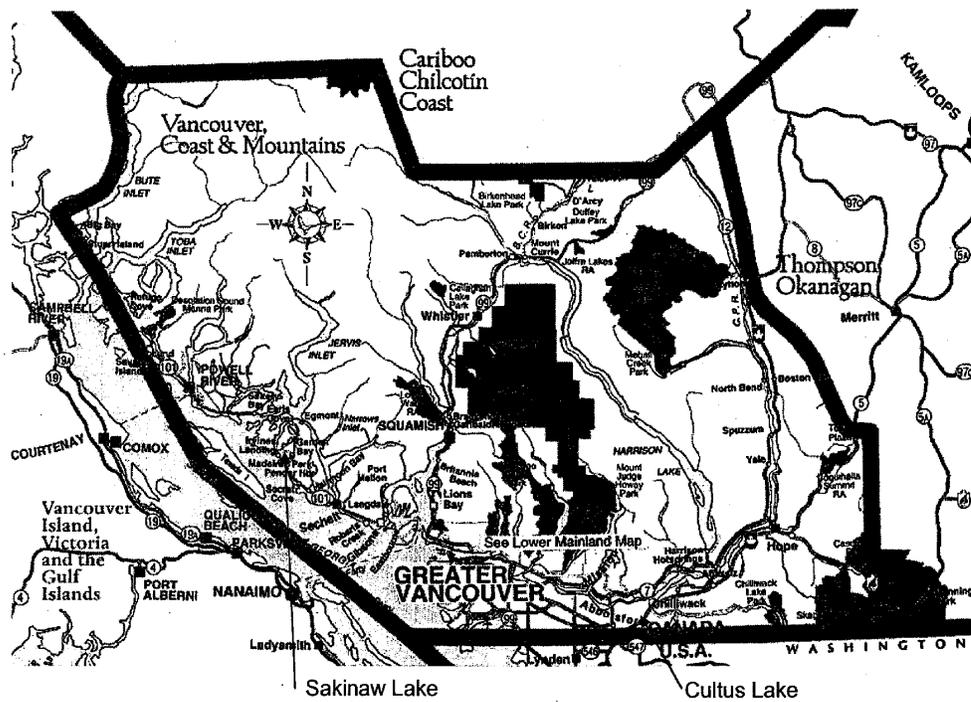


**SARA Emergency Listing Request:
An Approach for the Recovery and Rebuilding
of Sakinaw Lake and Cultus Lake Sockeye
Salmon**

Minister of the Environment
March 25, 2004

The first sockeye populations designated by COSEWIC

- In December 2003, COSEWIC requested emergency listing of Cultus and Sakinaw sockeye – the first sockeye populations proposed for listing.
- Historically, both populations were small to medium-sized, but their abundance has declined greatly in recent decades and now is at low levels.
- The population declines have multiple causes: over-harvesting, habitat loss and damage, fish passage problems, environmental or other factors resulting in lower marine survival, and, recently, abnormally high pre-spawning mortality in freshwater (Cultus) (see appendix for information on trends and status of the two populations, p.17-22).
- In July and August, both migrate through southern BC waters and are caught in mixed stock fisheries targeting other larger Fraser sockeye populations.
- The commercial fleet is highly dependent on Fraser sockeye as the mainstay of the salmon fishery in southern BC.



The emergency listing request and the departmental approach

- The department's approach is the following:
- Adopt measures to address any "imminent threats", removing need for emergency listing
- The overall approach to address any "imminent threats" to the populations includes fisheries management, habitat restoration, broodstock recapture, enhancement and other measures.
- The following illustrates how DFO intends to address threats to Cultus Lake and Sakinaw Lake sockeye in 2004 and beyond.
- The fisheries management options are described first, followed by the habitat restoration and other measures.

2004 Fisheries Management Options*

- **Option 1: Manage to a harvest rate of $\leq 5\%$ to achieve 500 spawners**
- **Option 2: Manage to a harvest rate of 10 -12% to achieve 250 spawners**
- **Option 3: Manage to a harvest rate of 15 -20% to achieve 100 spawners**
- **Base Case: Manage to a harvest rate of 30-40% to achieve Fraser River sockeye aggregate escapement goals (no specific measures to protect Sakinaw and Cultus Lake sockeye)**

*A summary is provided in the table on page 23

Base Case (for comparative purposes)

- No specific measures to protect Sakinaw sockeye (started in 2003) or measures to protect Late run sockeye including Cultus Lake sockeye (started in 2002).
- Could deliver First Nation's food, social and ceremonial target of 1 million sockeye and commercial landed value of ~ \$4 -\$5 million in a low cycle year
- Substantial probability that under this fishing plan, spawner numbers for Sakinaw Lake sockeye and Cultus Lake sockeye would be <100, quasi-extinction level.

Option 1: Manage to a harvest rate of $\leq 5\%$ to achieve 500 spawners

- Represents the minimum population size for long-term viability (<5% risk of extinction over 100 years)*

Pros

- Lowest biological risk and only marginally better than Option 2 (see table on page 23) and lower risk than Option 3.

Cons

- Allows no commercial catch of Fraser River sockeye and sets precedence for major commercial closures under SARA; and major restrictions to First Nation's FSC – 1/3 of target 1 million
- Low probability of achieving 500 spawners (see table on page 23)

* Both the Cultus and Sakinaw sockeye recovery teams have defined the minimum population size for viability as 1000 spawners, computed as the 4-year average over one generation (4 years) with no fewer than 500 spawners/yr

Option 2: Manage to a harvest rate of 10-12% to achieve 250 spawners

- Low risk and provides some minimal fishing opportunities

Pros

- Risk is marginally above the level of Option 1 under expected fishing patterns; lower risk than Option 3 (see table on page 23)
- Demonstrates commitment and sets stage for rebuilding (see table on page 13)
- Reasonable opportunities for FSC – 2/3 of target of 1 million sockeye – marine FSC target hit hardest; with restricted opportunities for commercial sector
- Harvest rate levels consistent with practice under U.S. ESA for salmon (e.g. exploitation rate on Nooksack chinook, considered to be in critical state, is >20%)

Cons

- Requires significant fisheries closures on widespread basis for many parts of coast
- Commercial sector will criticize the limited opportunities (estimated landed value of \$1-1.5 million versus \$3.5 million under Option 3)
- Restrictions to marine First Nation's FSC, while allowing commercial opportunities could raise concerns from First Nations.
- Expect objections from sport sector because of non-retention for sockeye

Option 3: Manage to a harvest rate of 15-20% to achieve 100 spawners

- The 100 spawners represents the quasi-extinction level, defined as four consecutive years of less than 100 effective spawners.

Pros

- The highest biological risk with the least restrictive management measures. Fulfills FSC needs in both marine and fresh water ~ 1million sockeye
- Provides the best commercial opportunities in a low cycle year (~ \$3.5 million landed value)

Cons

- Would be portrayed as managing Sakinaw Lake sockeye to technical definition of extinction (i.e., fourth consecutive year of returns at or below 100 fish). A significant environmental shock (El Nino) could result in extinction.
- Does not demonstrate that recovery effort is being made and would draw criticism for maintaining past exploitation rate levels.

Option 2 is Recommended

Rationale

- Acceptably addresses threats to these populations from fishing in 2004 and restricts Fraser sockeye fisheries to unprecedented levels.
- Risk is only marginally above the risk associated with Option 1 under expected fishing patterns. (see table on page 23).
- Lower probability of achieving 250 spawners for Cultus than for Sakinaw (see table on page 23); however, short-term rebuilding potential is much higher for Cultus (see table on page 15).
- Should provide more spawners to Sakinaw Lake than in any of last four years and sets the stage for rebuilding and recovery of both populations.
- In combination with non-fisheries management measures, such as broodstock recapture and supplementation program, habitat restoration, fish passage monitoring and predator control, will greatly reduce the risk, stabilize and halt the decline in abundance, and set the stage for future rebuilding

Ongoing impacts on fisheries

| Year | Fraser River Sockeye Return | Typical Landed Value Without SARA Measures | Expected Landed Value with SARA Measures |
|------|-----------------------------|--|--|
| 2004 | 4.9 million (forecast) | \$4 - \$5 million | \$1.1 – 1.5 million* |
| 2005 | 9.5 million (cycle average) | \$40-45 million | Unknown |
| 2006 | 12 million (cycle average) | \$40-50 million | Unknown |

* recommended option

- 2004 is the lowest cycle year of 4 year cycle for Fraser sockeye – in subsequent years, more fish return (see graph and data on page 24)
- At a harvest rate of 10-12% (recommended option), the expected landed value is \$1.1 to \$1.5 million. There would be widespread closures for the commercial fishery, and some restrictions to both Aboriginal (food, social & ceremonial) and recreational fisheries.
- The impact of SARA measures on future landed values has not been assessed. Expected catches would be somewhat larger than 2004, depending on the extent of innovative fishery approaches and the success of recovery actions.
- SARA measures would significantly affect processors. Without access to large components of Fraser sockeye, some major processors may not remain viable over the longer term.
- Requests for compensation from the commercial sector are expected.

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Sakinaw Sockeye: 2004 Rebuilding Plans

Fisheries Management

- As a recommended option, limit harvest rate to 10-12% to minimize fishing impacts and achieve escapement goal of 250 spawners
- This will halt the decline and support recovery

Captive Brood Stock and Enhancement Program

- Enhancement is key to Sakinaw - it will stabilize population and support recovery
- In 2004, for first time, there will be returning adults from enhancement started in 2000. Intensive enhancement (hatchery-reared fry releases) in 2000, 2001 but in 2002 few and 2003 no broodstock available (see table on page 15)

Habitat Restoration & Other Measures

- Two main spawning sites recently cleaned and gravel added. Existing habitat is very productive, but extent is limited and could be future bottleneck to recovery.
- More habitat restoration could raise spawning site capacity and upper limit of population size (although currently this is not a constraint).
- Fishway over dam and approach ways will be improved and monitored to ensure safe passage (low water and predation by seals/otters has been a problem)
- Water management study will continue on better control of water levels in lake during summer (e.g. possibility of dams on connecting lakes)

Cultus Sockeye: 2004 Rebuilding Plans

Fisheries Management

- As a recommended option, limit harvest rate to 10-12% to minimize fishing impacts and achieve escapement goal of 250 spawners
- This will result in significant increase over brood year (2000) and set the stage for even larger return in 2008.

Captive Brood Stock and Enhancement Program

- In 2004, first adults will return from enhancement started in 2000.
- Captive brood program will produce 500 viable adults/yr as required for 2004-2011 period. Enhanced smolts, released as hatchery-raised fry, swim to the ocean with wild smolts.
- This will accelerate rebuilding, providing substantial increase in production.

Habitat Restoration & Other Measures

- Habitat around Cultus Lake is degraded due to recreational activities, but current habitat is not a constraint to rebuilding in the short term. It could constrain upper limit of population over longer term.
- Eurasian milfoil (invasive weed) to be removed this year –habitat for Pikeminnow.
- Also, considering predator control of Pikeminnows that prey on fry and smolts. Their previous removal in 1930s & 40s increased fry/smolt survival 1.4 -3 times.
- Further evaluation of habitat restoration needs will be undertaken.

Longer Term Recovery Actions

- 2004 rebuilding plans are only the first step – a comprehensive, multi-year approach will be required. However, rebuilding is not guaranteed.
- There is good probability of success for Cultus sockeye, if planned measures are implemented and carried forward. Significant increases in Cultus sockeye are forecast over next 4 years (see table on page 20).
- Rebuilding of Sakinaw sockeye is a greater challenge, due to its very low abundance in all 4 cycle years; very low forecasts in 2006 & 2007 (see table on page 15). Options being explored to increase the number of viable adults in 2006 & 2007 include:
 - (1) capturing all outgoing smolts from 2002 & 2003 brood years and raising them in captivity to better ensure survival; and
 - (2) supplementing 2007 brood year with hatchery raised adults from 2004 egg take (in captivity salmon can reach maturity in 3 years).
- Of note, harvest rate adjustments to protect Cultus and Sakinaw will benefit other small sockeye populations in the southern coast of BC and in the Fraser River system.
- In late 2003, SARA recovery teams were formed for Sakinaw and Cultus sockeye

2000-2003 Returns and 2004-2007 Projections for Cultus Lake and Sakinaw Lake sockeye

- The table shows, for both populations, the brood year escapement (parent generation), the estimated numbers of smolts (offspring) migrating to the ocean, and the subsequent forecasted returns of adults from them.

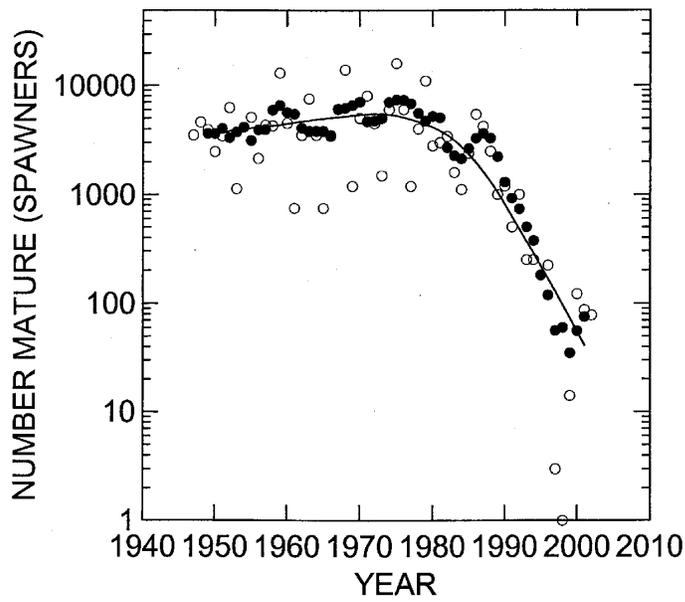
| Return Year | Brood Year | Cultus* | | | Sakinaw | | |
|--|------------|-----------------------|----------|------------------|-----------------------|----------|------------------|
| | | Brood Year Escapement | Smolts** | Forecast Returns | Brood Year Escapement | Smolts** | Forecast Returns |
| 2004 | 2000 | 86 | 7,558 | 203-386 | 122 | 13,578 | 286-525 |
| 2005 | 2001 | 253 | 14,426 | 536-903 | 87 | 12,414 | 356-777 |
| 2006 | 2002 | 4,242 | 100-250K | 11,031 - 20,001 | 44 | 3,591 | 103-225 |
| 2007 | 2003 | 1,485 | 76,752 | 3.7-7.6K | 3 | <336 | <21 |
| Max | | - | - | 283,162 | - | - | 30,000 |
| Avg | | - | - | 42,766 | - | - | 9,457 |
| Period | | - | - | 1952-2003 | - | - | 1970-1982 |
| *Cultus fence counts were multiplied by pre-spawn mortality to give effective spawning escapement. | | | | | | | |
| **Cultus forecasts for 2004, 2005, 2006 and 2007 include the contribution from hatchery smolts. Sakinaw forecasts for 2004, 2005 and 2006 include the contribution from hatchery smolts. | | | | | | | |

Appendix

Status: Sakinaw Lake sockeye

- Sakinaw Lake is the largest lake on the Sechelt Peninsula in Georgia Strait. (see map on page 3)
- From 1947 (when records began) to 1987, the average, annual escapement to the lake was 4800 sockeye - annual run-sizes 10,000-24,000.
- From 1987 to 2003 abundance declined dramatically. Declines were due to over harvesting in fisheries, degraded freshwater habitat and poorer ocean conditions. Sakinaw Lake sockeye is one of a group of small inside sockeye populations with low abundance.
- Between 1999 and 2002 average escapement was fewer than 80 adults, in 2003, only 3. In 2004, 286-525 sockeye are expected to return to the lake. In 2005, 400-600 are expected to return.

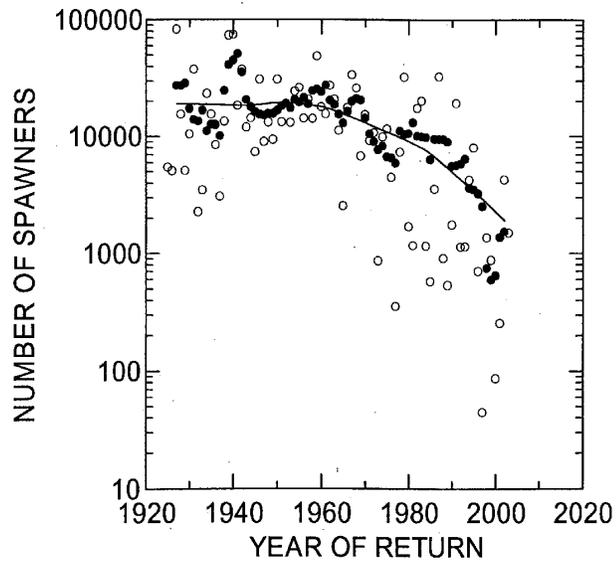
Trends in number of mature individuals in the Sakinaw Lake sockeye salmon population. Open circles are annual estimates of spawning escapement; filled circles are the corresponding estimates smoothed over one-generation (4 yr)



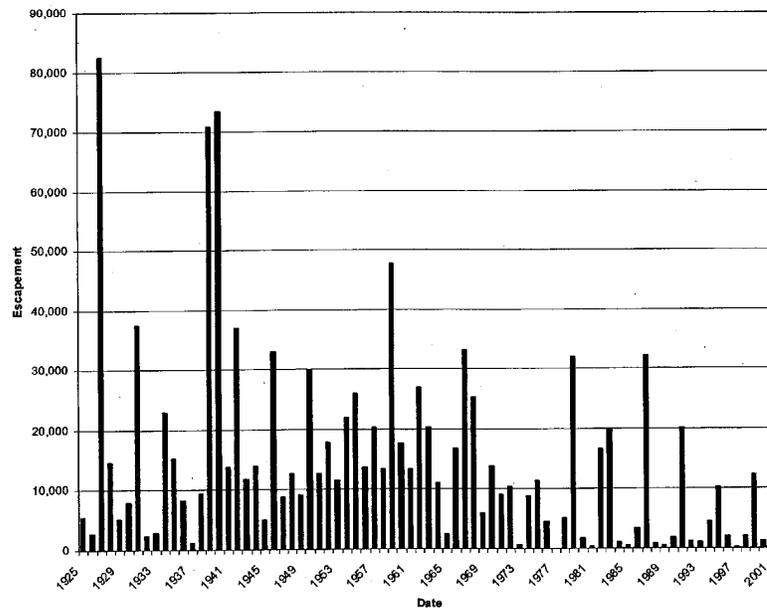
Status: Cultus Lake sockeye

- Cultus Lake is located in the eastern Fraser Valley of the Fraser River watershed, close to the U.S. border, about 112 km upstream from the Strait of Georgia (see map on page 12).
- One of 25-30 distinct lake populations of Fraser River watershed sockeye – historically, one of the medium-sized populations within this group. The largest 20% of Fraser River watershed sockeye populations can have run-sizes during high return years of well over 1,000,000 sockeye. On high years, Cultus Lake had run-sizes of over 150,000 sockeye.
- Between 1925 and the late 1960s, escapements to the lake were generally strong but variable, averaging 20,000 per year - annual run-sizes averaged 43,000 with a high over 200,000.
- Since the late 1960s abundance has declined. Beginning in the 1990s abundance dropped dramatically due to a combination of poor marine survival (El Nino effects), over-exploitation in fisheries and sharp increases in the level of prespawning mortality (PSM) in freshwater (PSM has decreased the last couple of years but still a concern).
- Over the last 12 years there has been a 92% decline in effective spawners.
- In 2003, less than 2000 sockeye returned to the lake. In 2004, approximately 203-386 adults are expected to return to Cultus Lake. In 2005, 800-1000 are expected to return.

Trend in the number of mature individuals in the CULTUS SOCKEYE salmon population. Open circles are annual estimates of spawning escapement; filled circles are the corresponding estimates averaged over one-generation (4 yr)



Annual escapements of Cultus sockeye adults, 1925 to 2001



Total annual escapement by cycle for Cultus Lake sockeye, 1925-2001

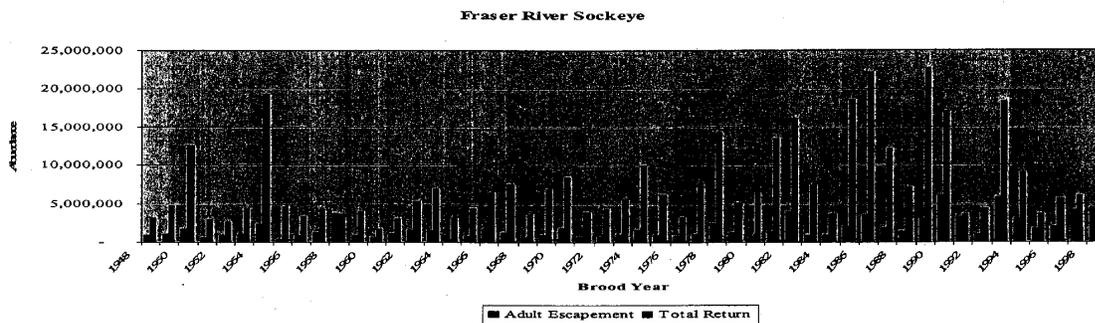
| 1998 Subdominant Cycle | | 1999 Dominant Cycle | | 2000 Off Cycle | | 2001 Off Cycle | |
|------------------------|------------|---------------------|------------|----------------|------------|----------------|------------|
| Year | Escapement | Year | Escapement | Year | Escapement | Year | Escapement |
| 1926 | 2,622 | 1927 | 82,426 | 1928 | 14,661 | 1925 | 5,423 |
| 1930 | 7,946 | 1931 | 37,473 | 1932 | 2,231 | 1929 | 5,084 |
| 1934 | 22,940 | 1935 | 15,339 | 1936 | 8,322 | 1933 | 2,864 |
| 1938 | 9,434 | 1939 | 70,789 | 1940 | 73,536 | 1937 | 1,227 |
| 1942 | 36,959 | 1943 | 11,822 | 1944 | 14,002 | 1941 | 13,950 |
| 1946 | 33,068 | 1947 | 8,699 | 1948 | 12,746 | 1945 | 5,030 |
| 1950 | 29,928 | 1951 | 12,677 | 1952 | 17,833 | 1949 | 9,055 |
| 1954 | 22,036 | 1955 | 25,922 | 1956 | 13,718 | 1953 | 11,543 |
| 1958 | 13,324 | 1959 | 47,779 | 1960 | 17,640 | 1957 | 20,375 |
| 1962 | 26,997 | 1963 | 20,303 | 1964 | 11,067 | 1961 | 13,396 |
| 1966 | 16,919 | 1967 | 33,198 | 1968 | 25,314 | 1965 | 2,455 |
| 1970 | 13,941 | 1971 | 9,128 | 1972 | 10,366 | 1969 | 5,942 |
| 1974 | 8,984 | 1975 | 11,349 | 1976 | 4,435 | 1973 | 641 |
| 1978 | 5,076 | 1979 | 32,031 | 1980 | 1,657 | 1977 | 82 |
| 1982 | 16,725 | 1983 | 19,944 | 1984 | 994 | 1981 | 256 |
| 1986 | 3,256 | 1987 | 32,184 | 1988 | 861 | 1985 | 424 |
| 1990 | 1,860 | 1991 | 20,157 | 1992 | 1,203 | 1989 | 418 |
| 1994 | 4,399 | 1995 | 10,316 | 1996 | 2,022 | 1993 | 1,063 |
| 1998 | 1,959 | 1999 | 12,392 | 2000 | 1,227 | 1997 | 88 |
| | | | | | | 2001 | 515 |
| Average | | Average | | Average | | Average | |
| 1926-1938 | 10,736 | 1927-1939 | 51,507 | 1928-1936 | 8,405 | 1925-1937 | 3,650 |
| 1942-1966 | 25,604 | 1943-1967 | 22,914 | 1940-1968 | 23,232 | 1941-1969 | 10,218 |
| 1970-1986 | 9,596 | 1971-1987 | 20,927 | 1972-1988 | 3,663 | 1973-1989 | 364 |
| 1990-1998 | 2,739 | 1991-1999 | 14,288 | 1992-2000 | 1,484 | 1993-2001 | 555 |
| All years | 14,651 | All years | 27,049 | All years | 12,307 | All years | 4,992 |

2004 Fisheries Management Options for Sakinaw and Cultus Sockeye

| OPTIONS | FISHERY SCENARIO & BIOLOGICAL RISK | SAKINAW | | CULTUS | | PROJECTED FSC CATCH | PROJECTED CDN COMMERCIAL |
|---|--|--|--------------------------------------|--|--------------------------------------|---------------------|--------------------------|
| | | ANTICIPATED SPAWNERS @ forecast abundance of 286 to 525 fish | PROB. OF ACHIEVING SPAWNER OBJECTIVE | ANTICIPATED SPAWNERS @ forecast abundance of 203 to 386 fish | PROB. OF ACHIEVING SPAWNER OBJECTIVE | | |
| Base: Manage to achieve Fraser R. sockeye aggregate escapement goals (status quo) - ER =30-40% | - Target fisheries in southern B.C. to achieve Fraser River spawning objectives; ER=30-40; PSM =10% in Sakinaw and 30% in Cultus - Adoption of this option results in substantial prob. that spawning populations lower than quasi-extinction levels (<100). | 154-331 | N/A | 85-189 | N/A | 950,000 | 410,000 |
| Option 1: Manage to achieve at least 500 spawners - MOST RESTRICTIVE - ER ≤5% | - No directed commercial fishery for Fraser sockeye & extensive closures for First Nations; recreational sockeye non-retention; ER=2% - Adoption of this option results in substantial prob. that spawning populations lower than interim MVP recovery target of 500. | 251-461 | 22% | 139-263 | 5% | 300,000 | - |
| Option 2: Manage to achieve 250 spawners - MORE RESTRICTIVE - ER 10-12% | Limited commercial & First Nation fisheries within 1-2 week period; only commercial gear operating in Queen Charlotte/Johnstone St are gillnet, marine recreational fishery retention once First Nation FSC fisheries commence and until they are closed; Fraser River recreational same as marine; ER=10%; PSM =10% in Sakinaw and 30% in Cultus | 232-425 | 70% | 128-246 | 40% | 700-800,000 | 100-130,000 |
| Option 3: Manage to achieve 100 spawners (quasi-extinction) or more with a high probability - RESTRICTIVE - ER 15-20% | - Limited commercial & First Nation fisheries within 2-3 week period; marine recreational fishery retention once First Nation FSC fisheries commence and until they are closed; Fraser River recreational same as marine; ER=15-20%; PSM =10% in Sakinaw and 30% in Cultus - Adoption of this option results in a high prob. (>90%) that spawning populations of quasi-extinction levels of 100 spawners or more will be met. | 212-390 | 97% | 117-223 | 93% | 950,000 | 320,000 |

| | 75% | 50% | 25% |
|------------|-----|-----|-----|
| Population | | | |
| Cultus | 203 | 281 | 386 |
| Sakinaw | 286 | 390 | 525 |

Graph and data to illustrate cyclic dominance and the relative differences between cycle years for Fraser River sockeye



- Fraser Sockeye cycle line average returns :

1996, 2000, 2004 (2008) --- 3,900,000
 1995, 1999, 2003 (2007)---- 5,600,000
 1994, 1998, 2002 (2006) ---12,000,000
 1993, 1997, 2001 (2005) --- 9,500,000

- Thus, 2004 is the lowest of the four cycles and large returns can be expected in 2005 and 2006.

Timing of Cod

- January 15, 2004 - Receipt of COSEWIC Status Report for four (4) Atlantic cod populations:
 - Newfoundland and Labrador – Endangered
 - Laurentian North – Threatened
 - Maritimes Population – Special Concern
 - Arctic Population – Special Concern
- April 15, 2004 - Response statements to listing are required. Atlantic cod is to be considered species that require “extended process” for consultation and decision.
- January 2005 - MOE transmits assessments to GIC.
- October 2005 - GIC decision on listing for Atlantic cod stocks.
- Other issues (not related to listing)
 - Late April 2004 - Minister will receive advice from the FRCC on Gulf cod stocks for the 2004/2005 fishing season.
 - Fall of 2004 - Federal-Provincial working groups to provide recovery strategy reports.

SAKINAW LAKE



MECTS

Cultus Lake



MECTS

DAM AND FISHWAY



MECTS

Pool immediately below the dam looking towards Georgia Strait (water flow reduced to permit construction of pools to improve water flow and salmon access. Minimum 1000 lpm and 14 foot tides required for salmon to use fishway).



Sakmaw Lake Dam Plunge Pool at a 13 Foot High Tide @ 200 lps.

DAM AT ENTRANCE SAKINAW LAKE (Photo during winter months of fresh water flowing from the lake into the Strait of Georgia. During low water periods, water only flows through the fish way. During these times, salmon must bypass the dam via the fish way.)



MECTS