



Lower Fraser River Salmon Recovery Brief

The state of Fraser River salmon

Wild salmon populations in the Fraser watershed are at a critical crossroads. The last several years have seen the lowest numbers of Chinook, sockeye and steelhead on record, as well as low abundances of coho and chum. As a result, people, wildlife and ecosystems are experiencing the repercussions of this collapse. Though many Fraser salmon populations are threatened or endangered (more than 50%), the Fraser watershed still hosts a remarkable diversity of populations from which these species can recover. Many Fraser salmon populations rely on the Lower Fraser River and Estuary to spawn and rear, and all populations use it to migrate.

Given the importance of wild Fraser River salmon ecologically, culturally and economically, and the intensity of development pressures in the lower river and estuary, Raincoast initiated our Lower Fraser River Salmon Conservation Program in 2016. The goal of the program is to see healthy populations of wild salmon returning to the Lower Fraser River and its historic tributaries, so that salmon can regain their traditional role as part of healthy, living rivers and watersheds. We are actively working towards this goal through research, restoration and conservation initiatives.

Raincoast's efforts to recover wild salmon

We focus our work on building a broader vision for salmon habitat conservation through the Lower Fraser River and on conducting focused research and restoration in the estuary. Over the last six years, we have engaged over 70 organizations, Nations and individuals active in efforts to protect and restore salmon habitat.

Our engagement with these groups reveals a desire for a broad vision that captures the importance of the Lower Fraser River and estuary for its local and global significance. We identified systemic issues resulting in extensive freshwater habitat loss and outlined a new paradigm for conservation in the context of UNDRIP. From community input and our findings, we have identified actions to move towards this shared vision, which is outlined in our March 2020 report *Towards a Vision for Salmon Habitat in the Lower Fraser*.

Complementing this work, we have been conducting restoration on the man-made barriers that prevent the natural migration of juvenile salmon between habitats in the estuary. This work is increasing the access to rearing habitats that are crucial for juvenile salmon, aiding their survival to future life stages and the recovery of wild salmon populations.

This briefing highlights research and other scientific submissions Raincoast and collaborators have conducted that show the importance of the estuary to juvenile salmon, barriers to fish passage, the concern hatcheries pose to wild salmon recovery, innovative conservation strategies, funding opportunities, and pathways to Indigenous-led and ecosystem-based governance frameworks. Collectively, this work is identifying how we can put salmon and their habitat on the path towards recovery.

The Fraser River Estuary - critical rearing habitat for juvenile salmon.

Raincoast's estuary research includes partners at the University of Victoria and UBC. In 2019, the Raincoast team, led by UVic PhD Candidate Lia Chalifour, published a study on how different fish used the three types of habitats within the Fraser River Estuary (marsh, eelgrass and sandflats). The research found that juvenile salmon rely heavily on the estuary's salt marsh habitat to feed and rear when they first arrive in the estuary. Their use of the eelgrass habitat was secondary and occurred once juveniles reached larger sizes. Their use of sandflat habitats was third, also occurring at larger sizes (Chalifour et al. 2019). The research underscored the importance of connected habitat types to support the movement of juvenile salmon and other fish.

To better understand how long juvenile Chinook salmon stay in the estuary while they rear and prepare for their ocean migration, ear bones (otoliths), that record information about the conditions salmon live in, were analyzed. Otolith analysis showed that individual Chinook salmon from the Harrison River rely on the Fraser estuary for one to two months, and can spend up to 90 days, while



they feed and grow (Chalifour et al. 2020).

These findings underscore the importance of connectivity among habitats for juvenile salmon and the role that different habitats play in supporting juveniles while they grow. It is clear from this research that the saltmarsh, eelgrass and sandflat habitats of the Fraser River Estuary are all critical components in the persistence and recovery of Chinook salmon that need to be protected to ensure long-term salmon survival.

Barriers to fish passage in the Lower Fraser River

Currently, over 70% of the estuarine habitat historically accessible to salmon in the Lower Fraser has been lost or disconnected, much of this due to extensive flood infrastructure. Research conducted by M.Sc Candidate Riley Finn, from UBC's Martin Conservation Decisions Lab and Raincoast, identified the amount of floodplain and stream habitat in the Lower Fraser Region that has been lost. Riley's research shows that 85% of floodplain habitat (Finn et al. 2021) and 1,700 kilometers of stream length have been lost behind current and predicted infrastructure barriers. This scale of habitat loss represents a significant opportunity to identify priority barriers that could be addressed to provide salmon access to areas of potentially intact habitat.

Salmon habitat restoration in the Fraser River Estuary

Following three years of data collection on the patterns of juvenile salmon movements in the estuary, Raincoast began restoration activities in 2019 by placing three breaches in the Steveston jetty in the main arm of the Fraser River. This jetty has blocked the movement of juvenile salmon into the saltmarsh on Sturgeon Bank for a century. Monitoring at locations opened by the breaches shows significant juvenile salmon passage by all five salmon species, including high densities of Chinook, chum and pink. The final phase of construction will occur in 2021, leaving three 50 meter wide breaches connected at all tide levels. We are now turning our attention to breaching the North Arm jetty while continuing our monitoring work.

Hatcheries and their implications for wild salmon

Although Raincoast has not conducted research on the impact of hatcheries on Fraser River salmon, the next phase of our estuary work plans to explore the interaction between wild and hatchery Chinook salmon to gain a better understanding of competition in the early marine stage. Growing evidence from studies in Canada and the US suggest that an overabundance of hatchery fry are





creating an environment with steep competition for limited food resources. Several salmon species, especially Chinook, are returning to spawn younger, smaller, and in fewer numbers. There are likely multiple reasons for this, but they include food competition in the marine environment and mixed stock fisheries that occur on the rearing grounds of immature Chinook (Gayeski et al. in prep).

Despite millions of dollars invested in hatcheries, and millions of salmon fry released annually, salmon catches have declined and wild salmon are in more trouble than ever. We hope to bring more research and knowledge on the effect that hatcheries and hatchery fish have on wild Fraser salmon populations and their recovery.

Priority Threat Management

Research led by Dr. Tara Martin at UBC applied a decision-making tool called Priority Threat Management to identify the most cost-effective conservation strategies needed to recover 102 species at risk of extinction in the Fraser Estuary, including Fraser salmon populations. The study found that a business-as-usual approach to decisions affecting the Fraser will likely lead to the loss of two-thirds of these species. However, a combination of conservation strategies, at a cost of \$381 million, or \$15 million a year, would give these species more than a 50% chance of survival (Kehoe et al. 2020). Importantly, governance in which First Nations and other governments work together to oversee and implement conservation measures, was found to be the strategy that gave species the highest possible chance of survival. Priority Threat Management is now being applied to 19 Conservation Units of five salmon species in the Lower Fraser River. This salmon study will determine the probability of persistence in 25 years under different conservation strategies, and will inform strategic investments in priorities to further recovery.

Funding for habitat restoration in the Lower Fraser River

To better understand the ‘funding landscape’ of the Lower Fraser River, Raincoast has researched the scale and scope of financial investments in aquatic habitat restoration, conservation and stewardship projects over the last decade. We identified investments of over \$90 million coming from all levels of government, charities, industry, and the nonprofit sector. Many of these projects did not outline ecological goals or objectives, collaborate with Indigenous communities, or conduct post-construction monitoring. We will publish our findings in 2021, along with a set of recommendations outlining how to make investments in habitat restoration more effective and supportive of Indigenous-led efforts.

Blueprint for restoring ecological governance

To help address conservation issues facing wild salmon in the Lower Fraser, such as habitat loss and siloed management, we have been collaborating with the Lower Fraser Fisheries Alliance, Martin Conservation Decisions Lab at UBC and West Coast Environmental Law, through the Lower Fraser Working Group. This group aims to propose options for Indigenous-led, co-governed and community-driven, science-based governance frameworks that foster long-term ecological resilience of the Lower Fraser River and the species and people that rely on it.

As a result, this group created a Blueprint for Restoring Ecological Governance to the Lower Fraser River, a resource that will guide our efforts towards realizing this long-term goal.

This Blueprint is guided by five key principles:

1. A commitment to sustainability that spans seven generations.
2. Governance that honours Aboriginal rights and title, inherent Indigenous jurisdiction and law, and the United Nations Declaration on the Rights of Indigenous Peoples.
3. Clear enforcement mechanisms to ensure ecological resilience.
4. Sustainable funding for governance and science-based ecosystem based management.
5. Respect for the opinion, voices, experiences and culture of others.



Terminal 2: Evidence to the federal review panel on impacts to Fraser Chinook salmon

Raincoast submitted evidence to the federal review panel assessing the proposed Terminal 2 expansion. Our evidence highlighted our concerns about the impacts from the expansion on Fraser Chinook salmon and Southern Resident killer whales. The federal review panel concluded Terminal 2 would have “significant adverse and cumulative effects on ocean-type juvenile Chinook salmon originating from the Lower Fraser and South Thompson Rivers” (Impact Assessment Agency, 2020).

In addition to the barrier and the lost habitat caused by another 85 hectare (210 acres) terminal footprint in the middle of the estuary, the expansion requires the widening of the causeway and the loss of more intertidal habitats used by juvenile Chinook. Terminal expansion also reduces the size of the estuary, brings more lights and noise, and changes the water circulation and flow. All of these changes are anticipated to affect the survival of ocean type Fraser Chinook that require the estuary to feed and grow for their survival.

Raincoast’s Lower Fraser Salmon Conservation Program team

The team includes Misty MacDuffee (Wild Salmon Program Director), Dave Scott (PhD Candidate at UBC and Lower Fraser Research and Restoration Coordinator), Ross Dixon (Communications and Development Director) and Kristen Walters (Lower Fraser Salmon Conservation Program Coordinator).

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Further information and references

Lower Fraser Salmon Conservation Program

<https://www.raincoast.org/lower-fraser/>

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