Context & Opportunities for Collaboration in Fraser Chinook Rebuilding

A Summary of Key Programs, Processes & Initiatives

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Preface

This is a first draft of a working document produced by 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 share widely as a resource to support collaboration in the work of rebuilding healthy Fraser Chinook populations.

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Canada's Commitment to Protecting biodiversity

Canada's 1992 ratification of the UN Convention for the Protection of Biological Diversity led to a number of initiatives at various levels of government to meet these goals. This summary includes key initiatives relevant to the protection, conservation and rebuilding of Pacific Salmon stocks in British Columbia.

1. COSEWIC and SARA

The 1996 accord for the Protection of Species at Risk in Canada created the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent panel reporting to the Minister of Environment that assesses the conservation status of endangered wildlife species and determines status level (Not at Risk, Threatened, Endangered, Extirpated). For fish stocks in the Threatened and Endangered categories, DFO conducts a Recovery Potential Assessment (RPA) (*see below*) to provide further information for decision making. The Environment and Fisheries Ministers review the RPA and advise the Federal Cabinet on whether to list the species or specific Designable Units (DU) of the species under Canada's Species at Risk Act (SARA).

Listing a species/DU under SARA can induce a range of protective measures, including strict prohibitions to eliminate further harm from sources or activities like fishing. The Ministers and Cabinet consider the expected socio-economic repercussions of invoking these required measures with a SARA listing decision. Largely because of this, no BC salmon stocks (even those in dire condition) have been SARA listed so far. In some cases (like Cultus Lake sockeye), DFO has instead invested millions in small-scale hatchery supplementation each year to prevent extirpation. The failure to successfully invoke SARA protections by listing any BC salmon stocks, even those subject to extreme conservation concerns, prompted calls for new ways to protect threatened and endangered BC wild salmon stocks.

2. Wild Salmon Policy

The goal of Canada's 2005 Wild Salmon Policy (WSP) is to restore and maintain healthy and diverse salmon populations and their habitats for the benefit and enjoyment of the people of Canada in perpetuity.

The Policy has three overarching objectives

1. Safeguard the genetic diversity of wild Pacific salmon
2. Maintain habitat and ecosystem integrity
3. Manage fisheries for sustainable benefits

Under the WSP, all decisions and activities pertaining to the conservation of wild Pacific salmon were to be guided by four principles.

Principle 1: Conservation

- Conservation of wild Pacific salmon and their habitats is the highest priority in resource management decision-making.
- The protection and restoration of wild Pacific salmon and their habitats will enable the long-term health and productivity of wild populations and continued provision of cultural, social and economic benefits. To safeguard the long-term viability of wild Pacific salmon in natural surroundings, the Department will strive to maintain healthy populations in diverse habitats.

Principle 2: Honour obligations to First Nations

- Resource management processes and decisions will honour Canada's obligations to First Nations.
- This includes Canada's legal duty to consult with First Nations and, depending on the strength of the claim of Aboriginal rights or Aboriginal title and the seriousness of the potential adverse effect of a decision on the claimed rights or title, accommodate their interests when Canada has knowledge of the potential existence of an Aboriginal right or Aboriginal title and is making decisions that might adversely affect the right or title. Resource management processes and decisions will also be in accordance with the Nisga'a Final Agreement, the Yukon Final Agreements, and any other treaties or agreements entered into between Canada and First Nations.

Principle 3: Sustainable use

- Resource management decisions will consider biological, social, and economic consequences, reflect best science including Aboriginal Traditional Knowledge (ATK), and maintain the potential for future generations to meet their needs and aspirations.
- Social, economic, and biological considerations will inform decisions on salmon, their habitats, and their ecosystems consistent with the priorities assigned to Principles 1 and 2. Conservation decisions cannot be based solely on biological information. The maintenance of biodiversity and healthy ecosystems must be considered in the context of human needs for use now and in the future. Decisions will not be taken without regard to their cost or social consequences.

Principle 4: Open process

- Resource management decisions will be made in an open, transparent and inclusive manner.
- To gain broad public support for decision-making, salmon management must accommodate a wide range of interests in the resource. Decisions about salmon protection and sustainable use will be based on meaningful public input to ensure they reflect society's values. Decision-making processes will be transparent and governed by clear and consistent rules and procedures.

While the WSP embodies good intentions, there have also been significant challenges and barriers to implementing the Policy as it was fully intended.

3. Fish Stocks Provisions & Limit Reference Points

2019 amendments to the Fisheries Act require DFO to identify Limit Reference Points (LRPs) or minimum conservation thresholds for BC wild salmon Stock Management Units (SMUs). The Act's new Fish Stocks provisions require that DFO develop methodologies to estimate LRPs and status at the SMU level, while considering the WSP goal of maintaining component CUs (Conservation Units) above their lower benchmarks to conserve adaptive diversity. Once these LRPs are in place, if spawning abundance at the SMU level drops below the LRP, DFO would be required to immediately start a rebuilding program aimed at restoring this population to a healthier state.

Proposed methods to determine these LRPs have recently been subject to initial CSAS reviews (see Holt et al. 2022). A Technical Working Group was established by DFO and included some First Nations participants to begin exploratory work to help establish guidelines for developing LRPs. To date, this process has been limited to developing LRPs, Upper Stock References (USRs), and rebuilding targets to Batch 1 stocks (Okanagan Chinook, WCVI Chinook considered below their LRPs). This group took a brief hiatus but has recently been re-established (December 2022) with an updated Terms of Reference (available upon request). This group is currently looking at:

- Using the Pacific Salmon Status Scanner to derive CU-level benchmarks (currently under CSAS Review), and application of the tool to new CUs.
- New guidelines for writing rebuilding plans under the Fish Stocks Provisions and A Fishery Decision-making Framework Incorporating the Precautionary Approach (dfo-mpo.gc.ca)
- Updates on development of LRPs, Upper Stock References (USRs), and rebuilding targets to Batch 1 stocks (Okanagan Chinook, WCVI Chinook considered below their LRPs)
- Gap identified from the LRP CSAS process (March 2022): considering ways to pair Indigenous Knowledge with Western science in developing reference points.
- Emerging needs to technical support (e.g., Batch 2 stocks).

Much more work is needed to complete the peer-review process and then develop and implement LRPs, and the timeline for implementation remains unclear.

4. Recovery Potential Assessments

When salmon stocks are designated as Threatened or Endangered by COSEWIC, there is a requirement to prepare a Recovery Potential Assessment. The RPA generally has two parts:

Part I focuses on identifying 'threats' that limit the survival and recovery of a given stock. These are categorized as either Anthropogenic (human-induced) or non-Anthropogenic (natural variation). The first category can include agriculture and aquaculture, energy production, pollution, industrial development, roads, forestry, fishing, etc. The second category includes landslides, earthquakes, floods, etc. A committee of 'experts' subjectively ranks the severity of each threat. The result is a ranked list of important stressors. Climate change, natural system modifications, fishing and pollution have all been identified as important impacts on Fraser River chinook. The most recent CSAS-reviewed Fraser River Chinook RPA Part 1 is by Doutaz et al., 2021.

Part II focuses on projecting future abundance trends, given recent information on population size, composition and productivity. Modelling scenarios assume habitat conditions will remain the same, except for ocean conditions (affects marine survival), and domestic fishing impacts (which DFO can control). The recovery period is often set to three generations, so it would be slightly longer for 5_2 than for 4_1 populations, and longer for Chinook than Coho. The forecasted abundance trajectory shows the extent of recovery after 3 generation under different hypothetical scenarios. The analytical methods used, data sources and latest projections results for Fraser River Chinook are given in the Part 2 Assessment by Weir et al. (2022). Recent assessments indicate that several Fraser Chinook stocks may not recover fully in three generations, even in the absence of fishing, while also noting that reduced harvest is one of the few mitigation measures available to reduce impacts.

RPAs assess the likelihood of depressed stocks naturally recovering to a better state. They do not consider the potential benefits of enhancement (e.g. lake enrichment, hatchery supplementation) or habitat improvements (mitigation for losses, flow controls, oxygenation, spawning channels). Stocks that might not recover naturally in 3 generations could perhaps do so with additional intervention, but this is outside the scope of RPAs, or the associated SARs (RPA summary presented as a CSAS Science Advisory Report).

5. Risk Assessment Methodology for Salmon

The Risk Assessment Methodology for Salmon (RAMS) is a process that was developed by DFO scientists with the overall goal of developing consensus on risks to salmon and actions required to rebuild salmon and ecosystems through a simple, scalable, structured process. RAMS can be used at the individual stream level, or at a broader watershed level to identify and assesses risks limiting the productivity and capacity of salmon populations. It can be used in both data-rich and data-limited situations and brings together stock and habitat experts, as well as local knowledge and Aboriginal Traditional Ecological Knowledge. RAMS helps to assess the benefit/costs of mitigation options and is an ongoing, iterative and adaptive process. Where something like SARA focuses on specific threats, RAMS focuses on salmon interactions at the habitat level and helps to identify critical limiting factors. There are four key steps in the process:

i. Create Understanding: Collate the available stock info, habitat requirements and status by each life stage, and info on specific limiting factors. Bring in technical and local knowledge experts.

ii. Link Biology to Relevant Limiting Factors: Link, by life cycle stage, the various habitat requirements, relevant limiting factors and potential stressors.

iii. Rate Risks and Knowledge Gaps: This is usually done through workshops by technical experts and local knowledge holders, with the overall goals of scoring risks, assessing certainty and knowledge gaps and assessing longer term climate effects.

iv. Develop Rebuilding Options: Finally, all the information can be used to develop mitigation options. This includes a cost/benefit analysis and identifies research and monitoring priorities for the given stream/watershed.

Essentially, the RAMS process identifies what the limiting factors are to a specific salmon stock or system, helps to rank those limiting factors in terms of highest risk to lowest risk, and then allows individuals to assess where best to place their efforts to help rebuild/recover that specific stock.

RAMS has been used to inform the RPA process for stocks like Nanaimo River Chinook and has also been used successfully on the Cowichan River to help restore local Chinook populations. It is currently being explored on the Thompson/Nicola.

An innovative hybrid approach is currently being developed on the West Coast of Vancouver Island (WCVI), which uses the freshwater RAMS approach but also expands this to the marine environment to help determine limiting factors for all life stages and habitat of WCVI chinook.

6. Pacific Salmon Treaty

Today's Pacific Salmon Treaty (PST) stemmed from a 1914 agreement in which the US government helped to pay to clear a large rockslide at Hells Gate triggered by railway construction, in exchange for a guaranteed annual harvest portion of the Fraser River salmon run. The Canadian and United States governments formed the Pacific Salmon Convention (PSC) of 1937, which created today's Pacific Salmon Commission. Work to build the current fishway began in 1944, with initial Canada-US efforts focused on rebuilding and recovery for Fraser salmon stocks. At the urging of W.E Ricker, the renowned Canadian fisheries scientist who saw over-fishing as a greater threat than the Hells Gate slide, Canada also began imposing fishing restrictions.

The official US/Canada treaty was first signed in 1985 after years of disputes over conservation and harvests. The Pacific Salmon Treaty states that both nations should aim to prevent over-fishing and allow for optimum production. In subsequent years, some funding was provided for fisheries management and habitat enhancement (e.g. Northern Fund, Southern Fund).

The treaty annexes describing implementation are reviewed every 10 years to deal with emerging issues such as changes in hatchery production, marine and freshwater habitat conditions affecting stock productivity, new fishery regulations, etc. Harvest allocations are negotiated by species/stock groupings for most fisheries, from Alaska to the California coast. Allocations tend to remain constant for the treaty period, though either country can reduce harvest domestically in response to lower than anticipated run sizes. For instance, Canada responded to the Big Bar slide and low ocean survival by opting to lower harvest in some domestic fisheries.

PST annexes are based on available information at the time they are re-negotiated and if additional information or new issues arise later — for example, recent concerns about accountability for Fraser Sockeye salmon impacts in S.E. Alaska fisheries — the two sides can try to find mutually agreeable solutions. But these talks are not always fruitful, so problems may persist until the next formal negotiations.

The PST is not a Rebuilding and Restoration initiative *per se*, but mainly a harvest sharing arrangement. It does not contain explicit provisions for stock rebuilding and leaves it to each country to take initiatives domestically for such purposes. There are, however, annual potential funding opportunities under the PST:

- The Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund (the Northern Fund).
- The Southern Boundary Restoration and Enhancement Fund (the Southern Fund).

The purpose of the two funds is to support three kinds of activities in both countries that support salmon stocks and their habitat:

1. Develop improved information for resource management.
2. Rehabilitate and restore marine and freshwater habitat.
3. Enhance wild stock production through low technology techniques.

In addition, there are more recent funding opportunities which fall under the PST including the Mark Selective Fisheries Fund.

8. Salmonid Enhancement Program

DFO's Salmonid Enhancement Program (SEP) was established in 1977 with the objective of restoring key salmon stocks to historic levels of abundance, primarily to support commercial and sport fisheries. Large-scale hatchery production facilities were built on Vancouver Island by the Big Qualicum River, the Puntledge, Quinsam, Nitinat and Robertson Creek, and on the mainland, at the Capilano, Chilliwack and Chehalis rivers. Many smaller facilities and spawning channels were also built in southern BC.

The SEP mandate has evolved to serve a broader set of objectives. Its current priorities are to provide ecosystem and socioeconomic benefits through fish production, community capacity development, public stewardship and habitat restoration. It also supports

community economic development by contracting work to volunteer organizations, Indigenous groups and NGOs. An example might be a contract for an Indigenous community interested in running a small hatchery to rebuild depressed local chinook stocks.

SEP's work includes PST obligations such as Coded Wire Tagging (CWT) of released juveniles to support stock assessment. SEP faces many challenges, such as maintaining its aging facilities, adopting new approaches to salmon production, and meeting changing needs and management objectives. The recently announced Pacific Salmon Strategy Initiative (PSSI) may dictate future changes for SEP.

Hatchery production has its limitations and can negatively impact wild stocks if not done carefully, but hatchery rearing and supplementation are useful tools to help rehabilitate threatened wild stocks. Small facilities using local brood stock and river water are generally termed 'Conservation Enhancement Culture programs'. Some have been successful, particularly for maintaining the genetic make-up of wild populations subject to short term impacts.

However, interactions between wild and hatchery fish is highly complex and in some instances hatchery practices have been shown to negatively impact wild Pacific salmon populations. The Pacific Salmon Foundation (discussed below) is currently conducting a Hatchery Effectiveness Review, which aims to support hatchery managers as they navigate the complex relations between release strategies and optimal salmon survival. The project's next phase, currently underway, examines the interactions between wild and hatchery fish.

Today, most SEP facilities still produce salmon to support mainly commercial and recreational fisheries, though in some cases, a substantial portion of downstream returns are allocated to local First Nations -- for example, local First Nations harvest substantial portions of Nitinat hatchery salmon at the top end of Nitinat Lake just before the hatchery. Local nations may also have access to returning salmon in excess of brood stock requirements, though this is not the case for all facilities in the Fraser watershed. The Chilliwack hatchery, for example, has large annual salmon production goals that support a considerable recreational fishery. Many First Nations see such intensive recreational fishing effort and impacts as excessive and unsustainable. Intense local conflicts over access, allocations and management have added to the complex challenges facing fishery managers, local communities and conservation efforts targeting declining Fraser chinook stocks.

9. Pacific Salmon Foundation

The Pacific Salmon Foundation (PSF), founded in 1987, is a non-profit organization dedicated to conservation and restoration of wild Pacific salmon and their natural habitats in British Columbia and the Yukon. It has been funded in part by donor contributions, other foundations (e.g. Gordon and Betty Moore), the PSC, BC Hydro and even DFO.

PSF sponsors initiatives to collect and share data on watersheds and supported populations, including the Pacific Salmon Explorer, an online data visualization tool that displays information on salmon populations and their habitats throughout British Columbia. This tool was used extensively in developing the most recent Chinook RPA.

The PSF also supports monitoring, research and habitat restoration. Through its volunteer driven StreamKeeper program, it supports small-scale hatcheries that support salmon fisheries and provide information to help DFO fishery management. This program is modelled after DFO's Salmon Enhancement Program (SEP) and US stream stewardship programs. The PSF also helps to fund small community-driven salmon conservation and restoration projects. As discussed above, PSF is currently undertaking a Hatchery Effectiveness Review.

10. Pacific Salmon Strategy Initiative

Launched in 2021, DFO hails the $647 million Pacific Salmon Strategy Initiative (PSSI) as Canada's largest, most transformative investment in salmon. It seeks to stem historic declines in key Pacific salmon stocks and rebuild them to sustainable levels. The Initiative's four pillars are: (i) Conservation and stewardship, (ii) Enhanced hatchery production, (iii) Harvest transformation, and (iv) Integrated Management and Collaboration.

PSSI led to some fishery closures in 2021, with perhaps more in years to come. It includes a commercial fishery license buy-back program and more focus on selective fishing practices and gear (where possible). DFO plans include consulting with First Nations on ways to address potential cost barriers to increasing selective fishing approaches in FSC fisheries. PSSI also aims to improve fisheries management, to increase BC SRIF funding for restoration work, and to engage and collaborate more with First Nations and harvesters. Significant new support is also expected for salmon enhancement.

Initial program activities were mainly organizational in nature, with implementation beginning in 2022-2023. FSMC's CRRI project, for example, was approved for BC SRIF funding in spring 2022. But with DFO's implementation plans and timelines to date outlined mostly at a high level, it remains to be seen how best indigenous-led work on restoring Fraser chinook can link to this initiative, particularly the Enhancement and Restoration components.

11. Southern BC Chinook Strategic Planning Initiative

The Southern BC Chinook Strategic Planning Initiative (CSPI) was a collaborative planning process led by DFO and First Nations, and involving multiple interest groups (Hall et al. 2014). Soon after its inception, it became clear that quantitative tools would be needed to evaluate long-term consequences of different harvest-hatchery-habitat management strategies for both wild and enhanced Chinook. Initial workshops were based on Structured Decision-Making principles and followed five steps: (i) identify planning priorities, (ii) Identify resource management options, (iii) establish various performance

indicators, (iv) assess likely impacts of management alternatives, and (v) identify preferred alternatives. Proposed activities were ranked by participants and the final outcomes highlighted both areas of convergence and divergences in opinion. Habitat protection and restoration were generally viewed positively. The main recommendations concerned finding ways to move towards consensus and the need to develop analytical methods (Statistical simulation models for forecasting and multi-species evaluations).

The CSPI report includes technical appendices containing useful summary information by region on stock status, hatchery production, harvest and spawning habitat state. It also has information on distribution of total mortalities by fishery (for south coast indicator stocks only). Some of this information is now dated (fishery impacts until 2011), and precedes the past decade's large impacts (rockslides, fires, floods), and fishery changes due to new regulations.

12. Freshwater Fisheries Society of BC

In 2015 the Province of BC signed an agreement with the Freshwater Fisheries Society of BC (FFSBC) to provide 100% of provincial fishing license revenues to activities that directly benefit recreational fisheries. These include research, conservation and education programs, improving angler access and stocking programs. A second body, the Habitat Conservation Trust Foundation, receives 100% of surcharge revenues from angling licenses to fund fish conservation projects.

FFSBC owns and operates six major fish hatcheries in Duncan, Abbotsford, Summerland, Clearwater, Fort Steele and Vanderhoof. It also operates a trout distribution centre in Prince George and nine egg collection stations throughout the province. The hatcheries raise and release over six million trout, char, and Kokanee salmon annually to stock 800 BC lakes to support angling. FFSBC also has conservation culture programs to rebuild specific stocks and helps manage special recovery programs for endangered species with indigenous technical assistance, such as Nechako white sturgeon.

There has been limited collaboration to date between FFSBC and DFO focused on Pacific salmon rebuilding, although the potential for such partnerships exists, since both agencies use similar operational protocols and have worked together in the past. DFO's Robertson Creek hatchery once helped produce trout for BC stocking programs. Nitinat helped produce steelhead until BC asked that this production be discontinued. The federal Tenderfoot hatchery was also used to support accelerated rearing of steelhead trout to support BC's Cheakamus recovery initiative following the 2005 CN derailment.

13. Habitat Conservation Trust Fund/Foundation

The Habitat Conservation Trust Fund (HCTF) was created in 1981 to help fund conservation projects for fish, wildlife and supporting habitats in BC. HCTF also has educational programs and offers enhancement and restoration grants for inventory, monitoring and research activities, ecosystems stewardship and education programs and post-

secondary scholarships for study in wildlife or fish conservation. Projects funded typically have a 3-year limit, with grants ranging from $10,000-$100,000/yr. For application procedure see https://hctf.ca/grants/enhancement-grants/.

HCTF funds about 350 grants annually and has also purchased about 25,000 hectares of conservation lands to support species of special interest.

The primary focus is on native species, by region. HCTF does not generally fund projects focused specifically on Pacific Salmon stock status but it can support projects addressing salmonid habitats, surveys, ecosystems, steelhead population assessment and monitoring.

14. Fish Habitat Management — DFO

Established in 1986, DFO's fish habitat protection policy focused on conservation and restoration to support productive capacity through "no net loss" of fish habitat. However, well-documented losses of salmon habitat and ecosystems continued in the Fraser watershed and elsewhere due to many factors, with only a small portion of those losses mitigated.

Big Bar landslide response: Recently, however, DFO's Fish & Fish Habitat Protection Program has begun implementing stronger protection measures approved under the 2019 Fishery Act amendments. A recent example includes the significant resources committed to facilitate salmon migration in the wake of the Big Bar rock slide. The Province helped fund this work and Fraser First Nations have also been deeply involved, providing labour and supervision assistance. This work includes an emergency conservation program to collect mature adults below the slide, conduct GSI analysis to determine stock origin and do egg takes for hatchery rearing of juveniles. In 2021 this program involved two SEP hatcheries and two operated by the Takla and Nak'azdli Nations. In 2022, over a million Sockeye and Chinook fry were released, including four Sockeye and 13 Chinook populations. This work has been hailed as a model for collaboration to support salmon recovery via enhancement and habitat restoration following a catastrophic event.

15. Fish Habitat Management — BC

Management of freshwater habitats is a shared, and largely Provincial, responsibility. BC's 2016 Water Sustainability Act aims to ensure minimal flows to support salmonids in stream and rivers, particularly during droughts. BC Hydro initiatives also seek to control ramping rates (i.e. changes in water discharge rates), to restore natural hydrographs and riparian vegetation and to minimize juvenile and smolt outmigration losses. However, concerns include the adequacy of BC Hydro's response to compensate for environmental damage caused by hydroelectric dams. Work by the First Nations Fisheries Council and indigenous leadership has also urged reforms to the 2016 BC Water Sustainability Act to reflect UNDRIP commitments.

A significant challenge in managing fish habitat is jurisdictional disputes over who is responsible for negative impacts, restoration and mitigation costs, given potential roles for federal, provincial, municipal and regional governments, independent agencies, industry and landowners. Another is the often-conflicting community priorities facing decision makers. Concerns include progressive loss of riparian habitat in the lower Fraser due to diking to protect farmland and the 2021 flooding of the Nooksak River in the US that spilled over into Canada, causing major impacts for farms, communities and potentially for salmon on Fraser floodplains. Questions have intensified about how to manage such floodplains in the face of increasingly extreme and unpredictable weather events accompanying climate change. BC's fish habitat protection policies are not primarily designed to favour fish stock rebuilding but can nevertheless play a key role in reducing harm.

16. BC Ministry Roles in Fish Management

While provincial ministry organization has shifted over the years, the Province's role in managing Fraser Steelhead trout, for example, has primarily involved three key ministries: Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), Environment, and Agriculture and Fisheries. However, collaboration on fish management between ministries has been challenged in the past by their often-conflicting mandates.

BC recently created a new ministry responsible for Land, Water and Resource Stewardship (LWRS), headed by a former biologist for the Nuu-chah-nulth Tribal Council. This ministry is now responsible for fisheries, taking over some of the old FLNRORD responsibilities. Osborne has also been tasked with advancing meaningful reconciliations with First Nations, with a focus on growing their economies while protecting ecosystem health to ensure sustainability. Osborne's ministry aims to develop a new strategic approach to land use, protection of salmon and helping species and stocks-at-risk. While it's too early to know how quickly or effectively this new Ministry can implement the proposed reforms, it's a potential opportunity for Fraser First Nations to take a lead role in identifying priorities and collaboration opportunities for Chinook rebuilding.

17. Indigenous initiatives

Fraser Chinook rebuilding can be supported through many channels, including reducing harvest impacts, habitat improvements and hatchery supplementation. Recent assessments indicate that many depressed Fraser Chinook and Coho stocks may not recover in three generations, even in the absence of fishing. Despite DFO measures to reduce fishery impacts, at-risk stocks continue to be intercepted in marine fisheries, and it's unclear how much more will be done to reduce such impacts. Under the new 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 focusing on establishing a clearer

understanding of fishery impacts and how to manage those to support recovery and rebuilding.

Meanwhile, habitat restoration and conservation-focused hatchery supplementation offer important opportunities to support rebuilding. These include conservation fish culture, possibly using 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 will also help to meet food security needs.

For conservation-focused rebuilding programs, released smolts are not fin-clipped so as to not be kept in recreational and commercial fisheries. The hatchery-raised fry can however be otolith-marked to permit identification during dead pitch stream surveys and through genetic stock ID in routine fishery sampling.

Examples:

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 commercial 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.

- Video documenting this and other Indigenous restoration programs in BC

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

- A recent Tyee series, for example, reviewed historical losses, rebuilding challenges and Indigenous efforts to help restore depleted runs.

Concluding remarks

The key tools to support Chinook recovery and rebuilding include fishery management to reduce fishery impacts, restoring lost spawning and rearing habitats and enhancement projects. The landmark 2019 CMA commits FSMC and DFO to collaborative management of Fraser salmon and fisheries, with management to support Fraser chinook rebuilding identified as a leading priority. First Nations, individually and collectively, are well-positioned to play a lead role in habitat restoration and in enhancement projects for local populations in their territories. Although years of effort may be needed before the

population benefits are obvious, funding and other supports are available to advance such opportunities. Large hatchery programs are costly, need to meet strict regulatory criteria and can create new challenges, such as negative impacts on wild stocks or increased fishery management complexity. Small, short-term hatchery production using local wild broodstock (conservation culture programs) can help rehabilitate depressed natural populations and offer opportunities for nations that want to take on a greater role as caretakers of local stocks.

Other potential approaches may include controlling predators and competing marine species that could be negatively impacting salmonids, with some calling for controls to BC's growing populations of seals and sea lions. In the US, there have been culls in the Lower Columbia to reduce salmon predation, with claims that a 2019 cull saved about 1,400 winter steelhead from a total run of about 5,500 fish. There is no large scale culling in the lower Fraser despite calls for such. Other threats include potential competition from Spiny dogfish and Pacific Whiting (hake), or impacts from open net pen Salmon aquaculture along the BC coast.

Recent initiatives like PSSI, and the success of collaborative models like Big Bar, offer opportunities for a fresh approach that recognizes First Nations as key partners in planning and implementing successful strategies to support Fraser chinook recovery and rebuilding.

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