapement estimates is needed in order to use similar units for comparisons. Calibration work will be undertaken at the Lower and Mid Shuswap rivers, Coldwater River, and possibly Chilcotin River in 2007.

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

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

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

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

## Appendix K: DFO Contacts

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	Resource Manager – Aboriginal Fisheries	Debra Sneddon	(604) 666-8426
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	Resource Manager - Commercial Fisheries	Barbara Mueller	(604) 666-2370
	Management Biologist (Chinook, coho, chum)	Melanie Sullivan	(604) 666-2417
	Management Biologist (FN catch monitoring)	Marla Maxwell	(604) 666-6608
Fisheries Management - B.C. Interior	A/Area Chief (to March 31, 2007)	Elmer Fast	(250) 851-4878
	Area Chief ( April 01, 2007 onward)	Gordon McEachen	(250) 851-4948
	Asst. Resource Manager - Fraser River watershed from Sawmill Creek to Deadman Creek	Merv Mochizuki	(250) 851-4952
	A/Resource Manager - Fraser River watershed upstream of Deadman Creek	Al Charbonneau	(250) 992-2434
	A/Resource Manager – B.C. Interior Area – Thompson/Columbia/Okanagan	Dean Allan	(250) 851-4821
	Senior Management Biologist	Les Jantz	(250) 851- 4948
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Stock Assessment Division	A / Head – Fraser River Stock Assessment	Timber Whitehouse	(250) 851-4833
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Conservation & Protection	Area Chief - Lower Fraser River Area	Herb Redekopp	(604) 607-4156
	A/Area Chief – B.C. Interior Area	Stu Cartwright	(250) 851-4922