Cowichan Salmon overview for Cowichan Watershed Board, July 7, 2011

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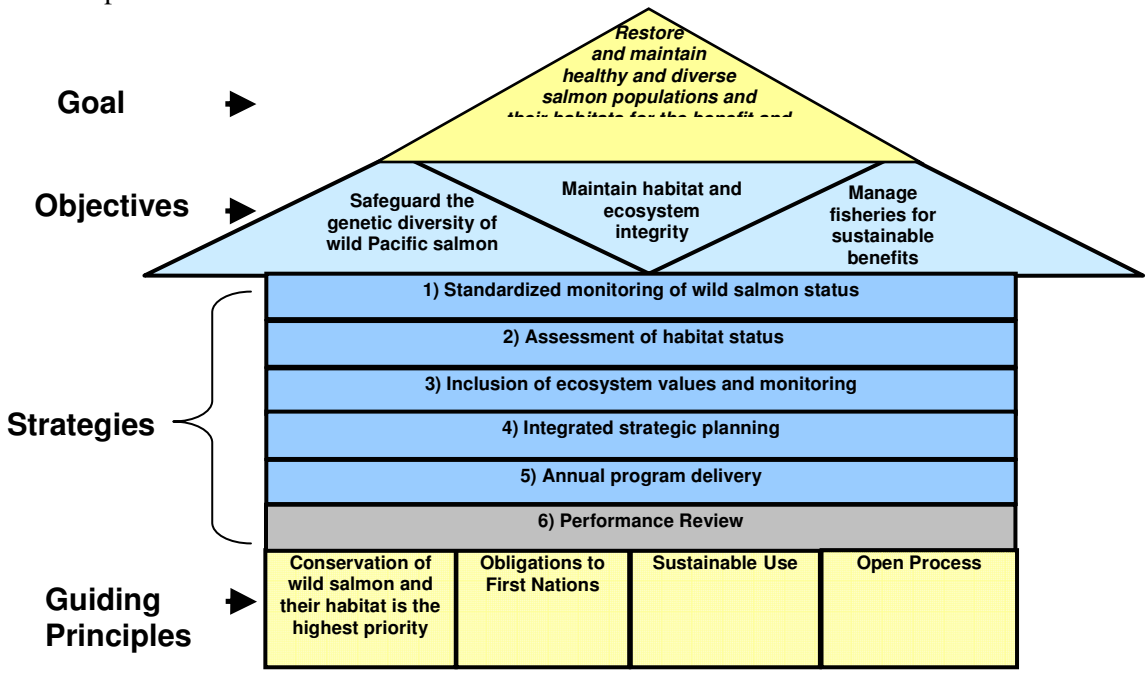
OVER-ARCHING CONTEXT, WILD SALMON POLICY.

1. DFO policy framework. DFO management of salmon is supposed to be guided by the Wild Salmon Policy (WSP). This policy has 3 main objectives.
    a. Conserve and protect the genetic diversity of wild Pacific salmon;
    b. Support ecosystem and habitat integrity;
    c. Manage sustainable fisheries.

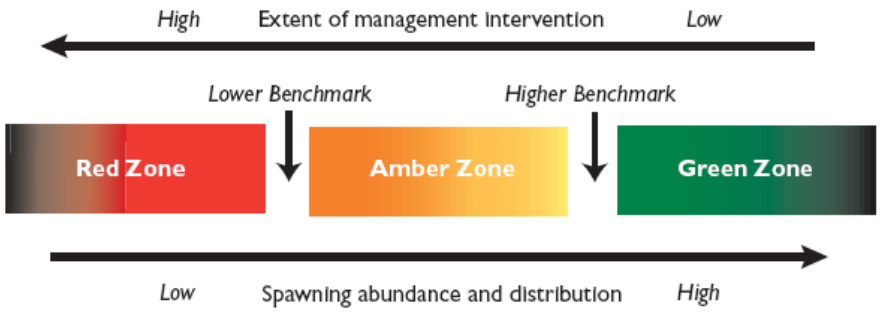
    The components of the WSP include:



2. The unit of salmon we are working at in the WSP is called a Conservation Unit (CU defines stock as a distinct group of populations). For salmon originating from the Cowichan the applicable CUs include:

    - fall run chinook: the Cowichan & Koksilah CU is distinct. This CU is also an indicator for the Georgia Strait Fall wild and small hatchery management unit (5 CUs) and the east coast Vancouver Island falls (3CU).
    - spring run chinook: no CU at this time
    - pink: part of east coast Vancouver Island CU
    - chum: part of Strait of Georgia CU
    - coho: part of east coast Vancouver Island CU

3. The general strategy behind WSP is that as stock status (spawner abundance and distribution) declines the level of intervention increases, as shown in the WSP diagram below. The lower benchmark is important since it informs planning and implementation of 'intervention' decision rules to keep the CU from approaching levels where the Species at Risk Act affects management of the stock and habitat.



4. The 'interventions' are included in management plans for the stock, the relevant fisheries, and the habitat they require. To this end, implementation of the WSP is through a comprehensive and integrated planning process, addressing limiting factors in the freshwater and marine environments. In the pilots, such as Cowichan, DFO is supporting the development of [local] "Strategic Plans" affecting wild salmon.

   Because of the advanced governance and community involvement in the Cowichan and the concern for Cowichan chinook, this area has been chosen as one of the pilots to test development and implementation of this process. At this time the following process is proposed:

Phase 1. Provide background and analytical support, set vision and targets, assess stock and habitat status, identify factors limiting stock from reaching potential target, and assess risk associated with each of these limiting factors.

Report to Cowichan Round Table fall 2011. Move to CWB for review and acceptance.

Phase 2. Use the information from phase 1 to focus on highest risk factors and issues, develop more detailed understanding, identify options to address limiting factors, evaluate the options, develop recommendations and a plan.

Develop options and plans in fall – winter 2011-12. Move to CWB for review, input, and approvals.

Phase 3. Linkage to appropriate jurisdiction, influence, implement, monitor, re-assess and feed back into process.

DFO implements fishery plans, enhancement plans, restoration plans. Other agencies and community implement as appropriate and able.

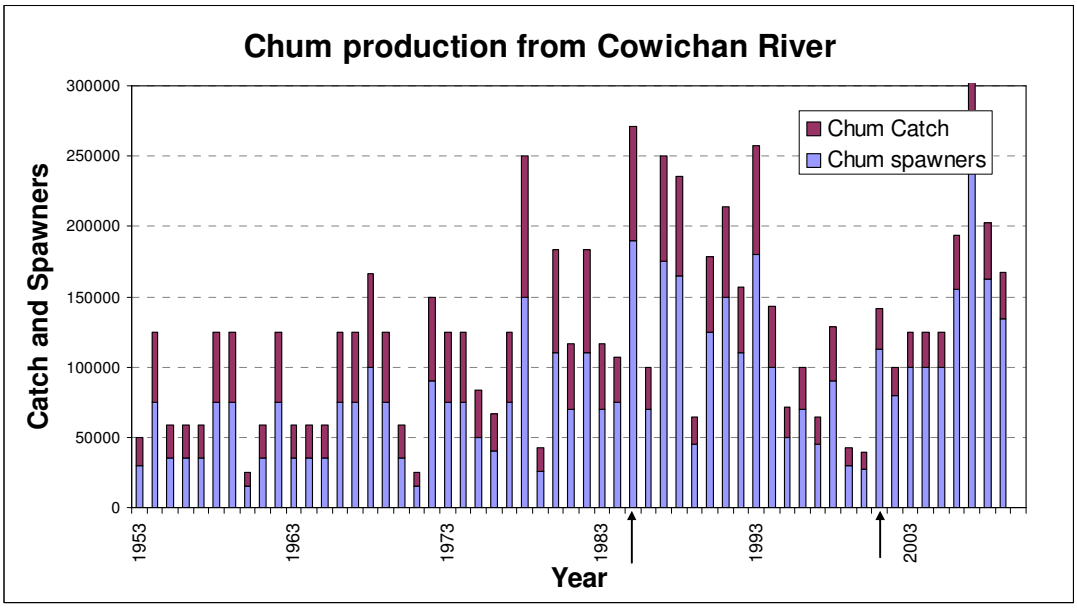
One key note: the DFO role and mandate is limited. Our expertise is focused. Successful implementation requires support and buy-in from other levels of government, from NGOs, from the community. For example, adequate water flows in rivers will likely be a key factor for each population. Water use, water management is more in the provincial jurisdiction and local management realm.

5. Also note that the process for planning, management, and rebuilding of Cowichan chinook is part of a broader process for coordinated management of southern BC chinook (see Appendix A for what Conservation Units are tentatively included).

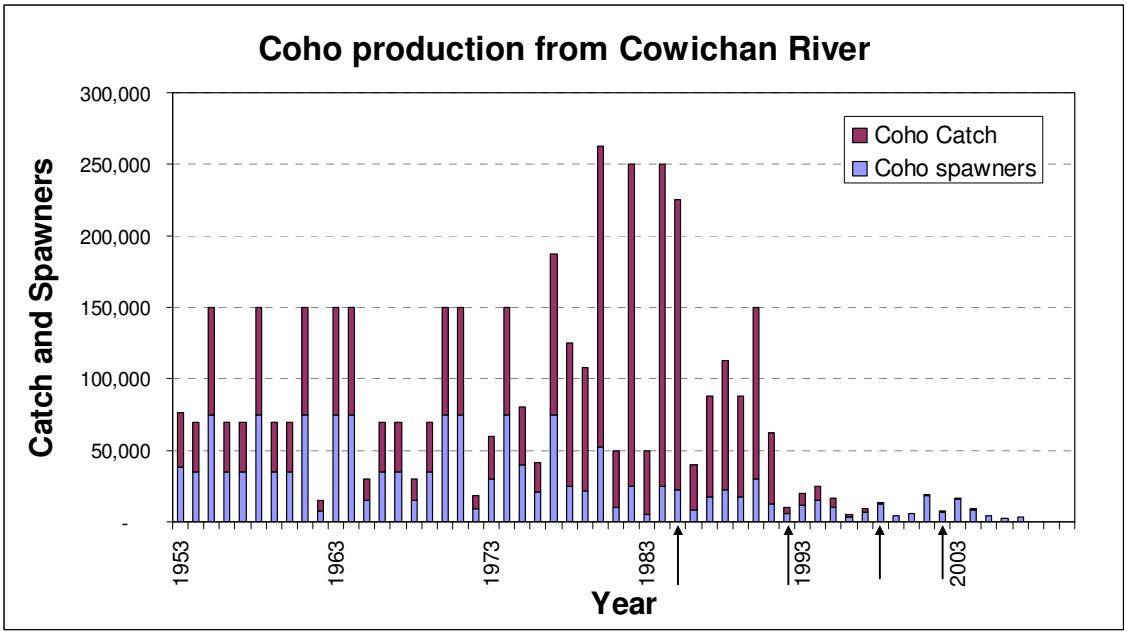
OVERVIEW OF COWICHAN SALMON AND MANAGEMENT

6. The status of the 3 main species, including chum, coho, and chinook based on natural spawners is presented in the following time series plots. The most recent status determination from the DFO stock outlook for 2011 is also presented.

   a. Cowichan chum population: large contributor to the Strait of Georgia chum CU
      - Life history is limited in freshwater. Chum spawn in lower reaches late in October, November. Fry migrate passively out to sea soon after emergence. Return in 3-5 years. Essential habitat is lower river spawning area, clean gravel, clean water for incubation of eggs, limited gravel / bed movement.
      - 2011 outlook is category 3 Near Target.
      - Significant fishery management milestones: 1983 Abundance based management in Johnstone Strait fisheries reduced harvest from over 40% to under 30% on average, 2001 fixed effort fisheries in Johnstone Strait limit harvest to 20%.
      - Cowichan River chum production (modelled catch based on average exploitation) is presented below. The spawner goal is 100,000.

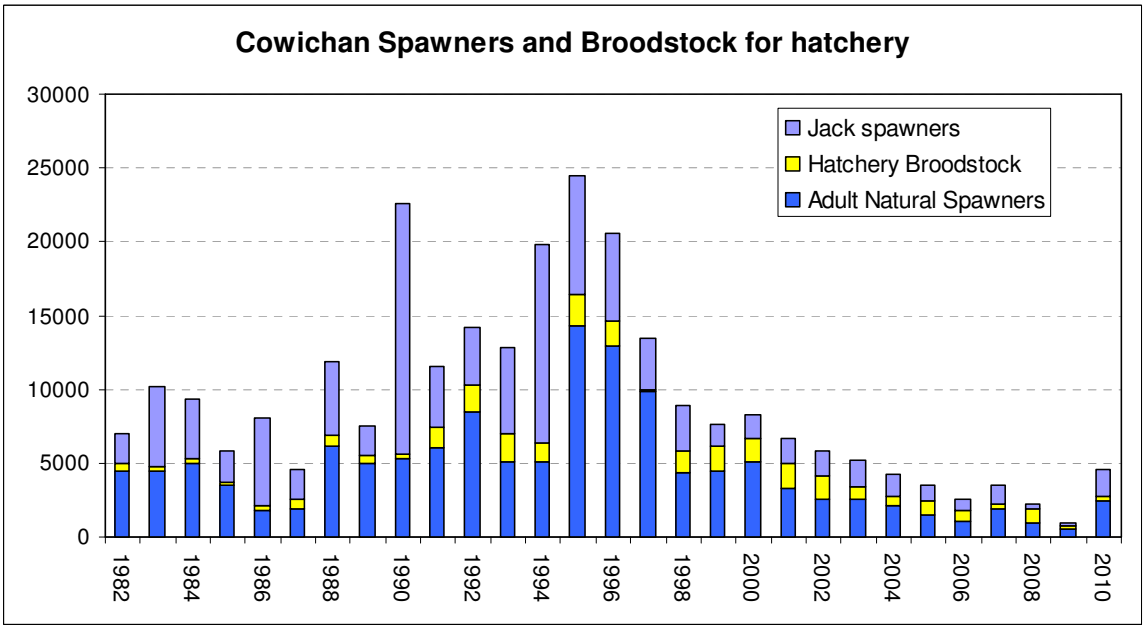


   b. Coho. Part of the east coast Vancouver Island coho CU.
      - Life history includes extensive use of freshwater habitat, spending about half their life in freshwater (including spawning, incubation, rearing through 1.5 years), mainly southern BC marine distribution, returning mostly at age 3.
      - 2011 outlook is category 2 LOW. Low marine survival continues to be a significant limiting factor.
      - Significant fishery management milestones: 1985 Pacific Salmon Treaty, 1992 Coho Initiative, 1998 complete shutdown of wild coho retention in southern BC commercial and recreational marine fisheries, and 2002 PST Southern Coho Plan limits ocean exploitation to much lower levels.
      - Total coho production is presented below and is likely an underestimate since spawners is an index value only, not a total number. Catch is modelled based on average exploitation through specified periods. In 2010 there was no assessment of coho.

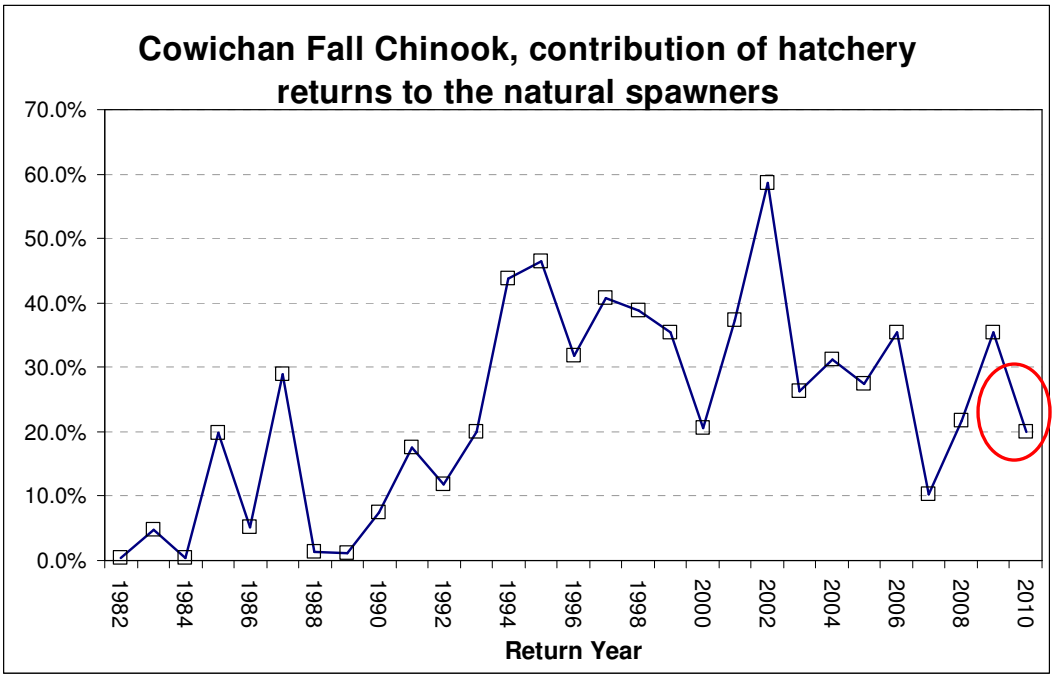


c. Chinook. Along with Koksilah the Cowichan fall chinook are a separate CU.

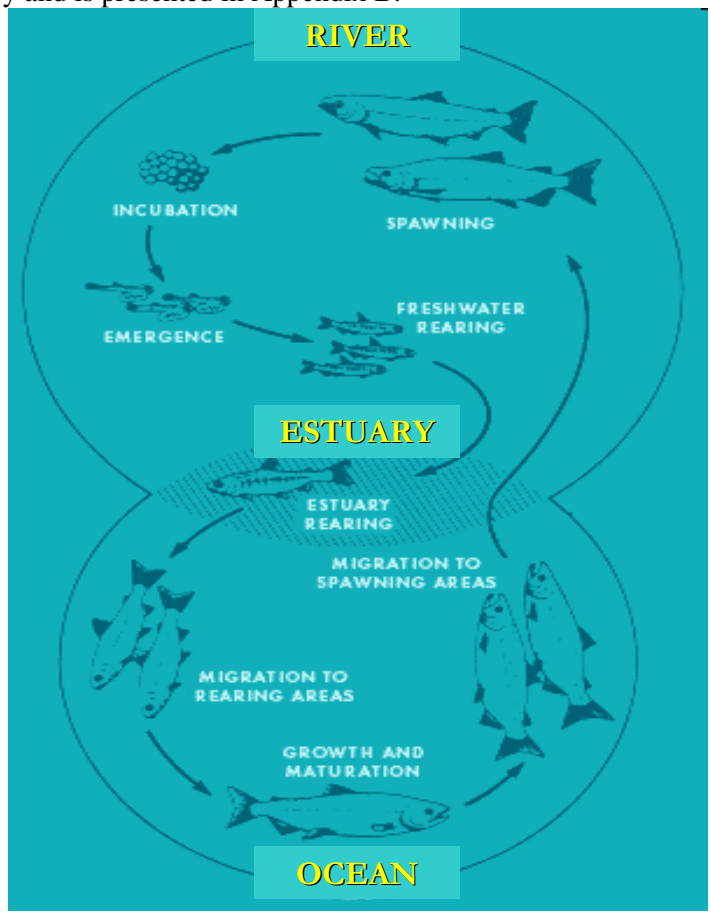
- Life history is often called '90 day wonders' in recognition of their dependence on the river. Spawning occurs in the upper river mainstem. Gradually the chinook migrate downstream. At the 2009 Cowichan Estuary Workshop US scientist Greg Rugerone presented work from Alaska showing the importance of the lower river rearing, estuary rearing, and early near shore marine in determining the overall survival to adult.
- After 2-5 years at sea adult chinook return to spawn in September to October, a period of frequent low water flow and high water temperature.
- The 2011 outlook is category 2, LOW. Spawner goal is 6500 chinook.



- The fall chinook are enhanced through the Cowichan Hatchery. Despite significant releases from the hatchery, the production from natural spawners dominates the run. Hatchery contribution to spawning is about 30% on average.



- Since about 2002 Cowichan chinook have been identified as stocks of concern. A preliminary list of issues and limiting factors affecting this stock was developed by evaluating factors affecting each stage of life history and is presented in Appendix B.



- The importance of the freshwater component of the life history of salmon should be recognized. At each stage many fish are lost to natural mortality. Reducing this mortality at an earlier life stage has greater benefit than at a later life stage. The effect of this level of mortality at each stage is shown below.

Base scenario	**Chinook**	**Mortality**
In River migrants	5,500	9%
Spawners	5,000	
Eggs laid	10,000,000	85%
Smolts leaving river	1,500,000	99%
Adults produced	15,000	
Caught in ocean	9,750	65%
Return to river	**5,250**	
Scenario 1. reduce harvest to make goal		
In River migrants	5,500	9%
Spawners	5,000	
Eggs laid	10,000,000	85%
Smolts leaving river	1,500,000	99%
Adults produced	15,000	
Caught in ocean	7,500	50%
Return to river	**7,500**	
Scenario 2. Improve egg to fry survival by 10%		
In River migrants	5,500	9%
Spawners	5,000	
Eggs laid	10,000,000	77%
Smolts leaving river	2,300,000	99%
Adults produced	23,000	
Caught in ocean	14,950	65%
Return to river	**8,050**	
Scenario 3. Improve condition and number of smolts		
In River migrants	5,500	9%
Spawners	5,000	
Eggs laid	10,000,000	85%
Smolts leaving river	1,500,000	98%
Adults produced	30,000	
Caught in ocean	19,500	65%
Return to river	**10,500**	

- With this in mind, a comprehensive approach was initiated distributing rebuilding effort among the 3 H's of Harvest, Hatchery, and Habitat/Ecosystem. The interim objective was to increase returns to river by 30%. The highest risk factors and actions taken are described in Appendix B. To summarize these included:

Improved Hatchery:

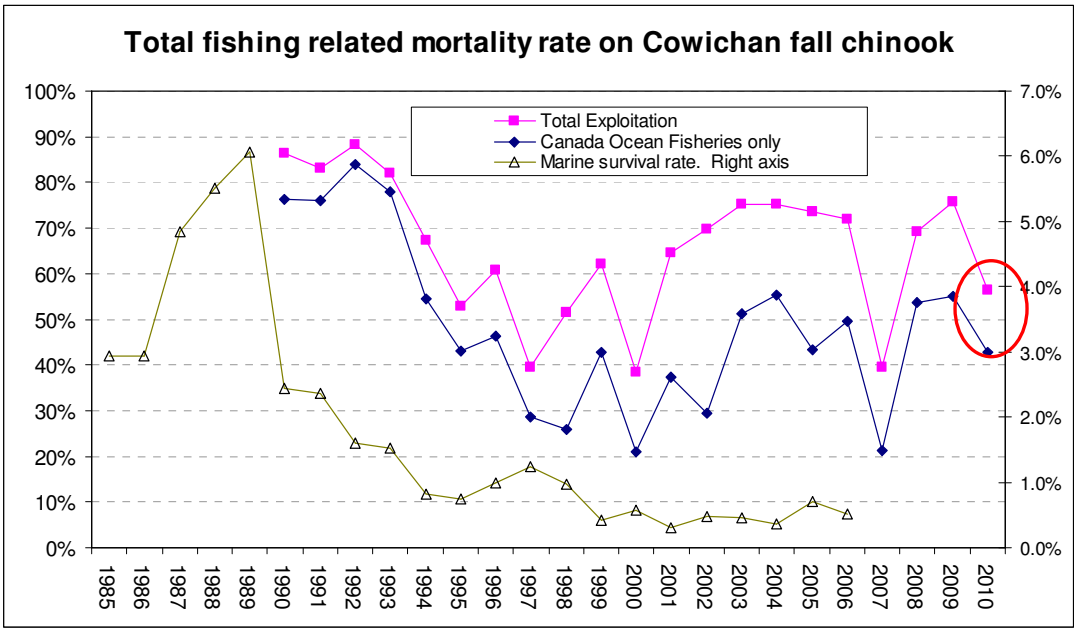
- Hatchery: Some experimentation, but mainly improvements in hatchery infrastructure, visioning / strategic planning process underway.

Improved Habitat:

- Stoltz bluff remediation improved mid to lower rearing, increased spawning area
- Spawning area gravel was replenished likely increasing egg to fry survival
- Increased rearing area through mid river side channel improvements andlower river side channel development
- Improved estuary habitat through eel grass restoration

Reduced Harvest:

- commercial troll fishery off the WCVI cut by 50%
- Cowichan Tribes voluntary reduction of inriver fishery



- Could the dramatic increase in return in 2010 be a result of these efforts? In my opinion… DEFINITELY. Lesson… improved health of the watershed has resulted in improved health of chinook smolts leaving the river. Coupled with improved marine conditions there is some optimism in the outlook for returns in 2011 and beyond.

NEXT STEPS

a. Short term efforts. There are many initiatives and projects planned or underway which will improve ecosystem health and so health of salmon originating from the Cowichan Watershed. A few examples are:

- Hatchery vision and strategic planning.
- Monitor fisheries and exploitation level.
- Implementation of Water Plan and development of other plans such as flood management, estuary management, etc..
- Near shore kelp reforestation and other habitat restorations.
- Research regarding seal predation; growth, distribution, and survival in the lower river, estuary, and near shore marine; climate change effects on salmon; etc..

b. Longer term efforts

- Fall 2011. Phase 1 stock and habitat assessment report completed and approved by Cowichan Stewardship and Fishery round tables, and brought to Cowichan Watershed Board for review and approval.
- Fall 2011-Spring 2012. Phase 2 uses the assessment report as the basis for developing options for addressing limiting factors, implementing an ongoing assessment and monitoring framework, etc.. The result is a strategic plan for the stock and watershed in relation to chinook rebuilding.
- Development of a southern BC chinook management framework, building on the comprehensive approach used in the Cowichan.
- Continued development local governance and leadership in stock and habitat management.

Appendix A. 2011 outlook for southern BC chinook management units and corresponding Wild Salmon Policy Conservation Units.

Southern BC chinook management units as reported in DFO Outlook for Salmon Returns in 2011
Outlook categories include 1: concern, 2: low abundance, 3: near target, 4: abundant

Outlook Management Unit / Group Name	2011 outlook	Conservation Unit full name
Late summer – South Thompson	4	CK::Shuswap River-summer timing-age 0.3
		CK::South Thompson-Bessette Creek
		CK::South Thompson-summer timing-age 0.3
		CK::South Thompson-summer timing-age 1.3
Spring – lower Thompson	1	CK::Lower Thompson-spring timing-age 1.2
Spring – upper & mid-Fraser, North Thompson	1	CK::Middle Fraser River-spring timing
		CK::North Thompson-spring timing-age 1.3
Summer – lower Fraser	2	CK::Lower Fraser River-summer timing
		CK::Maria Slough
Summer – upper & mid-Fraser, North Thompson	1	CK::Middle Fraser River-summer timing
		CK::North Thompson-summer timing-age 1.3
not assigned		CK::Fraser Canyon-Nahatlatch
		CK::Middle Fraser River-Portage
Early spring – lower Fraser	2	CK::Lower Fraser River-spring timing
		CK::Lower Fraser River-Upper Pitt
Fall – lower Fraser natural	3	CK::Lower Fraser River-fall timing (white)
Georgia Strait Fall (large hatchery operations)	2	CK::East Vancouver Island-Qualicum & Puntledge-fall timing
Georgia Strait Fall (wild and small hatchery operations)	1	CK::Boundary Bay
		CK::East Vancouver Island-Cowichan & Koksilah
		CK::East Vancouver Island-Goldstream
		CK::East Vancouver Island-Nanaimo & Chemainus-fall timing
		CK::South Coast-Georgia Strait
Georgia Strait Spring and Summer	2	CK::East Vancouver Island-Nanaimo-spring timing
		CK::East Vancouver Island-Nanaimo-summer timing
		CK::East Vancouver Island-Puntledge-summer timing
Johnstone Strait area including mainland inlets	3	CK::Homathko
		CK::Klinaklini
		CK::Northeast Vancouver Island
		CK::South Coast-southern fjords
WCVI-wild	1	CK::Nootka & Kyuquot
		CK::Northwest Vancouver Island
		CK::Port San Juan
		CK::Southwest Vancouver Island
WCVI - hatchery	3	not assigned

Appendix B. 2007 list of Cowichan River chinook limiting factors and actions to address these. Red circles show the highest priority.

Issue or Limiting Factor in salmon life history	Potential Causal Factors	RISK to salmon 1. Impact 2. Likelihood	Responsibility Center Primary / Secondary	Actions Taken or Planned
HARVEST				
a. Commercial Marine fisheries	- Increased incidence of Cowichan chinook in the WCVI fishery, but lots of variation from year to year, so hard to deliver specific actions. No clear direction on allowable ER in mixed stock fisheries.	1. High 2. High	DFO and Area G Comm	50% reduction in allowable catch in WCVI troll fishery as part of 2008 Pacific Salmon Treaty.
b. Recreational Marine fisheries	- Increased incidence of Cowichan chinook in the WCVI fishery, but lots of variation from year to year, so hard to deliver specific actions. No clear direction on allowable ER in mixed stock fisheries. Priority access to chinook.	1. High 2. High	DFO and SFAB	Closure of Gulf Islands area to chinook fishing from August 1 through October to protect local mature chinook returning to spawn.
c. First Nations fisheries	- food fisheries have constitutional priority and are important to Cowichan Tribes. Part of issue is that this fishery is at the end of the gauntlet of fisheries.	1. Low 2. High	DFO and Cowichan Tribes	Reduced effort and catch
d. In river poaching	- thought to be minor issue in Cowichan,	1. Mod 2. Low	DFO / Community	Education and Enforcement increased.
e. Bycatch in non-salmon fisheries	- bycatch in ground fish trawl fisheries is generally low but in some years is significant.	1. Low 2. Mod	DFO / Fishery stakeholders	Improved monitoring. E.g. commercial logbooks mandatory reporting plus offload validation for many fisheries.
HATCHERY				
f. Validity of hatchery vision and operational plan	- changes in the ecosystem, the need for succession planning at the hatchery, infrastructure issues, changing role of the hatchery, etc.	1. High 2. High	DFO and Cow Tribes / Community	Cowichan Tribes initiated process to redevelop long term strategic plan for Cowichan Hatchery, review operations, infrastructure, succession plan, etc.
g. Public perception about hatchery infrastructure	- lack of understanding			
h. Poor survival of smolts	- unknown causal factors, but begins with rearing success in lower river and estuary, complexity in foreshore areas, and conditions in GST. Climate change may be primary issue. There is a lack of understanding of the causal factors for early marine mortality.	1. High 2. High	DFO	Estuary beach seine, nearshore marine purse seine sampling, and Strait of Georgia trawl surveys showing that June – July period is likely the critical period determining survival. Hatchery experimentation is required.

HABITAT / ECOLOGICAL				
i. Stress during spawner migration and spawning	- variable and low water flows during upstream migration, lack of water due to climate change, extraction, groundwater hydrology, etc. - high water temperature, - fishway blockages, direct human disturbance	1. High 2. High	BC, CVRD, CWB, CSRT	Water management plan developed and CWB established for implementation.
j. Lack of spawning gravel	- lack of new gravel recruitment due to bank stabilization, type of bank, bed load movement during flood, etc. - fish cant get access to existing gravel due to sedimentation cementing existing gravel, knotweed, etc.	1. Med 2. Med	CSRT	Imported gravel into main spawning area in 2009.
k. Scouring substrate / redds by floods	- land use results in greater flow variation	1. High 2. High	CSRT? CVRD?	Better flood management distribute force
l. Smothering eggs by sedimentation	- natural erosion e.g. Stoltz, Block 51 - knotweed - land use e.g. sediment load from logging	1. High 2. High	CSRT and many partners	Bank stabilization and restoration in Stoltz has significantly reduced sedimentation in lower river. Egg to fry survival has increased greatly.
m. Fry stranding in side channels	- lack of water, including ground water hydrology, side channel morphology, operation of weir, etc.	1. Med 2. Med	CSRT, Cowichan Tribes, local community groups	Fry salvage operations continue as resources permit. The long term solution is to stabilize water flows in off channel habitat, improve access in and out.
n. Lack of rearing habitat in mainstem	- loss of riparian cover, reduced LWD, land use issues (forest-increase runoff, flood control and agriculture-dyking, development-impervious surface, etc)	1. High 2. High	CSRT, CVRD	Side channel developed.
o. Lack of rearing in lower river and estuary	- development reducing habitat, reduced complexity such as LWD, eel grass, booming of logs reducing vegetation, channelization, etc.	1. High 2. High	CSRT, CVRD	Side channel habitat developed through partnerships, especially MOT. Potential for significant increase in association with flood management planning initiative. Estuary management workshops held by Cowichan Tribes and DFO. Eelgrass restoration work ongoing. Monitoring programs by Cowichan Tribes and DFO.

p. Lack of rearing in nearshore marine	- loss of bull kelp forests and other nearshore complexity	1. High 2. High	CVRD, NGO	Pilot re-forestation of bull kelp in Cowichan Bay lead by Cowichan Tribes with Pacific Salmon Commission funding. Seagrass Society funded mapping of foreshore habitat and identification of sensitive areas, opportunities for restoration.
q. Predation on eggs	- existing fish such as trout or sculpin, birds, etc.	1. Med 2. Med	CSRT? CVRD?	
r. Predation on inriver rearing fry	-invasive species such as Brown trout may be having a significant effect on inriver rearing success	1. Med 2. Med	BC?	Discussions underway regarding developing studies on Brown trout predation
s. Seal predation on smolts	- unknown extent of this issue. Known to be high in some ECVI rivers. Likely have habituated seals in area.	1. Unk 2. Unk	?	
t. Seal predation on mature adults	- unknown extent of this issue, but seals observed in Bay and lower river up to fishway. Evidence of predation.	1. Unk 2. Unk	Research DFO Action ?	Research underway, including: UBC has two students working on impact of seals on chinook rebuilding in the Strait of Georgia. Cowichan is one study area. DFO also working in Puntledge area. Models being developed which evaluate the need to manage habituated seals in rebuilding salmon stocks.
u. Predation by southern resident Orcas.	- chinook known to be preferred food source and Cowichan chinook historically resided in GST and especially Lower GS in August-Sept.	1. Unk 2. Unk	Research DFO Action ?	Research underway at DFO. Chinook salmon have been identified as 'critical habitat' for southern residents.

Appendix C. Map of Cowichan River from Cowichan Lake to Cowichan Bay.

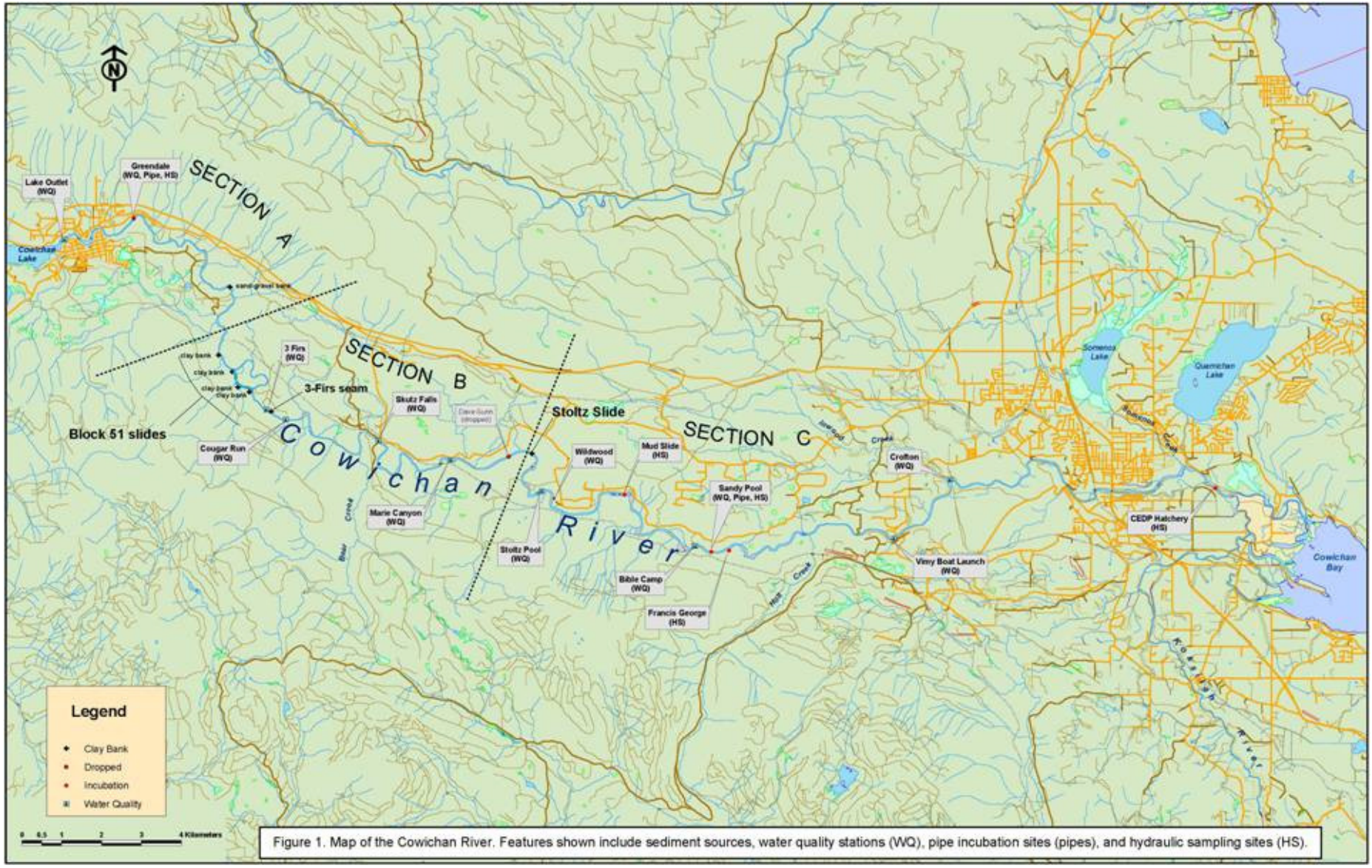


Figure 1. Map of the Cowichan River. Features shown include sediment sources, water quality stations (WQ), pipe incubation sites (pipes), and hydraulic sampling sites (HS).