

MEMO

To: FSMC TC

From: Dave Levy

Re: Summary of approaches for supporting Fraser Chinook rebuilding

Date: Dec. 5, 2023

This memo was prepared to support [Fraser Salmon Management Council's Science Advisory Team](#) for the [Chinook Recovery & Rebuilding Initiative](#). The intent is to build on this initial summary with input from partners and to promote collaboration in the work of rebuilding healthy Fraser Chinook populations.

The present memo is derived from 2 existing reports:

- 1) Labelle (2022). Context & Opportunities for Collaboration in Fraser Chinook Rebuilding: *A Summary of Key Programs, Processes & Initiatives* CRRRI Brief, V1 Fraser Salmon Management Council, Nov. 2022
- 2) Levy (2023). Review of Protection and Recovery Strategies for Pacific Salmon. Prepared for: Fisheries and Oceans Canada. [Pacific Salmon Strategy Initiative](#). Prepared by: [Levy Research Services Ltd.](#) July, 2023

The memo addresses the 9 topics listed below

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	LaBelle	Levy
Conservation and Biodiversity Protection	<ul style="list-style-type: none"> • Canada's Commitment to Protecting biodiversity • COSEWIC and SARA • Wild Salmon Policy • Fish Stocks Provisions & Limit Reference Point 	<ul style="list-style-type: none"> • Protection and Recovery Planning and Management • COSEWIC and SARA • Wild Salmon Policy • Salmon Sanctuaries, Strongholds and Parks
Planning Tools	<ul style="list-style-type: none"> • Recovery Potential Assessments • Risk Assessment Methodology for Salmon • Pacific Salmon Treaty 	<ul style="list-style-type: none"> • Recovery Potential Assessments • Risk Assessment Methodology for Salmon • Structured Decision Making • Priority Threat Management • Adaptive Management
Conservation and Production	<ul style="list-style-type: none"> • Salmon Enhancement Program • Pacific Salmon Strategy Initiative • Pacific Salmon Foundation 	<ul style="list-style-type: none"> • Salmon Enhancement Program • Pacific Salmon Strategy Initiative
Government Initiatives	<ul style="list-style-type: none"> • Southern BC Chinook Strategic Planning Initiative • Freshwater Fisheries Society of BC • Habitat Conservation Trust Fund/Foundation • Fish Habitat Management — DFO • Fish Habitat Management — BC • BC Ministry Roles in Fish Management 	
Indigenous Initiatives	Various	Various

Implementation of Conservation Actions and Recovery Programs

The two main avenues for salmon conservation in Canada are the Wild Salmon Policy and COSEWIC assessments. Despite operating since 2005, none of the red-zoned salmon CUs under the WSP have triggered a Recovery Program, a requirement of the WSP that is tied to the completion of WSP Strategy 4, Integrated Strategic Planning.

COSEWIC assessments have been undertaken for Fraser sockeye and Southern BC Chinook.

Table 1. COSEWIC status of salmon in B.C.

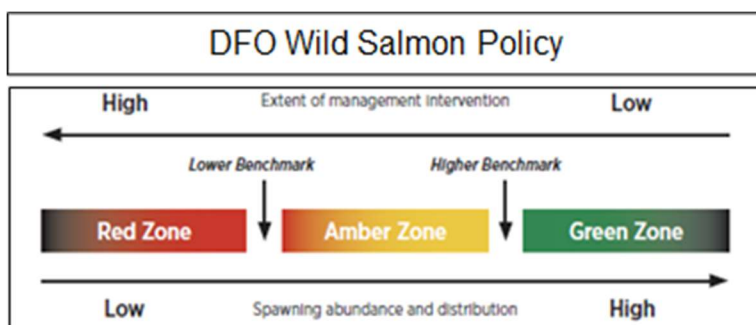
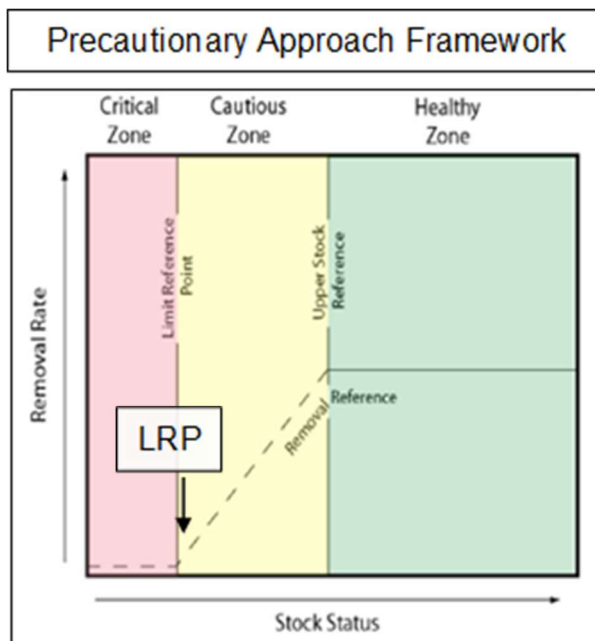
Species	Total Number of DUs	Endangered	Threatened	Special Concern	Not-at-risk	Data Deficient
Fraser River Sockeye	24	8	2	5	9	-
Southern BC Chinook	26	12	7	2		5
Okanagan Chinook	1	1				
Interior Fraser Coho	1	1				
Interior Fraser Steelhead	2	2				

Under COSEWIC, DU's that are Endangered and Threatened required consideration for listing under SARA. To date, not a single salmon DU has been listed due to the substantial socio-economic consequences and protection and conservation of these CUs and DUs is falling through the cracks.

Given that CU status and DU status have already been determined, the identified Chinook populations could be prioritized for rebuilding and political leaders could also challenge DFO to apply the law and implement rebuilding plans and to move forward with rehabilitation.

Fish Protection Provisions

DFO regulatory amendments to the 2019 revisions to the *Fisheries Act* set out requirements for the rebuilding of depressed fish stocks that are subject to harvesting and presently below their Limit Reference Point (LRP), as illustrated in the diagram below. This classification system is identical to the definition of a Lower Benchmark for classifying red-zoned Conservation Units (CUs) under the DFO Wild Salmon Policy.



The Regulatory Amendment reflects a Precautionary Approach and requires that if a stock declines below its' LRP, a rebuilding plan be prepared with the intent to grow the stock out of the critical zone. A guidance document has been prepared by DFO for developing recovery plans under a Precautionary Approach Framework and a document is prepared annually by ECCC to summarize the status of Canadian fish stocks.

Rebuilding plans include:

- A description of the stock status, stock trends and reasons for the stock's decline;
- Measurable objectives aimed at rebuilding the stock with timelines;
- Management measures aimed at achieving the objectives;
- A method to track progress to achieve the rebuilding plan's objectives; and,
- An approach to review the objectives and adjust them if the objectives are not being achieved.

It has been suggested that the DFO fish protection provisions could serve as a partial basis for rebuilding Chinook salmon stocks. The proposed list of major Batch 1 stocks for all of Canada is shown in the Table below; of these only 3 stocks involve salmon and it is unclear which salmon stocks were selected for Batches 2 and 3. In any event, the list of candidate Chinook stocks for rebuilding is 20 COSEWIC Endangered and Threatened DUs and the list of potentially

depressed Fraser Chinook stocks is shown in Table 1. The impression of the CRRl Team is there are many more Chinook stocks that require rebuilding than can be practically addressed under the Fish Stock regulatory provisions. There is also a strategic question as to whether rebuilding programs should be stock-specific or whether modest levels of rebuilding can be distributed between stocks (e.g. specific life history enhancements across multiple stocks) to achieve broader rebuilding benefits. Rebuilding activities also could be enhanced by setting strategic priorities for Chinook recovery.

Proposed list of major stocks for Batch 1	
Stock	Region with management lead
Bocaccio rockfish	Pacific
Chinook salmon: WCVI	Pacific
Herring: Haida Gwaii	Pacific
Yelloweye rockfish: inside population	Pacific
Yelloweye rockfish: outside population	Pacific
Okanagan chinook	Pacific
Pacific hake	Pacific
Sable fish	Pacific
Southern inside coho	Pacific
Mackerel: Atlantic (NAFO 3-4)	National capital region
Northern shrimp: SFA 6	National capital region
Cod: 4RS3Pn	Quebec
Gulf shrimp	Quebec
Lobster: Areas 19-20-21 (Gaspé)	Quebec
Herring: 4T (spring spawner)	Gulf
Snow crab: CFA 12 (12, 18, 25, 26), 12E, 12F, 19	Gulf
White hake: 4T	Gulf
Atlantic halibut: 3NOPs4VWX+5	Maritimes
Redfish: Unit 3	Maritimes
Sea scallop: inshore SFA 28 (Bay of Fundy)	Maritimes
Silver hake: 4VWX	Maritimes
Snow crab: Scotian Shelf (ENS-N)	Maritimes
Snow crab: Scotian Shelf (ENS-S)	Maritimes
Cod: northern (2J3KL)	Newfoundland and Labrador
Cod: Atlantic (3Ps)	Newfoundland and Labrador

Maximize the Efficiency of Existing SEP Facilities

There is a large body of information describing the benefits and pitfalls of salmon enhancement and it is important to distinguish whether enhancement activities target production enhancement or conservation enhancement. A [Salmon Enhancement Scoping Analysis in Northern BC](#) was undertaken to evaluate potential enhancement opportunities. Some of the main conclusions included:

- There is a lack of adequate funding for ongoing enhancement.
- Potential proponents are also impacted by a dearth of experienced staff in DFO and amongst other potential proponents.
- Lack of capacity is particularly an issue in remote coastal First Nations villages.
- Some existing DFO facilities have not been properly maintained and renewed and therefore serve as poor prospects for additional production.
- DFO has also lost significant capability to properly assess production benefits and costs to develop credible Benefit-Cost ratios for new or existing projects.

Most of the enhancement facilities in Northern BC were chronically underfunded and produced smaller numbers of salmon than they were designed for. Hatchery managers advised that additional salmon could be increased via appropriate operational funding and capital improvements. The analysis was undertaken 15 years ago, and it likely that enhancement capacity in Northern BC has further eroded over this period.

This can be viewed as an opportunity as physical restoration and properly funding of the facilities would serve as “low hanging fruit” in terms of additional salmon production, potentially obviating the need for new salmon hatcheries.

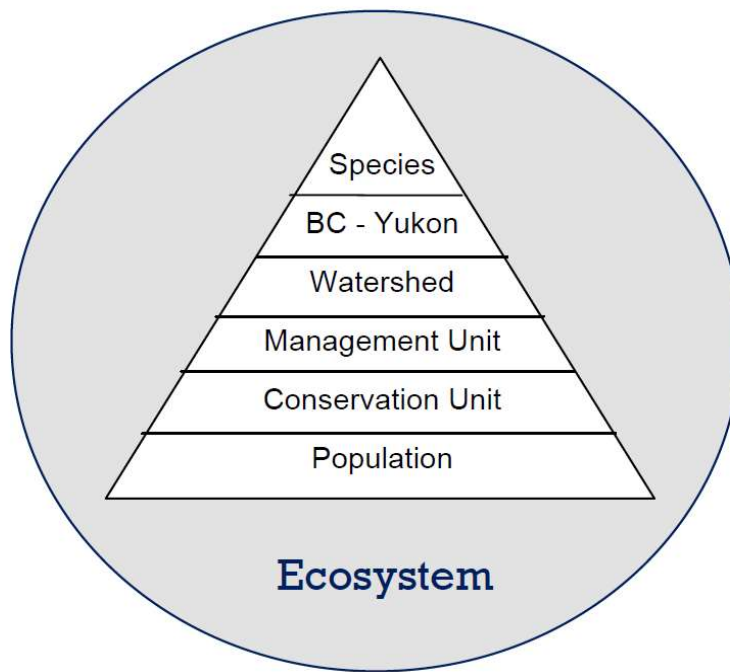
Integrated Strategic Planning

The Integrated Strategic Planning (ISP) component contemplated under the PSSI is similar to the ISP process that comprises Strategy 4 of the WSP. There may be efficiencies to combine these 2 processes and to use the experience obtained during implementation of Strategy 4 of the WSP to inform the PSSI analysis.

Scaling

Salmon protection and recovery requires geographical scaling to plan for activities and projects at different levels of analysis (there can be more than one) as reflected in the diagram below. Definition of PSSI planning units will require both regional analyses as well as project planning

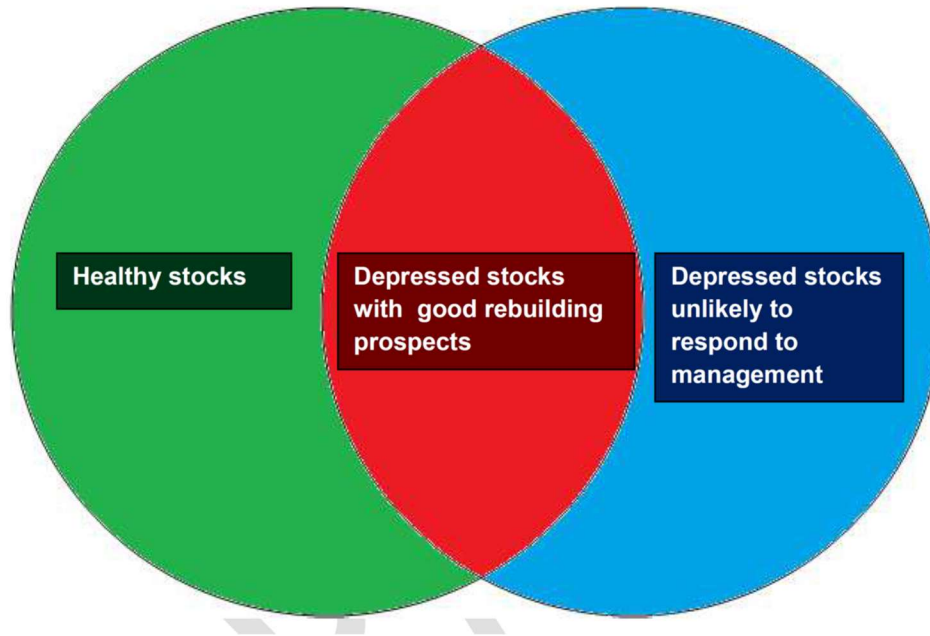
at the local scale. Various options for regional scaling of PSSI projects can be based on a watershed approach or political or administrative boundaries (a watershed approach is preferred from an ecological viewpoint). Local scale protection and recovery projects would then be nested within regional planning frameworks.



Triage

As reported in the Central Coast Priority Threat Management research, the investigators noted that resources are typically allocated to the most threatened populations or species e.g. Cultus Lake and Sakinaw Lake Sockeye Recovery Programs, or those of high public interest (e.g. Chinook salmon). Despite the legal and social reasons for prioritizing these diminished populations, they may have the lowest probabilities of recovery and may require the most expensive solutions compared to less threatened populations with higher recovery potential. If the goal is to increase the total number of healthy populations and their benefits to society, then focusing on the most threatened ones may be suboptimal.

The Salmon 2100 conference developed the Triage concept which can be depicted graphically using a Venn diagram (below).



Salmon stocks contemplated for protection and restoration include healthy stocks (green), depressed stocks unlikely to respond to management (blue) and depressed stocks with good rebuilding prospects (red).

The objective of restoration is to push depressed stocks into the healthy (green) zone where practical management interventions exist and where there is sufficient budget and technical expertise for implementation.

Salmon biologists in the U.S. argue that the current practice, driven by the Endangered Species Act (ESA), of focusing resources on restoring the most endangered populations –those suffering from the greatest threats – is a losing strategy. Unless conservation resources to protect or “anchor” the most robust remaining populations in ecologically functional river basins, remaining wild salmon will be condemned to a downward spiral of declining habitat conditions and possible extinction.

[Best Management Practices and Standardization \[Levy Report\]](#)

The planning tools described in Report #2 include:

- Salmon Enhancement (SEP)
- Structured Decision Making (SDM)
- Priority Threat Management (PTM)
- Recovery Potential Analysis (RPA)
- Risk Assessment Methodology (RAMS)
- Adaptive Management (AM)

In some cases different planning tools were combined e.g. SDM combined with PTM, PTM combined with Expert Elucidation etc. There were a few subtle differences between the planning tools e.g. PTM reliant on Expert Elucidation vs SDM reliant upon empirical data. However, there are more similarities between planning tools than there are differences.

The length of time required to complete the PTM process ranges between 0.5 and 2 years, depending on the complexity of the problem; the time availability of the PTM team, experts, and stakeholders; the availability of data; and the communication products required.

The Salmon conference [Salmon 2100 The Future of Wild Pacific Salmon](#) concluded that there is no scientifically correct approach to restoring runs of wild salmon, but rather a suite of alternatives with 'best' largely being a function of which vision of salmon restoration one accepts. The choice of the preferred methodology and policy options is a public choice in which the contribution of science is to evaluate the consequences of each option.

Within the PSSI program, DFO's intends to create a standardized process that can be applied to future salmon protection and recovery programs. Following review of the available planning tools it is concluded that there is no optimal pathway for defining implementation strategies. Salmon ecosystems are heterogeneous and different CUs have different conservation requirements, enhancement opportunities and constraints.

Relevant considerations include:

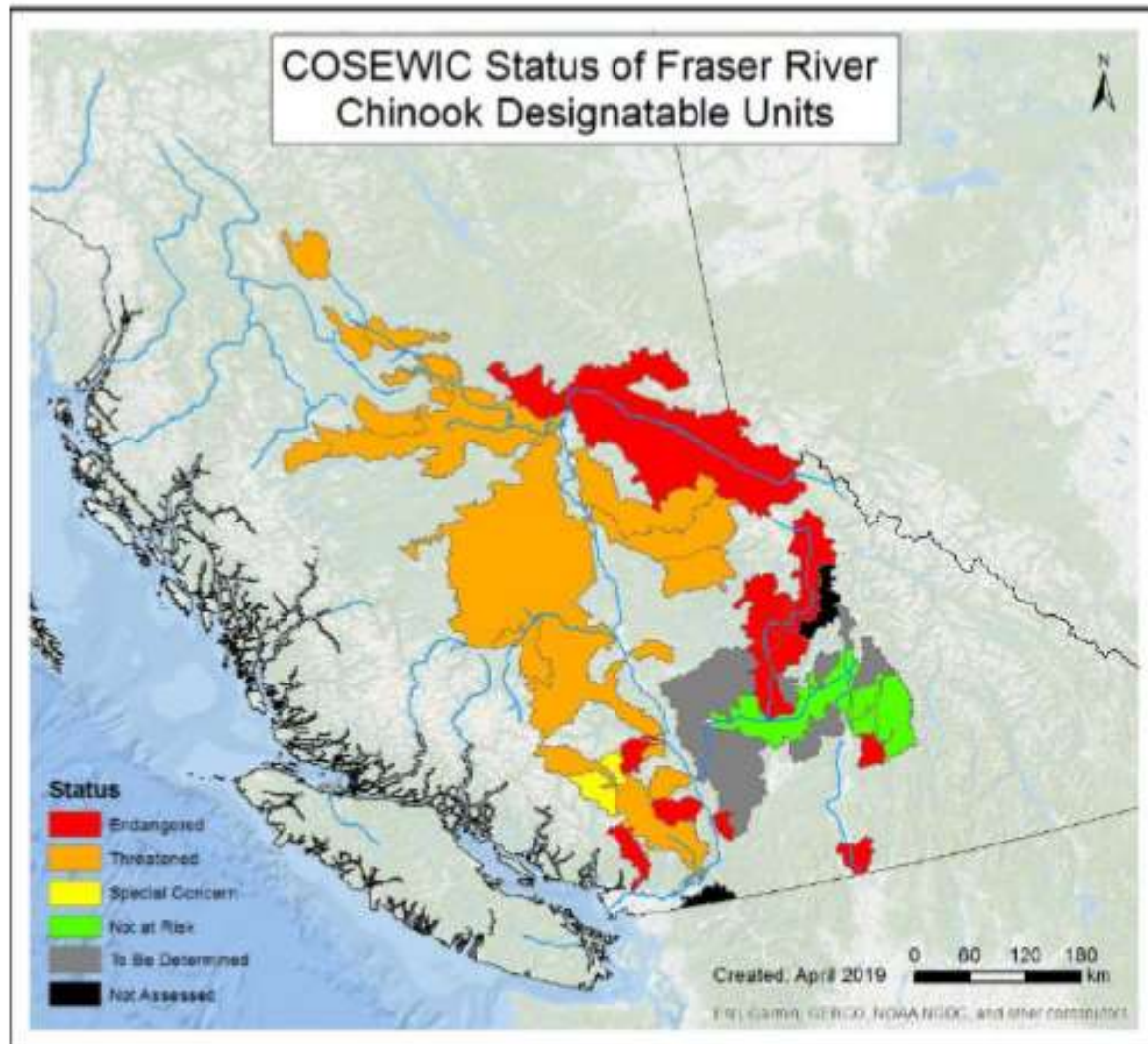
1. Which Agency, First Nation group or ENGO will lead the development of salmon protection and restoration programs (see Table 1)?
2. How will the program be supported financially, technically and administratively over the long term¹?
3. Who would implement one or more of the regional planning tools at the front end of the project?
4. Who would lead and develop the implementation and communication framework for local salmon protection and recovery projects?

As an example, the recovery prescriptions for threatened Upper Fraser Chinook would be very different for threatened and endangered DUs from the Lower Fraser River due to migration distance, life history variation (0+ vs. 1+), migration timing, vulnerability to migration obstacles etc. There are also challenges to develop technical capacity that can guide projects at the local level. Life history differences also require consideration. For Chinook salmon it would be easier to recover 0+ animals with a short duration juvenile residence time in freshwater compared to 1+ Upper Fraser Chinook that reside in freshwater for 1 year prior to outmigration.

¹ This has been the Achilles Heel for salmon protection and restoration projects. An example is the Harrison Stronghold which was well funded during the first 5 years of operations but is now struggling due to insufficient operational funding. Funding for well-intentioned programs is usually front-end loaded but declines over time as staff change and other funding priorities take precedence. A potentially useful approach would be for the Government and partners to co-fund an Annuity that can generate operating funds down the road. For example, an annuity of \$500,000,000, less than the total cost of the current PSSI, would generate an annual cash flow of \$25 million at a 5% annual return.

Table 1. Classification of Fraser Chinook Management Units, Conservation Units and spawning stocks.

Management Unit	Conservation Unit #	Conservation Unit Name	Spawning Stock
Fraser Spring 4₂	16	STh Bessette Creek	Bessette Creek
	17	LTHOM spring	Bonaparte River; Coldwater River; Deadman River; Louis Creek; Nicola River; Spius Creek
Fraser Spring 5₂	4	LFR springs	Birkenhead River
	5	LFR Upper Pitt	Pitt River-upper
	8	FR Canyon-Nahatlatch	Nahatlatch River
	10	MFR springs	Cariboo River-upper; Chilako River; Chilcotin River upper; Chilcotin River-lower; Cottonwood River; Horsefly River; Narcosli Creek; Naver Creek; West Road River
	12	UFR springs	Bowron River; Dome Creek; East Twin Creek; Fraser River-above Tete Jaune; Forgetmenot Creek; Goat River; Holliday Creek; Holmes River; Horsey Creek; Humbug Creek; Kenneth Creek; McGregor River; McKale River; Morkill River; Nevin Creek; Ptarmigan Creek; Slim Creek; Small Creek; Snowshoe Creek; Swift Creek; Torpy River; Walker Creek; Wansa Creek; West Twin Creek; Willow River
	18	NTHOM spring	Blue River; Finn Creek; Raft River
Summer 5₂	6	LFR summers	Big Silver Creek; Chilliwack/Vedder River; Cogburn Creek; Douglas Creek; Green River; Lillooet River; Lillooet River-lower; Lillooet River-upper; Sloquet Creek; Weaver Creek
	9	MFR Portage	Portage Creek
	11	MFR summers	Bridge River; Cariboo River lower; Chilko River; Endako River; Kazchek Creek; Kuzkwa River; Nechako River; Quesnel River; Seton River; Stellako River; Stuart River
	14	STh summer age 5 ₂	Eagle River; Salmon River
	19	NTHOM summer age 5 ₂	Barriere River; Clearwater River; Mahood River; North Thompson River
Summer 4₁	7	Maria Slough	Maria Slough
	13	STh summer age 4 ₁	Adams River; Little River; South Thompson River; Lower Thompson River
	15	Shuswap River summer age 4 ₁	Shuswap River-lower; Shuswap River-middle
Fraser Fall 4₁	3	LFR fall white	Harrison River



Indigenous Initiatives

Fraser Chinook rebuilding can be supported in several ways including reducing harvest impacts, habitat improvements and hatchery supplementation. Despite DFO measures to reduce fishery impacts, at-risk stocks continue to be intercepted in marine fisheries. Under the [Fraser Salmon Collaborative Management Agreement \(CMA\)](#), the joint Fraser Salmon Management Board has identified Fraser chinook rebuilding as a top work plan priority, and FSMB's Joint Technical Committee (JTC) has been focussed on establishing a clear understanding of fishery impacts and how to manage those to support recovery and rebuilding.

Meanwhile, habitat restoration and conservation-focused hatchery supplementation provide important rebuilding supports, possibly supported by PSF or SEP funding. First Nations' leadership on such programs can help them establish an ongoing role as caretakers of their

communities' resources, while protecting overall genetic diversity and resilience by preserving local wild chinook stocks. Rebuilding depleted local runs can also help to meet food security needs.

[Okanagan Nation Alliance \(ONA\)](#) has one of largest Indigenous fishery programs in Canada. It operates a large hatchery that helped to successfully restore Columbia River Sockeye salmon and is now working to restore Okanagan Chinook. This work, supported by substantial funding from US Tribes, had to comply with strict DFO hatchery program requirements, but the successful results include Sockeye returns that now support an important ONA fishery.

[Takla Lake First Nation](#) played a key role in restoring salmon spawning habitat in Sitlika Creek, a tributary to Takla Lake, that was lost during CN Rail construction in the 1950s. Joint efforts with the Canadian Wildlife Federation (CWF), the Province and CN Rail since 2020 have removed blockages, improved habitats and restored access to former spawning grounds. Takla Lake First Nation now operates their own small hatchery to support Takla Lake Sockeye salmon [rebuilding](#).

Many other Indigenous salmon rebuilding and habitat restoration initiatives are underway throughout the BC and the US Pacific Northwest.

Integration

There are many initiatives that in principle, support the recovery of wild Chinook: the WSP, COSEWIC, SARA, DFO fish stock provisions, individual programs by communities, tribal councils and Provincial agencies, NGOs like the PSF, Watershed Watch, etc. It is counterproductive to have numerous agencies with similar mandates and goals and integration and integrated approaches could better serve all parties simultaneously. While this type of Tier 3 co-operation seems advantageous, there would be value to scope out a Tier 1 approach under CRR1 by March 31, 2024.