FRASER RIVER SALMON SUMMARY

April 1998

FRASER RIVER ACTION PLAN FISHERY MANAGEMENT GROUP

SOCKEYE

PINK

COHO

CHUM

STEELHEAD

CHINOOK

Fisheries and Oceans Pêches et Océans

Canada

Department of Fisheries and Oceans. 1998. Fraser River Salmon Summary.
Prep. by Fraser River Action Plan, Fishery Management Group. Vancouver, B.C. 16p.

FRASER RIVER SALMON SUMMARY

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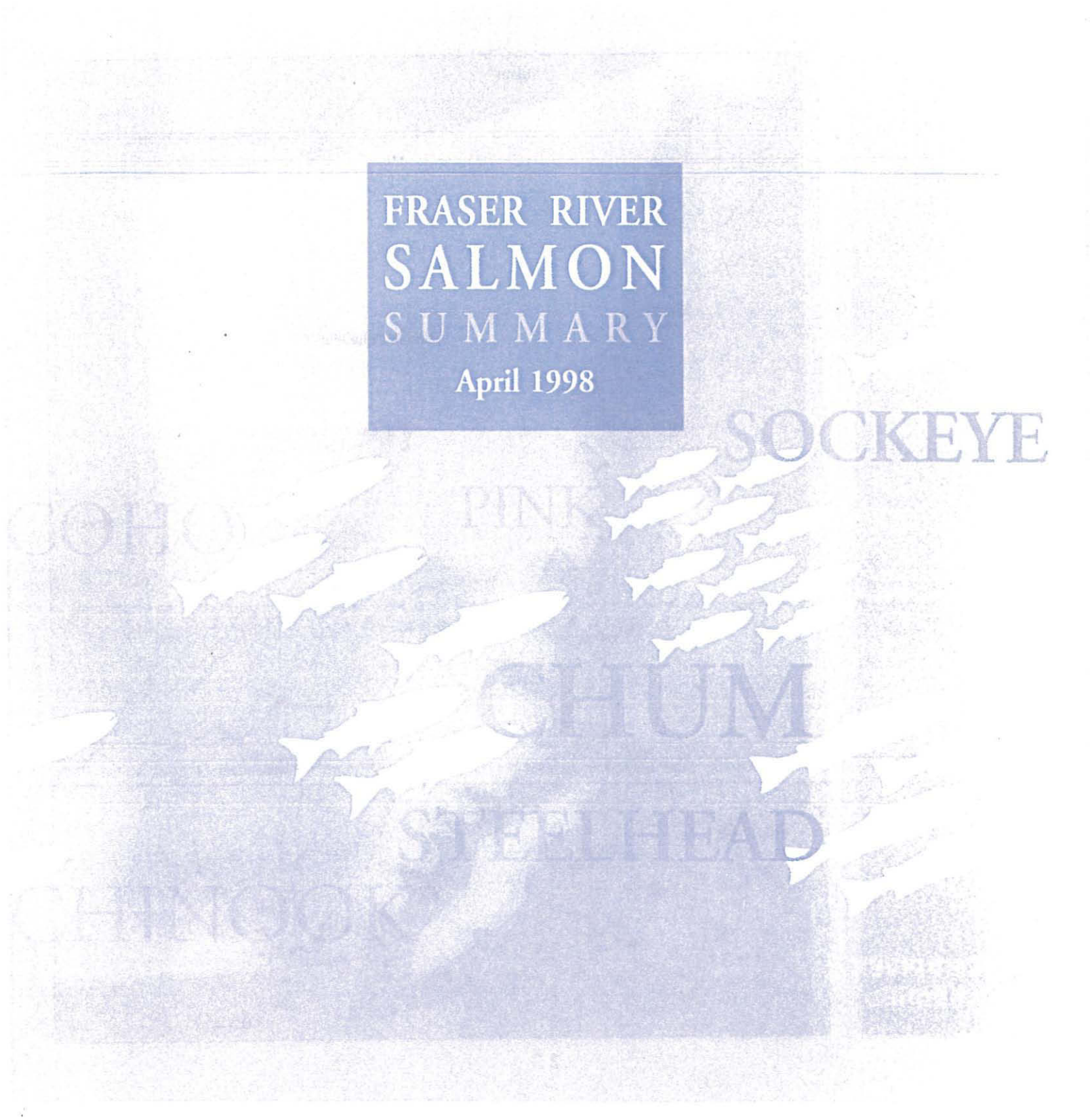
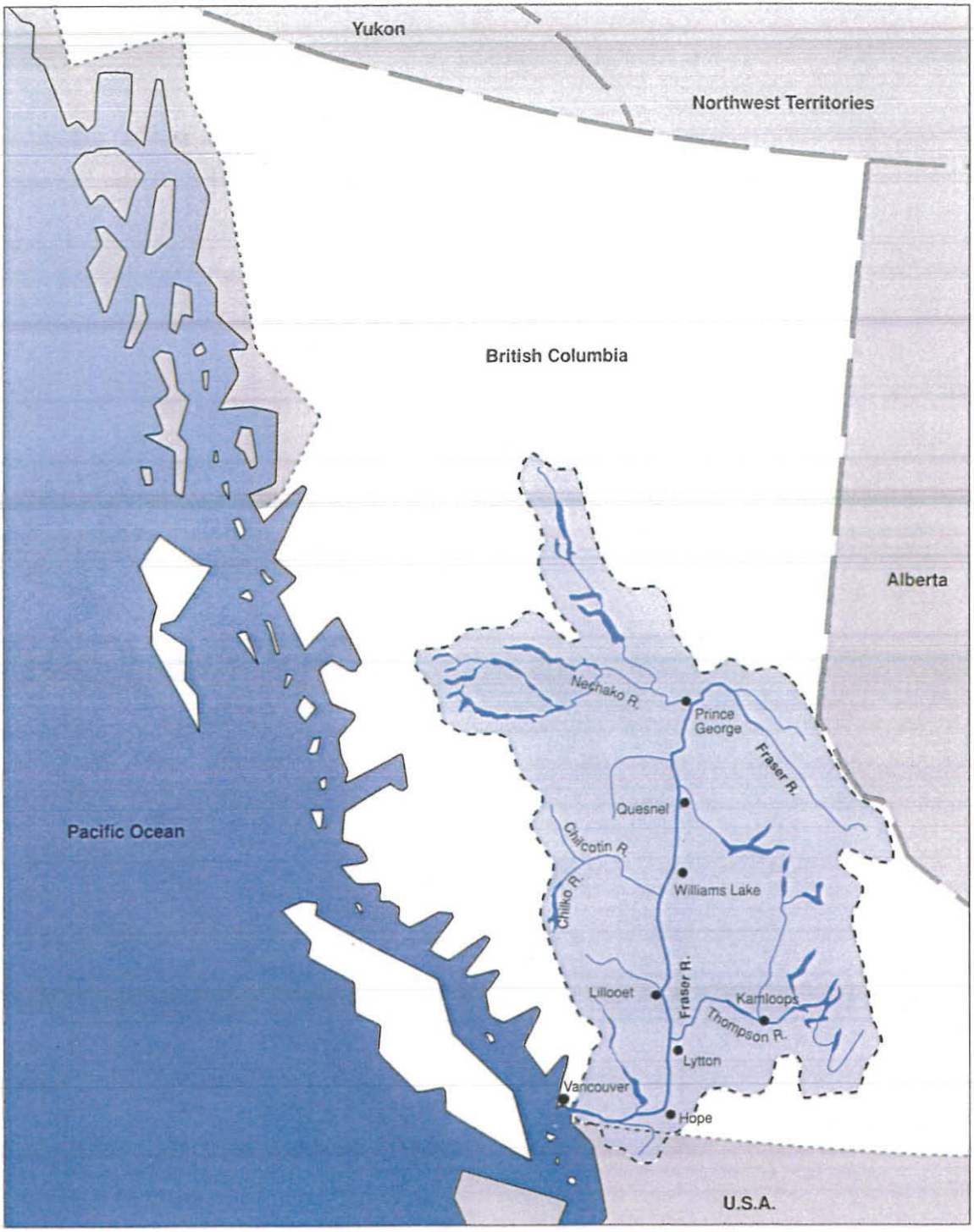


FRASER RIVER WATERSHED



FRASER RIVER SALMON

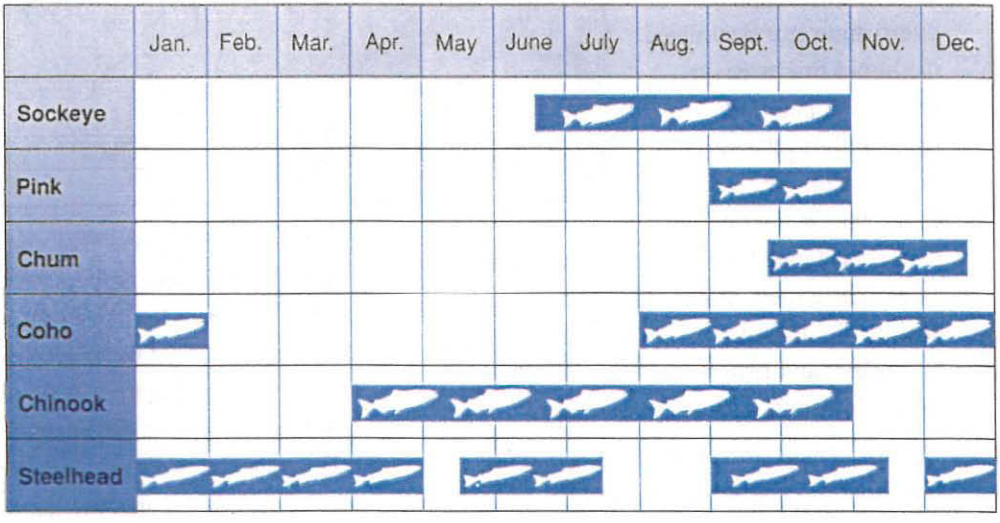
INTRODUCTION

Canada's fourth largest river, the Fraser River flows 1,375 kilometres from the Rocky Mountains to its delta on the shores of the Pacific. The river and its vast network of lakes and tributaries drain a richly varied basin the size of Great Britain. The broad range of ecosystems and climatic zones traversed by the river system represent an abundant diversity of life; the rivers, streams and estuary are among the most productive in the world.

Fraser River is the largest sockeye producer in the world, and a major producer of pink, chum, chinook, coho and steelhead salmon. Pacific salmon rear in the ocean and return to lay their eggs (spawn) in their birth streams. After hatching, young salmon spend differing amounts of time in freshwater. Pink and chum migrate directly to the sea, sockeye and coho rear in freshwater for one year and chinook for a few days to a year. Steelhead spend the longest time in freshwater, typically 2-3 years. Adults return to the lower Fraser mainly in the summer and the fall. Steelhead can be present in the Fraser throughout the year, but the period of most abundance is the winter.

Fishery management of Fraser salmon is highly complex since different species (sockeye, pink, chum, coho, chinook and steelhead) and stocks (groups within a specific species) travel through the same areas. This makes it almost impossible to have a fishery for a specific stock. Fraser sockeye are typically managed on the basis of 5 or 6 main stock groups each with its distinctive timing and abundance. Pink and coho are managed as single stocks, although there is increasing pressure to manage coho on a more specific level. Fraser chinook are managed as several stock groups, while chum are managed as two groups, based on the time they return to spawn. There is no directed commercial fishery for steelhead, however they are caught incidentally in salmon fisheries during fall, spring and summer. Steelhead are managed to minimize that by-catch.

Recent annual catches of Fraser salmon in the Canadian and U.S. fisheries averaged approximately 9.5 million sockeye (1990-1996), 9 million pinks on the odd-year cycle (1981-1995) and 0.5 million chum (1990-1993). Total catches of Fraser chinook, coho and steelhead are uncertain due to limited data. Fishing pressure has declined in recent years for pink, sockeye and chum salmon, but remains very high for Fraser coho. Enhanced production has been considerable since the mid-1980s, contributing over 40% of the terminal (mouth of river) coho run in 1987, and about 35% to the total chum returns (catch plus escapement) for the 1990-1993 period. Coastal winter and summer steelhead are hatchery enhanced; the interior stocks are not enhanced. In general, Fraser salmon returns have increased in recent years.

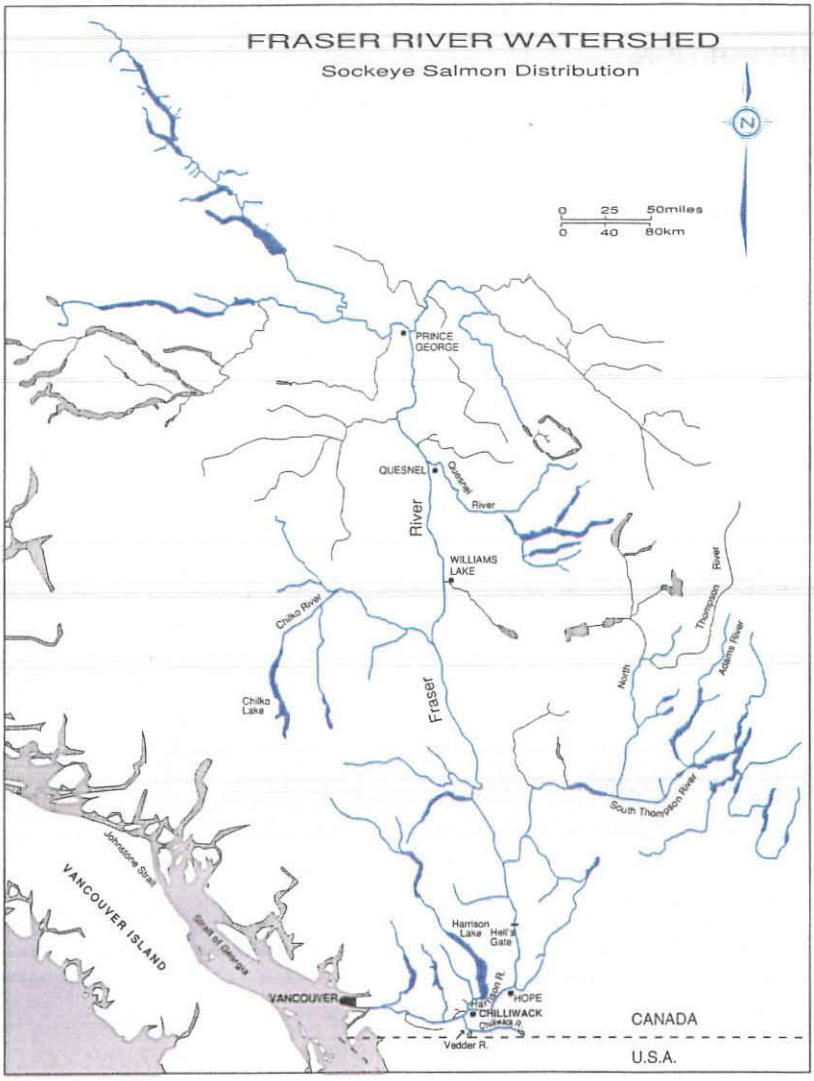


Major return migration timing of salmon in the lower Fraser River.

SOCKEYE

FRASER RIVER SOCKEYE

Fraser River sockeye salmon are world renowned. They are valued for their bright red flesh and high oil content. These fish support a large Canadian and export market. Commercial harvest of the species began in British Columbia in the mid 1800s.

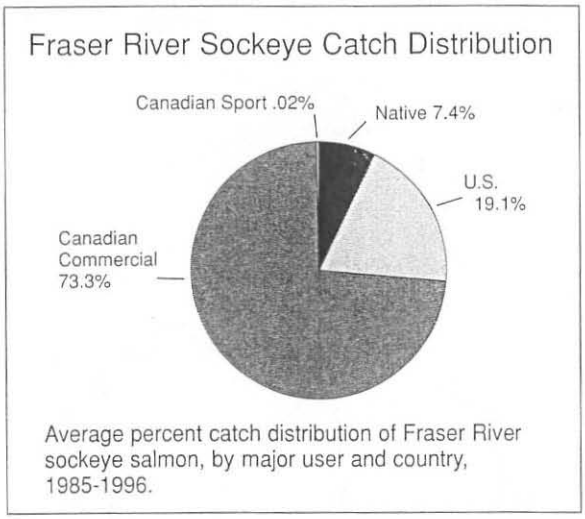


The Fraser River is the largest producer of sockeye salmon in the world. However, significant human induced events have occurred on this river system, the most noteworthy being the Hell's Gate blockage in 1913 and subsequent overfishing that decimated the upper Fraser River sockeye populations. Dams built in the early 1900s on the lower Adams River and on the Quesnel River accelerated the declines in stocks in these areas. Since then, remedial work on fish passage facilities in the Fraser Canyon and elsewhere, and fishery management actions have allowed these stocks to rebuild.

Sockeye eggs are deposited in stream or lakeshore gravel during fall, and fry emerge the following spring. Juvenile sockeye usually rear in freshwater for one year and migrate to salt water in their second year of life. Most Fraser sockeye rear in the ocean for about two years before returning primarily as four year olds, to spawn. Approximately 100 sockeye stocks spawn throughout the Fraser River watershed. The majority of Fraser sockeye are concentrated in nine stock groups, the largest being the Quesnel, Shuswap and Chilko populations.

Since sockeye return primarily as 4-year olds, many stocks have a dominant return year, followed by three years of lower abundance.

Fraser sockeye are caught mainly in the commercial fisheries operating around Vancouver Island.

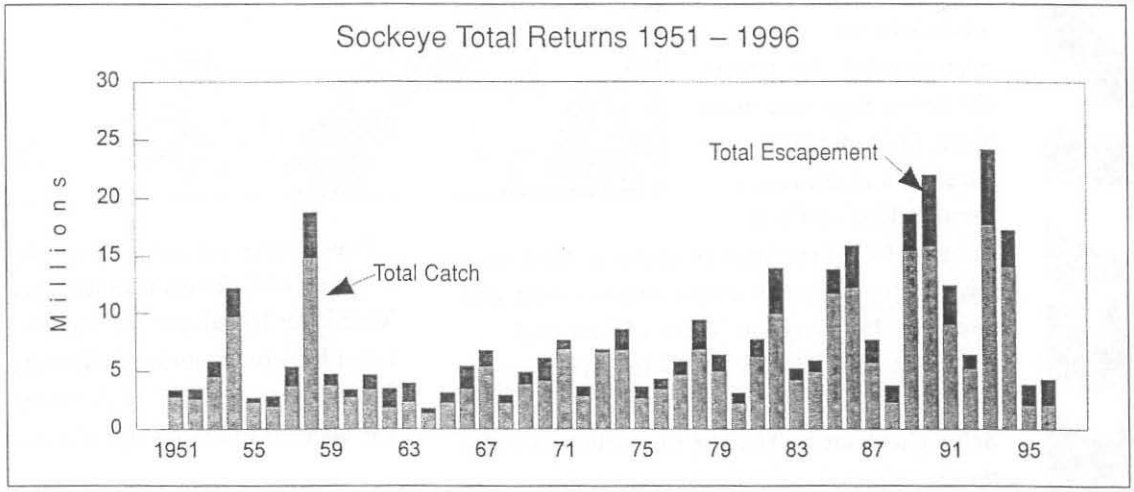


Average percent catch distribution of Fraser River sockeye salmon, by major user and country, 1985-1996.

Fraser sockeye stocks have been rebuilding steadily in the last several decades. Average annual returns have increased from approximately 5 million in the early 1960s, to over 13 million for the period 1989-1996. Returns on each of the two dominant cycle lines (1993 and 1994) in the late 1980s and early 1990s have averaged over 20 million. Sockeye escapements have also increased, especially on the 1993 and 1994 cycle lines. The increasing trend in total returns, strongly suggests that a potential exists to increase the total annual average returns of Fraser River sockeye to historical levels of 15-20 million adults or more.

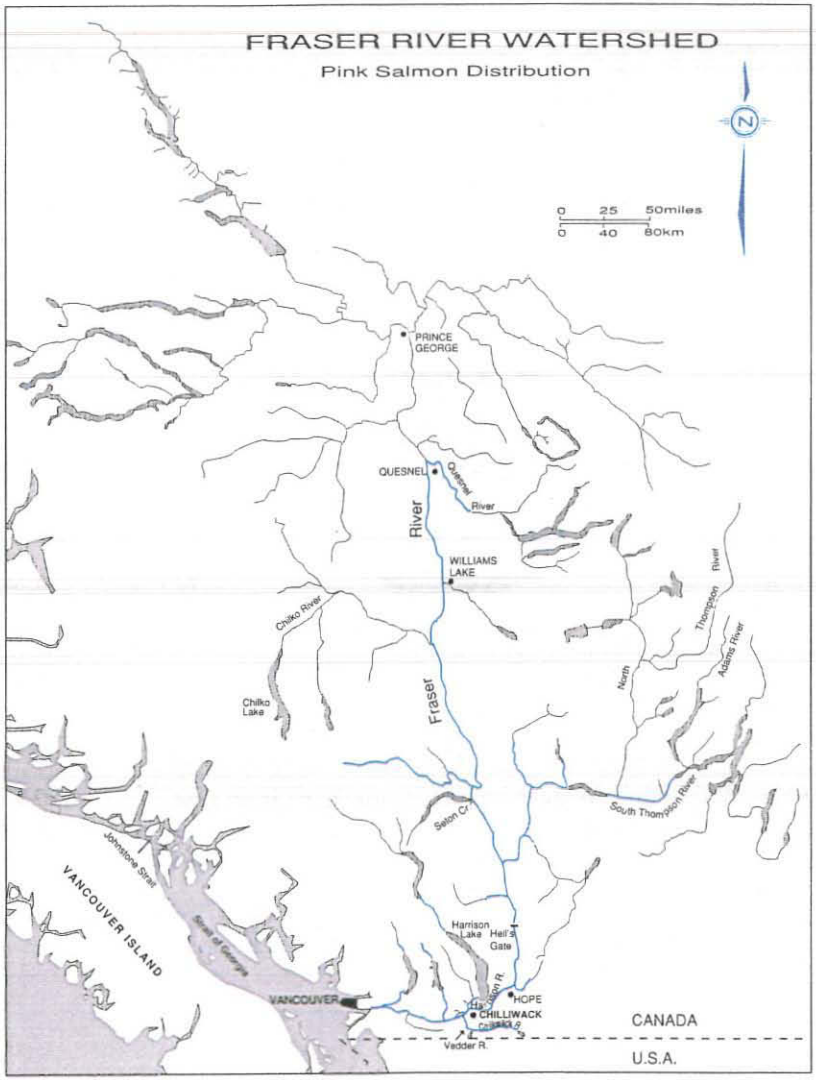
Stock rebuilding is conducted mainly through fishery regulation for escapement and improvements to fish passage in the Fraser system (especially at Hell's Gate). More recently, spawning channels and lake fertilization programs have improved production in several river systems. Channels contribute (annually) about 5% of sockeye production in the watershed.

Sockeye salmon management is probably the most complex of all Fraser salmon species. They are managed based on four timing groups (Early Stuart, Early Summer, Summer and Late runs). Fraser sockeye and pink have been managed jointly by Canada and the U.S. since the late 1930s. Since 1986, the Pacific Salmon Commission has directed the management of many of the fisheries which harvest Fraser sockeye.



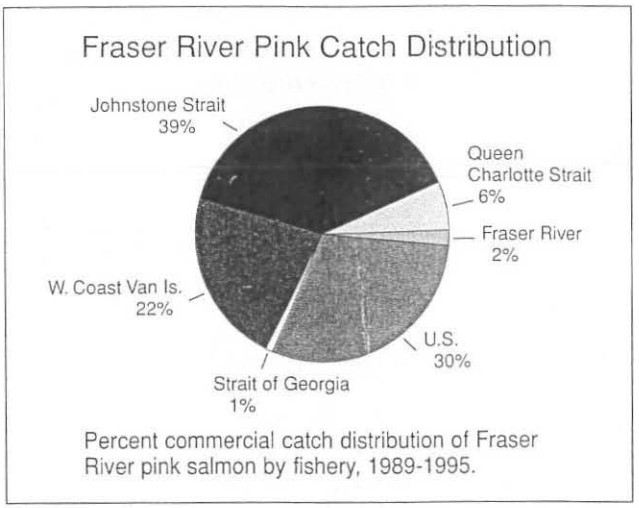
FRASER RIVER PINKS

The Fraser River supports the largest pink salmon population in the northeast Pacific basin south of Alaska. Between 1985 and 1995, the total return of Fraser River pink salmon on the odd-year cycle has averaged around 15.7 million fish. The Fraser River pink salmon spawn in odd years only, hence the even year abundance is insignificant.



Pink salmon emerge in the early spring and migrate immediately to the Strait of Georgia where they feed for several months. The sub-adults live for approximately one year in the ocean, migrating as far as the Gulf of Alaska. The 2-year old adults return through Juan de Fuca Strait or Johnstone Strait to spawn in the Fraser River. The stocks are categorized into early and late runs. The early run (about 85% of total return) includes mainly stocks from the lower Fraser mainstem, the Thompson River and the Seton Creek areas. The late run includes mostly those stocks below Hope, B.C., with the Harrison and Chilliwack-Vedder rivers being the largest.

Fraser pinks are caught primarily in the commercial fisheries operating around Vancouver Island and off Salmon Banks and Point Roberts in northern Washington waters. Since 1989, over 90% of the commercial catch has occured south of Cape Caution.

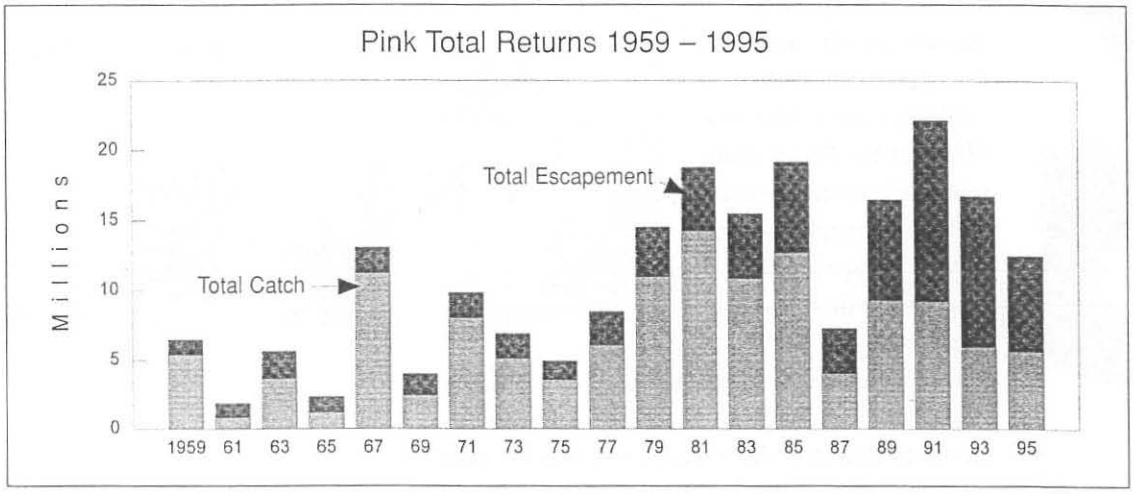


Percent commercial catch distribution of Fraser River pink salmon by fishery, 1989-1995.

Fraser pinks have contributed an average of 5.2 million and 2.2 million fish to the respective Canadian and U.S. fisheries during 1989-1995, in the odd years. Presently, a major portion of the total Canadian commercial catch is taken in the Queen Charlotte Strait and Johnstone Strait. Significant catches are also taken in the West Coast Vancouver Island, Juan de Fuca Strait, and Fraser River – Strait of Georgia fisheries. Catches of Fraser pinks have usually been less than 200,000 fish in both the Native and sport fisheries in recent years. Since 1985, Fraser River pink stocks have been managed by the Fraser River Panel of the Pacific Salmon Commission.

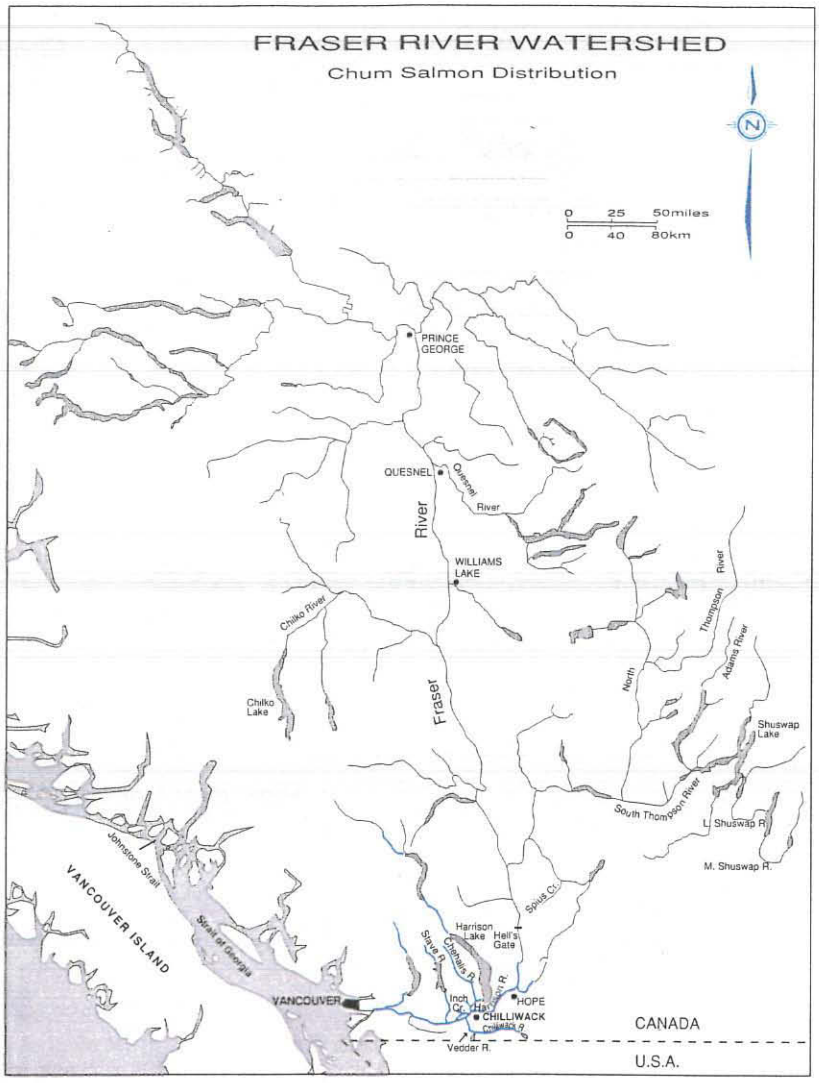
Pink salmon enhancement in the Fraser River watershed is currently limited to three spawning channels (Upper and Lower Seton Creek and Weaver Creek).

The abundance of Fraser River pink salmon has increased in recent cycles although returns have varied between 7 – 22 million in odd years since 1987. The maximum production capacity of the Fraser River is presently unknown.

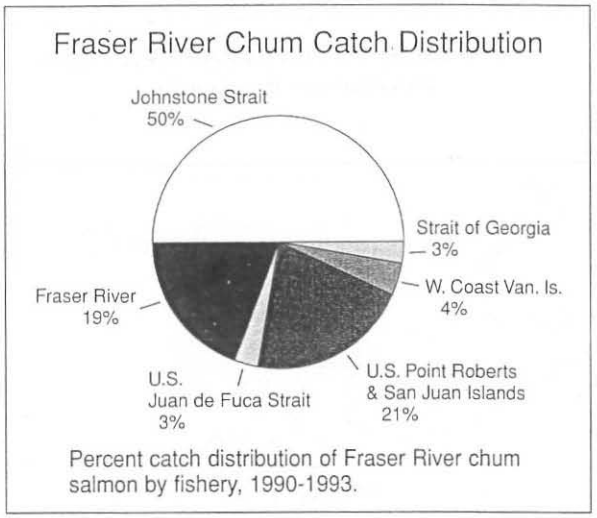


FRASER RIVER CHUM

Fraser River is the largest producer of chum salmon in British Columbia, with total annual returns averaging 1.0 million for the 1980-1993 period and reaching a maximum of 1.7 million chum in 1985.



Chum emerge from gravel and migrate directly downstream (primarily in March and April) to rear in the Fraser estuary and nearshore areas for up to several weeks. Juvenile chum salmon subsequently migrate into the Strait of Georgia and from there to offshore waters. Majority (74%) of the Fraser chum return to spawn at age 4, and the remainder at age 3 (19%) and age 5 (7%). Spawning extends from late September into January. For management purposes, the Fraser chum are divided into early and late runs, based on return timing to the lower Fraser. Fraser chum salmon spawn mainly in the lower Fraser River, below Hope, B.C., with the Harrison, Chilliwack/Vedder and Stave rivers supporting the largest chum stock groups in the Fraser system.

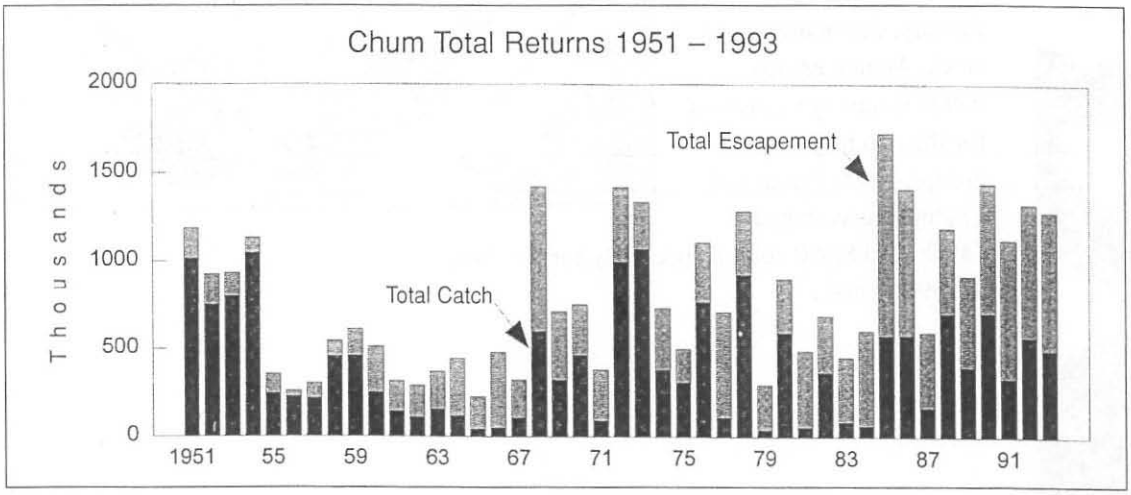


Percent catch distribution of Fraser River chum salmon by fishery, 1990-1993.

Fraser chum are caught mainly in the commercial net fisheries, with half the catch taken in Johnstone Strait and most of the remainder in the U.S. and Fraser River estuary. Management of chum catches in the Johnstone Strait interception fishery was regulated since 1983 through the "Johnstone Strait Clockwork Management Approach". In 1987, a separate harvest strategy was initiated for the Fraser River terminal fishery, linking the harvest opportunities in that area to terminal chum abundance. Separate harvest strategies govern the Johnstone Strait and the Fraser River fisheries. Harvest allocation between Canada and the U.S. is currently governed by the Pacific Salmon Treaty (signed in 1985) and is based on total chum abundance.

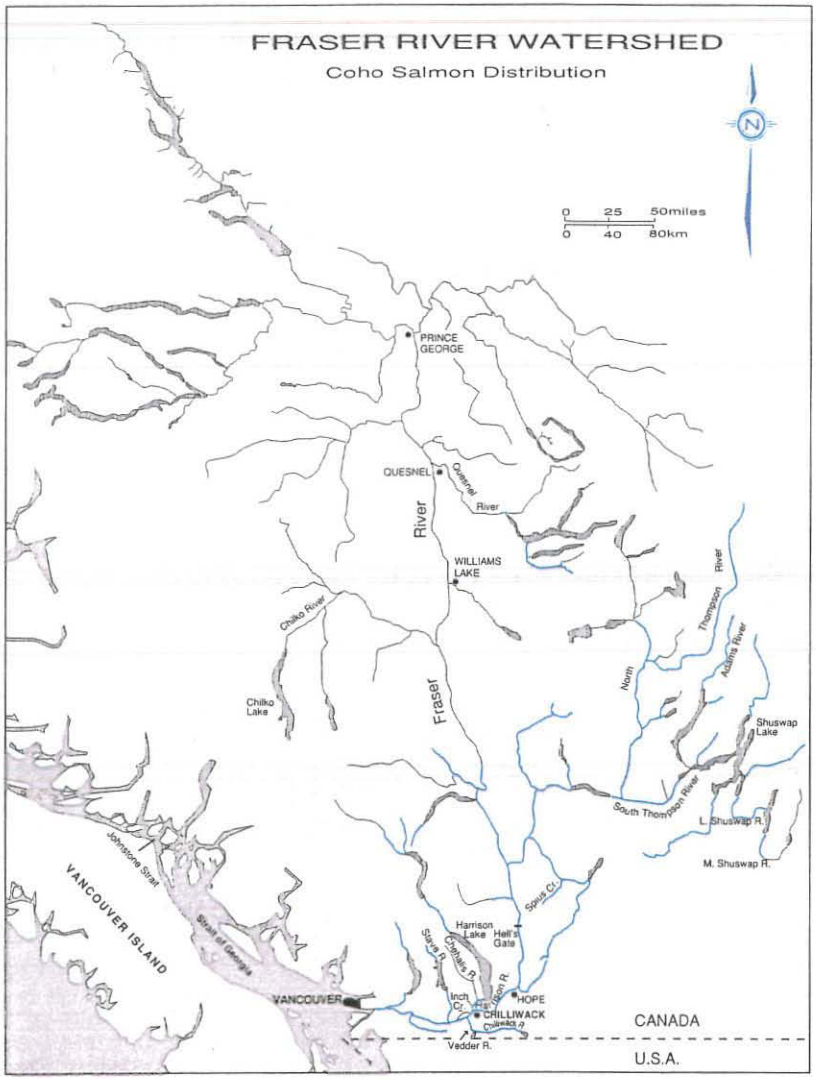
Total annual escapements and returns have nearly doubled from the pre-enhancement to post-enhancement return years ('80-'84 versus '85-'93). Major enhancement facilities are the Chilliwack River, Chehalis River and Inch Creek. Total enhanced production (based on 1994 egg targets) is predicted at approximately 400,000 adults, or about one third of the average total return of Fraser chum for the 1990-1993 period.

Increases in total returns of Fraser chum since the mid-1980s may be attributed to the Clockwork management strategy initiated in 1983 to rebuild chum stocks, and to the significant returns from enhanced production beginning in 1985. Presently the minimum escapement goal for Fraser chum overall is 700,000 spawners. Evidence suggests that the optimum escapement for Fraser chum is over 800,000 spawners.



FRASER RIVER COHO

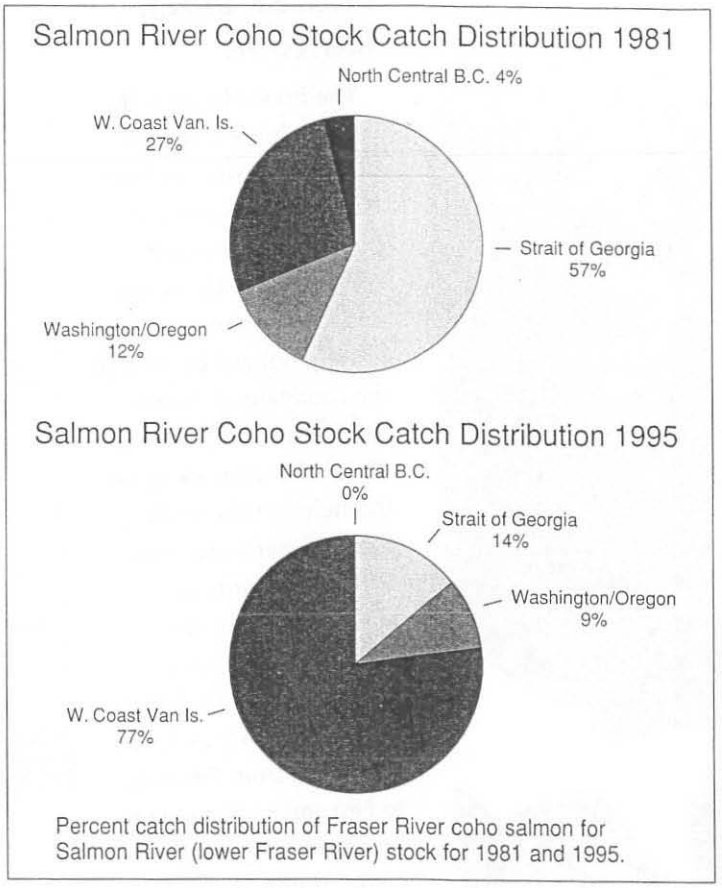
The Fraser River watershed supports 187 reported coho salmon stocks. About two thirds of these spawn in the lower Fraser system below Hope, B.C., and the remainder in the upper Fraser, primarily in the Thompson River system. Most juvenile coho enter the Strait of Georgia in May and June, generally after spending one full year in freshwater after emerging from the gravel. The majority of Fraser coho return to spawn at age 3. Most returning fish enter the Fraser River between August and January, depending on the stock. Annual escapements to surveyed streams for the two major stock groups, lower Fraser and Thompson, averaged at 24,000 and 8,000 coho respectively for the 1992 to 1996 period.



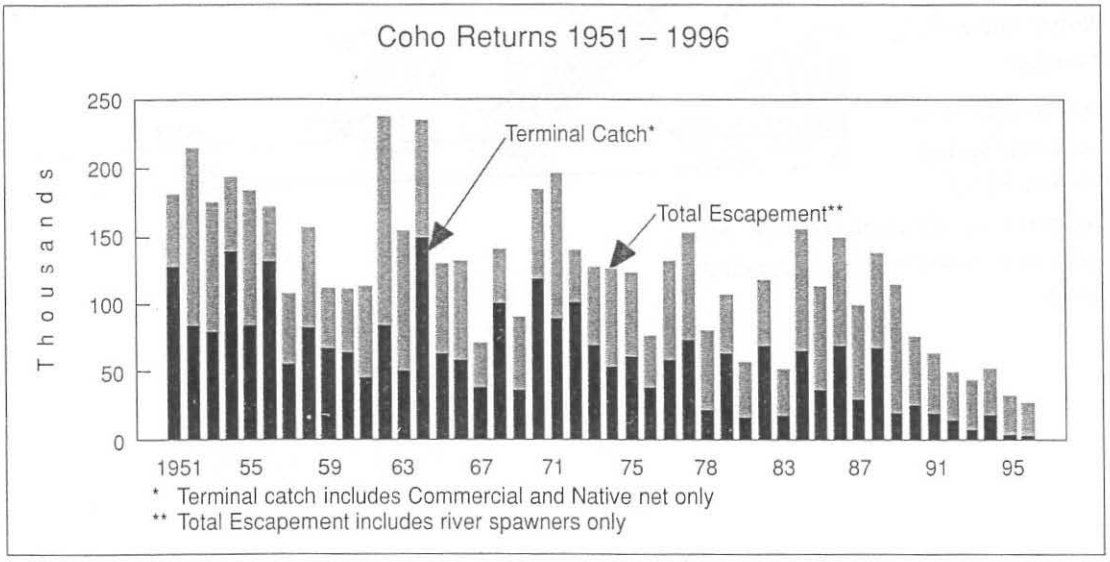
In the 1970s and early 1980s, Fraser River (including Thompson) coho were caught mainly in inside waters (predominantly the Strait of Georgia). In many recent years, the marine catch distribution of Fraser coho has been significantly altered, with most fish being caught on the West Coast of Vancouver Island. This shift is illustrated in the figure comparing Salmon River (lower Fraser River) catch distributions in 1981 and 1995. Similar outside distributions were found for most Fraser coho stocks in 1991, 1994, 1995 and 1996.

The stock status and production potential of Fraser coho stocks are uncertain due to limited information. Escapements to wild stock indicator systems in lower Fraser and Thompson have declined significantly in recent years. The declines are primarily due to poor marine survival with habitat loss and overfishing also contributing.

Terminal commercial catches represent only incidental coho catches in fisheries directed at other salmon species, and hence do not reflect the actual run strength of Fraser coho in the terminal area. In addition, the terminal catches constitute only a portion of the total catch of Fraser coho since this population is also harvested in several major non-terminal marine fisheries.



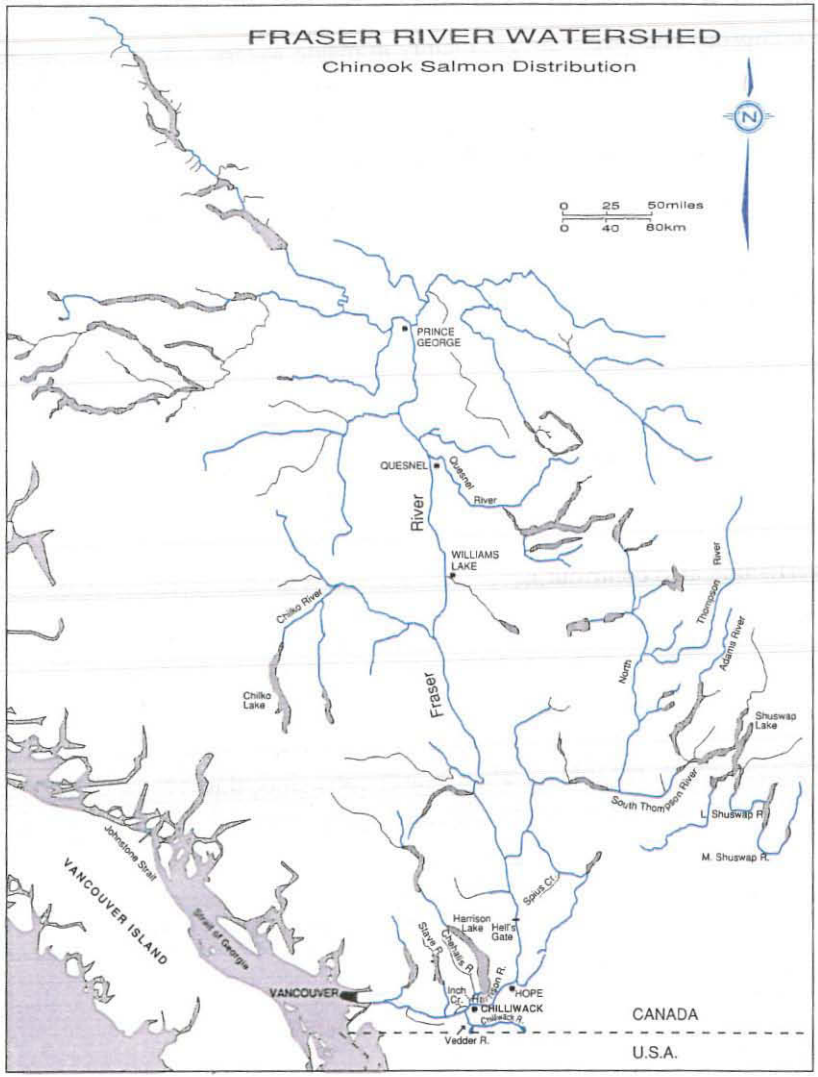
Percent catch distribution of Fraser River coho salmon for Salmon River (lower Fraser River) stock for 1981 and 1995.



Major coho producing facilities are the Chilliwack River, Chehalis River and Inch Creek hatcheries, all located in the lower Fraser. Total enhanced production was approximately 400,000 adults by the late 1980s. Rebuilding of the Fraser coho stocks must focus on management actions, particularly the reduction of fishing rates, as well as the protection and restoration of the coho freshwater habitat.

FRASER RIVER CHINOOK

The Fraser River is the largest chinook salmon producer in western North America. This chinook population is a major contributor to the ocean and river fisheries, and is heavily utilized by each of the commercial, Native and sport fishing sectors. The Fraser chinook spawn throughout most of the Fraser River watershed, with the majority of stocks spawning above Hope, B.C.. Chinook adults return to the Fraser River (primarily as 3, 4, 5 year olds) from February to November. Spawning begins in early August, peaks during September to mid-October, and ends by mid-November.

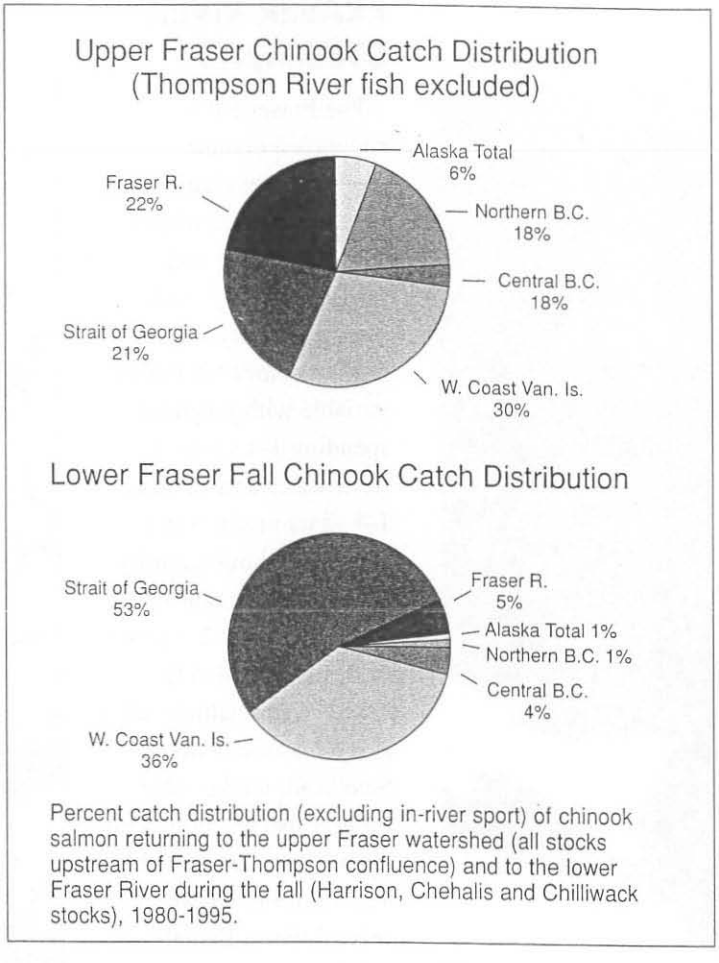


Chinook emerge from the gravel in the spring (March to late May) following spawning. Chinook fry may spend up to a year in freshwater before migrating to the ocean.

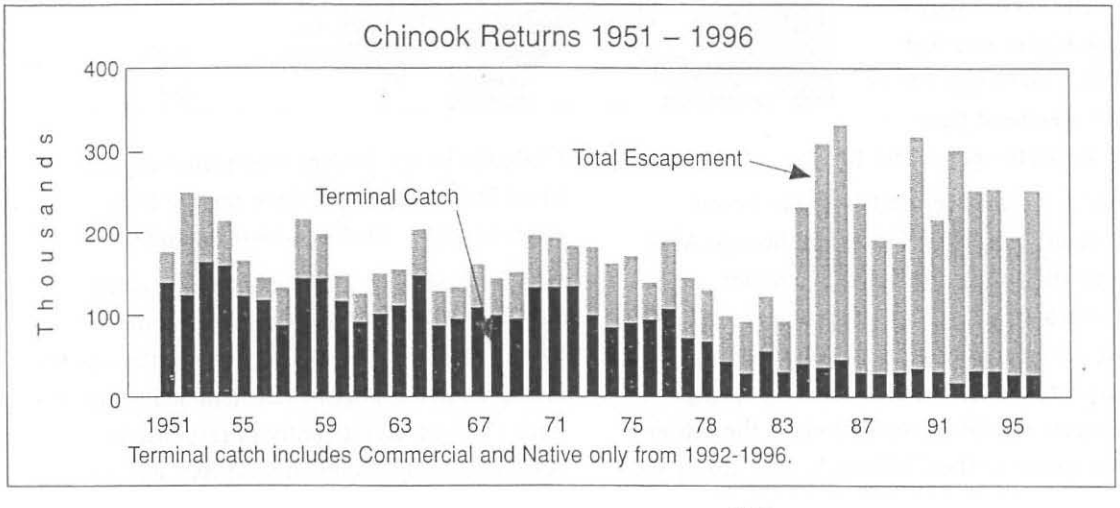
For management purposes, the Fraser chinook are divided into three groups (spring, summer and fall), based on migration timing through the lower Fraser. The fall run group (mainly the Harrison River stock) is by far the largest, with an average escapement of 102,300 spawners (1984-1993).

Unlike other Fraser salmon, the chinook show significant catches also in Alaska and North/Central B.C. However due to limited data, marine catch estimates are uncertain, as are the stock status and production potential. Chinook fisheries in Canada and the U.S. are regulated by the Pacific Salmon Treaty through a series of catch ceilings. The Fraser chinook are harvested mainly in the marine fisheries from southeast Alaska to Washington; as well as in the terminal fisheries (commercial net, Native and sport) within the Fraser River system. The Fraser chinook are also harvested incidentally in the commercial terminal fishery. Due to the extensive range and number of mixed-stock fisheries that harvest the Fraser chinook, this population cannot be managed on a stock-specific basis.

Major chinook-producing facilities are the Spius Creek and Shuswap River in the upper Fraser, and the Chehalis and Chilliwack River in the lower Fraser. The total enhanced returns of chinook salmon from all the Fraser River facilities continue to increase, from 10,000 (1983) to approximately 41,000 (1990) adults.

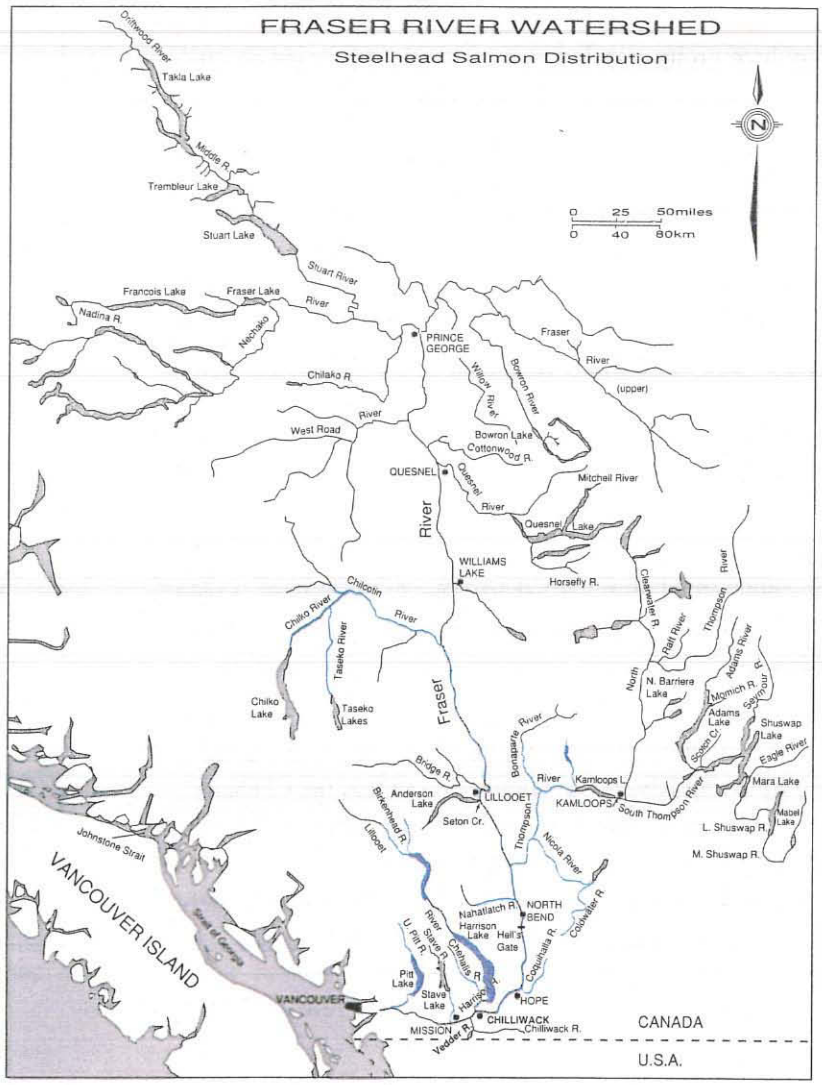


Percent catch distribution (excluding in-river sport) of chinook salmon returning to the upper Fraser watershed (all stocks upstream of Fraser-Thompson confluence) and to the lower Fraser River during the fall (Harrison, Chehalis and Chilliwack stocks), 1980-1995.



The chinook production potential of the Fraser River watershed is difficult to assess due to the virtual absence of information on habitat capacity. Assuming that adequate habitat is available, rebuilding initiatives, particularly an increase in the total spawning escapement, should increase the total return of Fraser River chinook salmon.

FRASER RIVER STEELHEAD



The Fraser River supports a diverse steelhead population that includes coastal winter, coastal summer and interior summer stocks. The life history of Fraser River steelhead is highly variable with juveniles spending 1-4 years in fresh water and sub-adults 1-4 years in salt water before reaching maturity. However, the majority of juveniles spend 2-3 years in fresh water and the adults reach maturity after 2-3 years in salt water. Steelhead, unlike other salmon species, do not all die after spawning and may return to spawn several times. Females survive to repeat-spawn at a much higher rate than do males, and some Fraser coastal steelhead have been shown to spawn four times.

Coastal winter steelhead enter the Fraser River mainstem from November through April and spawn in the same season. Summer steelhead stocks (coastal and interior) enter the Fraser mainstem between mid-April and November, and spawn the following spring. The largest steelhead populations in the Fraser system spawn in the Chilliwack, Thompson and Chilcotin rivers. Recent steelhead escapements to all Fraser tributaries have ranged from approximately 10,000 to 14,000 adults.

In the Fraser River system, anglers catch steelhead along the mainstem and in the tributaries. Recreational angling regulations for steelhead in the Fraser mainstem and tributaries have changed significantly in response to declining escapements of wild fish and stocking

of hatchery steelhead. In general, the change has been toward reduction and elimination of wild steelhead kill, and encouragement of harvest of hatchery steelhead. Catch and release fisheries have been promoted as a management tool to reduce harvest of wild steelhead.

Summer steelhead stocks (coastal and interior) returning to the Fraser River are intercepted as by-catch in commercial and aboriginal fisheries conducted along migratory corridors in marine and fresh waters. The largest proportion of Fraser River steelhead intercepted are the interior summer stocks. This is because their run timing and movement patterns overlap those of commercially important Pacific salmon. The commercial and aboriginal fishery regulations for steelhead returning to the Fraser River have changed significantly in response to declining escapements of wild steelhead. Interception of steelhead in marine commercial fisheries has declined due to reduction in fishing time and/or ongoing catch and release strategy.

The stock status and production potential of Fraser River steelhead is uncertain due to limited information. While escapements to some streams have increased in recent years possibly due to reduced overall catch, other streams have shown a decline or highly variable returns despite greatly reduced exploitation rates. This suggests that multiple factors, including poor marine survival, loss of freshwater habitat and overfishing, are influencing Fraser steelhead production.

Rebuilding of steelhead stocks continues to focus on maintaining low exploitation rates, with further reductions where possible (through selective fishing methods, etc.). The continued protection and restoration of freshwater habitat is also essential for rebuilding and maintaining wild steelhead populations. In addition, a major need exists to seek out better and more comprehensive biological information regarding factors limiting steelhead production, thereby allowing fishery managers to understand where the blocks to improved production exist.

Summary

Most Fraser River salmon stocks remain relatively healthy, although some, coho and steelhead in particular, are showing signs of stress from habitat degradation and overfishing. The Fraser basin is experiencing urban and population growth, industrial development and increased resource extraction. All these factors add stresses to the basin's ecosystem and with over 50% of B.C. salmon coming from the Fraser, the necessity of proper management is clear.

The Fraser River fisheries resource is complex, involving many interactions amongst stocks as well as between fish and their habitats.The challenge is to manage and enhance Fraser River fish stocks and their habitats for the benefit of future generations while accommodating other present and future uses of the river and land base.

Under the Fraser River Action Plan (FRAP), the Department of Fisheries and Oceans (DFO) has set in motion an integrated fisheries management plan designed to rebuild Fraser River salmon resources, maintain a diversity of stocks and improve their habitat management while providing for sustainable fisheries. The plan recommends involving all interested parties in the process. These interests include federal, provincial and local governments; First Nations; various fishing groups; and environmental and community groups.

Resolving the watershed's many challenges is a monumental job and the goal of sustainability is a long-term project. The groundwork has been laid and by working together we hope the resources of the Fraser will be enjoyed for generations to come.

We would like to thank the following agencies for their valuable contributions to this report: Ministry of Environment, Lands and Parks, Fisheries Branch (Steelhead Section) and Pacific Salmon Commission (Sockeye and Pink Sections).

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