



**Risks to salmon in  
the *ha-ha-houlthee* of the  
Nuu-chah-nulth *Ha'wiih* and  
connected harm to other life**

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**WATERSHED FUTURES  
INITIATIVE**

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## **Researcher roles**

The core research team consisted of Nigel Sainsbury, Eric Angel, Jonathan Moore, and Kelda Blackstone. Eric, Nigel, and Jonathan co-developed the research positioning, questions, and methods, which they presented to the Council of *Ha'wiih* Forum on Fisheries in June 2021 with a commitment to update the Council during the research and to return to share the final research outputs. Data collection was co-produced by Eric, Nigel, and Kelda. Data analysis was co-produced by Eric and Nigel. All research participants were invited to co-produce the report writing and be named as report authors. Nigel and Eric co-produced the report writing with Jonathan, and Kelda, named-author Nuu-chah-nulth research participants, named non-Indigenous research participants, and research participants who wished to remain anonymous. The final draft research report was presented to the Council of *Ha'wiih* Forum on Fisheries on 21 February 2024.

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# 1. Executive Summary

*'Risks to salmon in the ha-ha-houlthee of the Nuu-chah-nulth Ha'wiih and connected harm to other life', is a report that presents Nuu-chah-nulth-centred research on risks to salmon and connected harm to other life.*

## Background and context

- Nuu-chah-nulth peoples have sustainably stewarded their *ha-ha-houlthee* (chiefly territories - consisting of salmon, other resources, the environment, and people) since time immemorial.
- Nuu-chah-nulth salmon populations (salmon that call the Nuu-chah-nulth *ha-ha-houlthee* home) and their watersheds have declined from pre-colonial baselines.
- Despite recent progress documenting risks to salmon in the Nuu-chah-nulth *ha-ha-houlthee*, gaps remain, including Nuu-chah-nulth perspectives, knowledge, values, and worldview; identifying cumulative effects of multiple threats over time and place from historic baselines; and identifying specific threats and the pathways by which they harm salmon.
- The Nuu-chah-nulth worldview of *hishuk-ish tsawak* (everything is one, everything is connected) instructs that there is also a need to understand how salmon declines impact local communities.
- The Salmon Watersheds Lab (Simon Fraser University), Uu-a-thluk (Fisheries program, Nuu-chah-nulth-Tribal Council), Nuu-chah-nulth knowledge holders (Nuu-chah-nulth First Nation members and experts with traditional, local ecological, and/or scientific knowledge of salmon and the *ha-ha-houlthee* — 'knowledge holders' from hereon), and non-Indigenous experts co-produced this research to support the Nuu-chah-nulth *Ha'wiih* and Nations in taking care of salmon and to further Nuu-chah-nulth rights to steward their territories.
- The research aimed to: (1) identify threats to Nuu-chah-nulth salmon and pathways of effect; (2) describe cumulative effects risks to Nuu-chah-nulth salmon; and (3) document harm to local communities caused by Nuu-chah-nulth salmon declines.

## Collaborative approach and methods

- The core research team aimed to use a de-colonized approach that honoured multiple ways of knowing and worldviews, with the utmost respect for Nuu-chah-nulth data sovereignty.
- A research methodology of semi-structured interviews and focus group meetings was employed to elicit qualitative perceptions from Nuu-chah-nulth knowledge holders and non-Indigenous experts.
- 22 Nuu-chah-nulth knowledge holders and 18 non-Indigenous experts were interviewed.
- Interviews were analysed to identify themes, then presented to interviewees in focus groups to validate and seek comments on how the core research team interpreted the data.

## Key findings

- Participants described harm to Nuu-chah-nulth salmon accumulating over time and space to the point where once abundant individual river and stream populations have greatly diminished and average salmon size (weight, primarily Chinook salmon) and female ratios have declined.
- Nuu-chah-nulth knowledge holders emphasized the threat to salmon from colonial greed and individualism, which have driven and facilitated the human activities that have harmed salmon.

- Interviewees highlighted that colonial governance has enabled harm to Nuu-chah-nulth salmon, particularly insufficient inclusion of Nuu-chah-nulth Nations and knowledge, regional and national centralization, siloed jurisdictions, inaccurate data and monitoring, failure to manage fisheries adaptively, lack of transparency and accountability, and insufficient enforcement.
- Legislative changes and increased regulation of activities to protect salmon, such as logging, was seen by many interviewees as inadequate and failing to prevent continued harm to salmon. Logging of private lands with lower forestry practice standards than crown land was also highlighted.
- Interviewees identified climate change and many local, regional, and international human activities that have harmed Nuu-chah-nulth salmon, including logging and pulp mills, commercial and recreational fish harvesting, enhancement, open-pen fin fish aquaculture, predation, such as by marine mammals, municipal development and waste, and transport.
- Research participants described a variety of pathways by which climate change and human activities have, and continue to, cause harm to salmon.
- The presence of threats to salmon from human activities varied across the ha-ha-houlthee and time.
- Pathways of effect from activities to salmon included direct mortalities of adult and juvenile salmon and alterations to marine and freshwater ecosystems causing reduced spawning and rearing success, destruction of redds, reduced resilience to environmental change, and reduced adult size and health.
- Climate change was described as harming salmon through ocean and freshwater warming, reduced food availability, and increases in extreme freshwater hydrology (low and high flows) from drought, reduced snowpack and glacier inputs, and increased storm intensity. Participants also noted examples of climate change amplifying harm from other threats.
- Participants discussed logging extensively, describing harm to salmon through increasing transport of sediment, gravel and rock, hydrological change, changing stream geomorphology, reduced riparian shade, logjams, pollution, and estuary log booms.
- Nuu-chah-nulth knowledge holders described salmon declines causing harm to local communities in a myriad of ways fundamental to Nuu-chah-nulth society including loss of: the Nuu-chah-nulth way of life and identity; food security; health; livelihoods; individual connections to salmon; inter-generational knowledge sharing; family and community connections; home; and peace.
- Non-Indigenous experts reported lost livelihoods, loss of peace, loss of recreational fishing access, and feelings of loss and responsibility from salmon declines.
- The research is based on the perceptions of Nuu-chah-nulth participant knowledge holders and non-Indigenous experts and as such cannot be generalized beyond the research participants. Knowledge holders participated in an individual capacity and did not represent their Nations.

## **Interpretations**

- Allowing Nuu-chah-nulth knowledge holders to define the problem space reveals a larger solution space in which broader and more fundamental risks to salmon are recognized and can be addressed to enable a transition to healthy Nuu-chah-nulth ecosystems for salmon and people.
- Recognizing Nuu-chah-nulth Nations' leadership in salmon stewardship is essential to bringing Nuu-chah-nulth values, governance and laws, and knowledge into decision making and planning.
- Co-governance between Nuu-chah-nulth and provincial and federal governments in local salmon systems is an important pathway to mitigating many of the risks to salmon and people identified in this research.





# **NUU-CHAH-NULTH LANGUAGE GLOSSARY & CULTURAL LEARNING RESOURCES**

## 2. Nuuchahnulth language glossary and cultural learning resources

Here we provide a glossary of Nuuchahnulth language words used in this report. Given that language is intertwined with values and culture, several Nuuchahnulth words and phrases were used in the report. The Nuuchahnulth language, of which there are several dialects with spelling and meaning varying between dialects, is inextricably tied to Nuuchahnulth culture and identity and is vital in re-establishing Nuuchahnulth Nations as stewards of their traditional territories. We also provide in this section a selection of resources to learn about Nuuchahnulth culture.

### 2.1. Glossary of Nuuchahnulth words

Please note that variations in these words exist, including in the translation of spoken Nuuchahnulth sounds to the roman alphabet.

Tyee Hawilth – Senior ranking member of a Hereditary Chieftainship and possibly of a Nuuchahnulth Nation.

Hawilth – Hereditary Chief.

Ha'wiih – Hereditary Chiefs.

Muschim – commoners/citizens in Nuuchahnulth societies.

Ha-ha-houlthee – Multiple Nuuchahnulth Chiefs' territories, comprising the lands, waters, resources, and people for whom they are responsible.

Ha-houlthee – one Nuuchahnulth Chief's territory, comprising the lands, waters, resources, and people for whom they are responsible.

Nuuchahnulth-aht – Nuuchahnulth people

Hishuk-ish tsawak – the Nuuchahnulth worldview of everything is one, everything is connected.

Uu-a-thluk – Taking care of

lisaak – Respect with caring

Sa-tsup/suuḥaa – Chinook salmon

Hin-kuu-as – chum salmon

Tsu-wit – coho salmon

Chaaplth – pink salmon

Hisit/Mii-aht – sockeye salmon

Ki-wah – steelhead trout

Kuu-us – people/person

## 2.2. Resources relating to Nuu-chah-nulth culture and history

The list of resources provided here is not designed to be exhaustive, but a starting point for those unfamiliar with Nuu-chah-nulth culture and history.

### *Nuu-chah-nulth language resources*

<https://nuuchahnulth.org/language/language.html>

<https://toquahtlanguage.com/nuu-chah-nulth-texts/>

<https://tshaht.com/history-culture/language/>

<https://nuuchahnulthlivingarchive.com/language/nuu-chah-nulth-language>

<https://www.nic.bc.ca/programs/indigenous-studies/indigenous-education/nuuchahnulth-language/>

<https://huyuayht.org/services/nuu-chah-nulth-language/>

[http://www.kwistuup.net/n/n/files/NFN\\_2011\\_handbook.pdf](http://www.kwistuup.net/n/n/files/NFN_2011_handbook.pdf)

### *Cultural and historical publications by Nuu-chah-nulth authors*

ʔeh ʔeh naa-tuu-kwiss (Atleo, Marlene Renate), 2006. "The Ancient Nuu-chah-nulth Strategy of Hahuulthi: Education for Indigenous Cultural Survivance." *The International Journal of Environmental, Cultural, Economic, and Social Sustainability: Annual Review 2* (1): 153-162. doi:10.18848/1832-2077/CGP/v02i01/54158.

Coté, Charlotte, 2010. *Spirits of our Whaling Ancestors*, University of Washington Press, Seattle, USA.

Coté, Charlotte, 2022. *A Drum in One Hand, a Sockeye in the Other: Stories of Indigenous Food Sovereignty from the Northwest Coast*, University of Washington Press, Seattle, USA.

George, Earl Maquinna, 2003. *Living on the edge: Nuu-chah-nulth History From an Ahousaht Chief's Perspective*, Sononis Press, Winlaw, Canada.

hiininaasim (Happynook, Tommy), 2022. *watšiʔaʔin ʔuuʔaʔuk+i haʔuʔi: Coming home to take care of the territory: a project of (re)connecting with traditional lands, waters, knowledge, and identity*, Diss. University of Victoria, Canada, <https://dspace.library.uvic.ca/handle/1828/13906>

ʔikaatius, (Atleo, Tyson), 2021. *Ahousaht Law And Chinook Salmon Conservation In The Megin River*, Diss. Royal Roads University, Canada, [www.proquest.com/openview/7f1f163d62ce6e6c66643d934172964b](http://www.proquest.com/openview/7f1f163d62ce6e6c66643d934172964b).

Umeek (Atleo, E. Richard), 2005. *Tsawak: A Nuu-chah-nulth Worldview*, UBC Press, Vancouver, Canada.

Umeek (Atleo, E. Richard), 2012. *Principles of Tsawak: An Indigenous Approach to a Global Crisis*, UBC Press, Vancouver, Canada.

*Cultural and historical texts by non-Indigenous authors*

Arima, Eugene and Hoover, Alan, 2011. *The Whaling People of the West Coast of Vancouver Island and Cape Flattery*, Royal British Columbia Museum, Victoria, Canada.

Drucker, Philip, 1951. *The Northern and Central Nootkan Tribes*, Smithsonian Institution, US Bureau of American Ethnology Bulletin 144, Forgotten Books, London, UK.

Hoover, Alan L., 2000. *Nuu-chah-nulth Voices, History, Objects and Journeys*, Royal British Columbia Museum, Victoria, Canada.

Jewitt, John, 1987. *White Slaves of the Nootka*, Heritage House, Surrey, Canada.

McMillan, Alan D., 1999. *Since the Time of the Transformers*, UBC Press, Vancouver, Canada.

Mozino, Jose M., 1792. *Noticias de Nutka*, Douglas and McIntyre Ltd., Vancouver, Canada.



# INTRODUCTION

## 3. Introduction

### 3.1. Research statement

This research is a co-produced collaboration between the Salmon Watersheds Lab at Simon Fraser University and Uu-a-thluk, the fisheries program of the Nuu-chah-nulth Tribal Council. The research aims to support the Nuu-chah-nulth Council of *Ha'wiih* (Hereditary Chiefs) and Nuu-chah-nulth Nations in taking care of salmon and to advance Nuu-chah-nulth rights and self-determination.

### 3.2. Research context

#### *The Nuu-chah-nulth Nations*

The Nuu-chah-nulth Tribal Council consists of 14 Nuu-chah-nulth First Nations that work together to deliver core programs, administration, and political advocacy. The research presented in this report contributes to the aquatic resources management program of Uu-a-thluk and shares the goals of the Tribal Council, which are:

- To advance and protect the *ha-ha-houlthee* (territories) of the Nuu-chah-nulth *Ha'wiih* (Hereditary Chiefs)
- To pursue self-determination
- To promote the betterment, prosperity, and well-being of the Nuu-chah-nulth people
- To advance Nuu-chah-nulth culture, language, beliefs, and way of life

The 14 member Nations of the Nuu-chah-nulth Tribal Council are split into three regions as follows:

#### ***Southern Region***

Niitiinaʔath (Ditidaht)

Huuʕiiʔath (Huu-ay-aht)

Huupačasʔath (Hupacasath)

Ćišaaʔath (Tseshah)

Huučuqʕisʔath (Uchucklesaht)

#### ***Central Region***

ʕaahʕuusʔath (Ahousaht)

Hiškʕiiʔath (Hesquiaht)

ʕaʔuukʕiʔath (Tla-o-qui-aht)

Tukʕaaʔath (Toquaht)

Yuufuʔitʔath (Ucluelet)

#### ***Nothern Region***

ʔiihʕatisʔath (Ehattesaht)

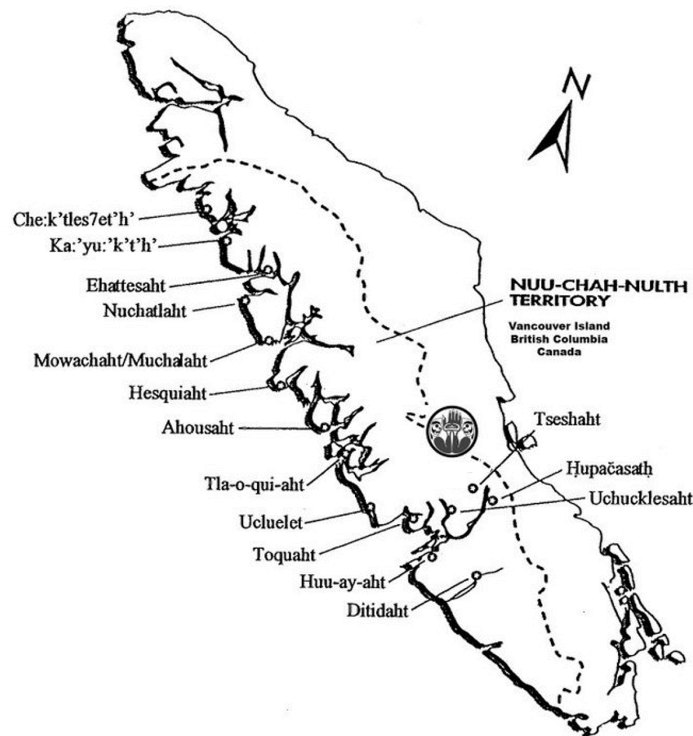
qaayuukʕath/čiiqʕisʔath (Kyuquot/Checlesaht)

Muwačath/mačʕaath (Mowachaht/Muchalaht)

Nučaafʔath (Nuchatlaht)

### *Nuu-chah-nulth ha-ha-houlthee*

The *ha-ha-houlthee* (traditional Chiefly territories) of the *Ha'wiih* of the 14 Nuu-chah-nulth First Nations affiliated with the Nuu-chah-nulth Tribal Council make up the majority of the West Coast of Vancouver Island (WCVI) (Figure 1). Nuu-chah-nulth *Ha'wiih* traditionally own and are responsible for stewarding the *ha-ha-houlthee* for present and future generations. The *ha-ha-houlthee* incorporates all living and non-living things, including people, lands, rivers and the sea, and all animal and plant life. Nuu-chah-nulth peoples have sustainably stewarded their *ha-ha-houlthee* since time immemorial. Settler colonialism has removed Nuu-chah-nulth people from their traditional stewardship role, and sought to remove all traditional governance, culture, and *Nuu-chah-nulth-aht* (Nuu-chah-nulth people) access to the natural resources of the *ha-ha-houlthee*. Since contact with European colonialists, the state of the *ha-ha-houlthee* and the resources that *Nuu-chah-nulth-aht* rely on have been significantly eroded.



**Figure 1. A map of the Nuu-chah-nulth ha-ha-houlthee, showing the traditional territories of the Chiefs of the Nuu-chah-nulth Nations affiliated with the Nuu-chah-nulth Tribal Council. The Pacheedaht and Makah Nations are also Nuu-chah-nulth but not affiliated with the Nuu-chah-nulth Tribal Council (Source: adapted from a Nuu-chah-nulth Economic Development Corporation map).**

### *Nuu-chah-nulth stewardship and governance*

Nuu-chah-nulth Nations have stewarded their *ha-ha-houlthee* using highly developed systems of governance and knowledge for millennia. Nuu-chah-nulth governance systems are based on laws and a Hereditary system of leadership, ownership, and power within each Nation, which defined the distributional allocation of natural resources, among other things, within the *ha-houlthee* (Atleo, 2021).

The Hereditary leadership system consists of the *Tyee Hawilth* (senior ranking Hereditary Chief), who owns all the land and waters of their *ha-houlthee* (traditional territory), several lower-level *Ha'wiih* (Hereditary Chiefs) that are granted use of resources by the *Tyee Hawilth* in specific locations, and *muschim* (commoners/citizens), who are occasionally granted use of specific place-based resources by the *Tyee Hawilth*. *Ha'wiih* use ceremonies to distribute resources within their community and to share and trade with other Nations. Nuuchahnulth knowledge, encompassing place-based lessons learned from connecting with the natural world over thousands of years, is passed through the generations and employed in stewardship decisions. Nuuchahnulth language, storytelling, art, song, dance, and symbols are vessels of Nuuchahnulth knowledge, culture, and laws.

### *Hishuk-ish tsawak*

The Nuuchahnulth worldview, or perspective, of *hishuk-ish tsawak* means that everything is one and is “inclusive of all reality, both physical and metaphysical” and stems from Nuuchahnulth origin stories, predating modern western scientific ontological ideas (Atleo, 2005, 2012). Consequently, harm to one aspect of the *ha-ha-houlthee* will connect with another aspect of the *ha-ha-houlthee*. Accordingly, a single part of the system, be it people, other life, or the forest, rivers, and sea that life rely on, cannot be considered in isolation. For instance, through the *hishuk-ish tsawak* worldview, it is inherent that harm to salmon will impact people, other animals, and plant life. Together with Nuuchahnulth values, for example *uu-a-thluk* (taking care of) and *iisaak* (respect with caring), *hishuk-ish tsawak* has always, and continues to be core to the successful stewardship of the *ha-ha-houlthee* (Figure 2).

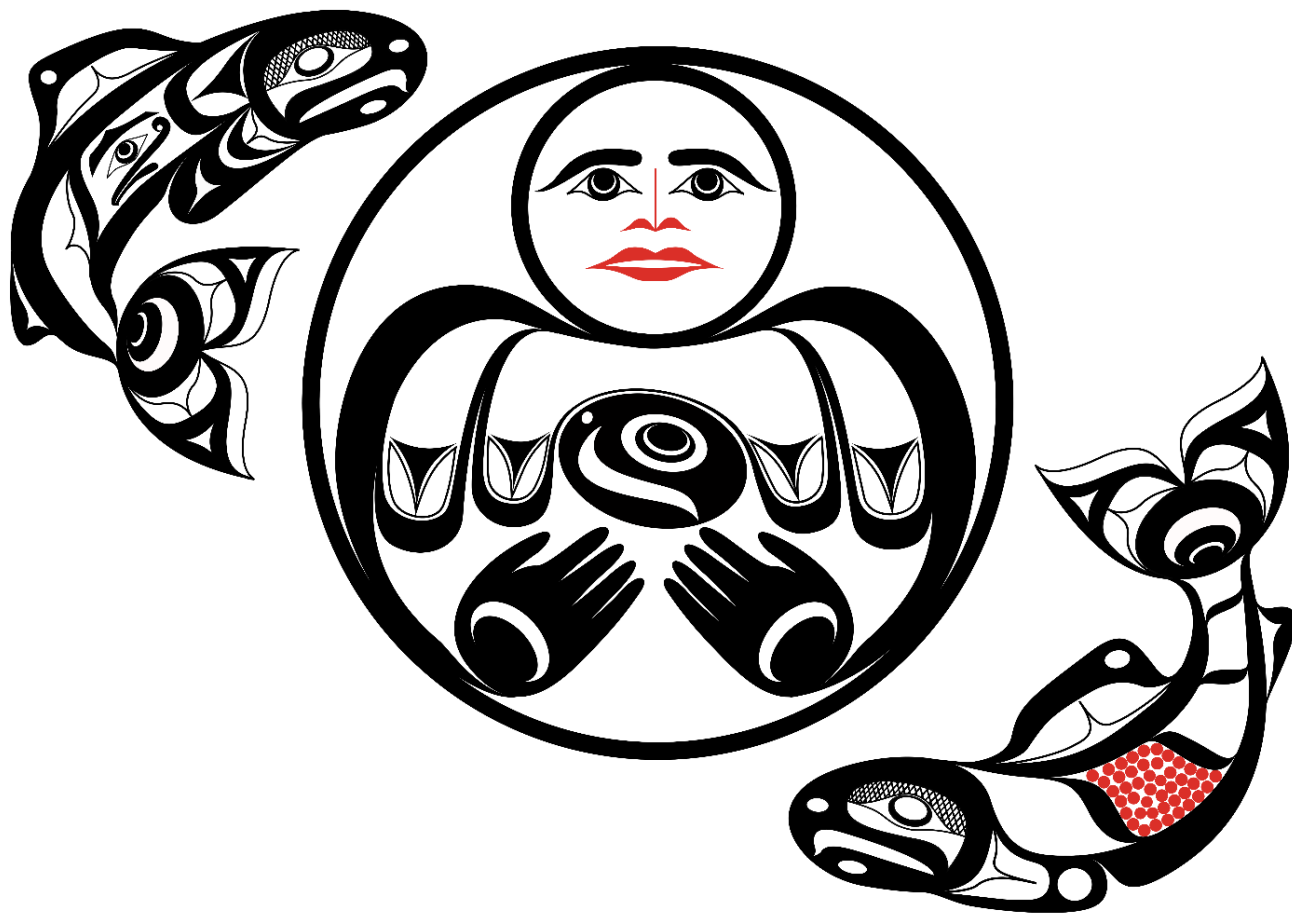
### *Nuuchahnulth and salmon*

The *ha-ha-houlthee* of the 14 Nuuchahnulth Tribal Council member Nations is a rich combination of ecosystems that has traditionally supported all species of Pacific salmon and Steelhead trout. Salmon have always been a foundation of Nuuchahnulth life, being fundamental to food, health, social processes, and ceremony. These connections mean that *Nuuchahnulth-aht* are inseparable from the *ha-ha-houlthee* and the salmon that call it home. Before European colonialism impacted Nuuchahnulth societies, the Nations were wealthy in the abundance of resources that sustained them, natural systems were fully functioning and intact, with abundant salmon populations and healthy watersheds.

### *Colonial impacts to salmon*

In the 250 years since first contact with Europeans, Nuuchahnulth salmon populations have been depleted to a fraction of their pre-contact abundance. During the same period, European settlement and colonialism in the *ha-ha-houlthee* first introduced diseases that killed an estimated 80% of Northwest Pacific Indigenous, including Nuuchahnulth, peoples (Boyd, 1999), then took control of the majority of the *ha-ha-houlthee*, before systematically attempting to eradicate Nuuchahnulth governance, knowledge, culture, worldview, and values through policies including residential schools and removing access to traditional ways of life. At the same time as Canadian colonialism was removing Nuuchahnulth children from their families and communities to residential schools, the rights of Nuuchahnulth *Ha'wiih* to steward their traditional territories were taken away. Despite colonial impacts, Nuuchahnulth Nations have retained traditional knowledge, governance, worldview, and values. The suppression of Nuuchahnulth rights to steward their traditional territories using traditional laws, and the colonial systems that took their place, have directly contributed to the decline in wild Nuuchahnulth salmon populations (Atleo, 2021).





*Figure 2. 'Hishuk-ish Tsawak', was created by Nuuchah-nulth artist Joshua Watts to provide Nuuchah-nulth context to this research. Joshua described the piece of art as follows, "The core value that is shared by all Nuuchah-nulth people is that everything is one. To represent the belief of Hishuk-ish-tsawak, this piece has a central figure of one of the moon sisters. Nuuchah-Nulth people recognize the many different moons that appear throughout the annual cycle of seasons. Inside the hands of the moon, she is holding a salmon egg. This communicates the important relationship between the moon, the tides, and the life cycle of salmon. Through their connection, the salmon move through their journey of life. The Nuuchah-Nulth people have been taught this for many generations, and with respect we have created a sacred fisheries structure within our Ha-Houlthee, and within our governance. One relationship not of resource exploitation, but accountability, and respect for the salmon. Encircling the sister moon and the salmon egg is a pair of salmon, one female and one male. They are encircling and watching the life of this salmon egg to assure that their life is being respected, and that the agreement is still being honored to this day. Nuuchah-Nulth history shares that many moons ago the salmon stopped running. This was due to overfishing, and disrespect to their way of life. Before they would come back to our watersheds an agreement needed to be made. Our people agreed to return the bones of the salmon to the water after we eat them, and so the salmon ceremony began."*

### *Nuu-chah-nulth stewardship and rights resurgence*

Nuu-chah-nulth Nations are active in asserting their rights and responsibilities, including taking care of salmon and the *ha-ha-houlthee*. The Nuu-chah-nulth *Ha'wiih* from all 14 Nations come together several times a year as the Council of *Ha'wiih* to discuss fisheries-related topics and to make decisions that inform fisheries management as carried out by individual Nations and DFO. Nuu-chah-nulth rights have been affirmed through direct action, legal action, and through economic means. The Clayoquot Sound logging protests that began in 1984, led by Tla-o-qui-aht First Nation, reduced forestry activity in the area and increased Nuu-chah-nulth voices in forestry decisions. This action not only halted commercial logging on Meares Island but led to the province of British Columbia (BC) turning over tree licenses to Nuu-chah-nulth Nations. Nations have had to resort to legal action where the Federal government has not recognized Nuu-chah-nulth rights to access their own resources. Most prominently, several judicial decisions, the most recent in February 2021, have affirmed the rights of five Nuu-chah-nulth Nations (Ahousaht, Ehattesaht, Hesquiaht, Mowachaht/Muchalaht and Tla-o-qui-aht) to fish commercially in their traditional territories (T'aaq-wiihak Fisheries). Furthermore, Ehattesaht First Nation has recently successfully challenged the Mineral Tenures Act in court, the outcome from which requires those staking mineral claims to consult with First Nations. Huu-ay-aht First Nation's partial acquisition of Tree Farm License 44 (a venture now known as C'awak ?qin) provided the platform for the creation of a new Indigenous-led forestry planning process, which launched in 2022.

### *Nuu-chah-nulth individual Nation and collective governance*

Nuu-chah-nulth governance varies by Nation. Under the Indian Act, the traditional governance model of Nuu-chah-nulth Nations was replaced by a western elected Chief and Council system. In some Nations, the Chief and Council are also *Ha'wiih*. In 2011, five Nuu-chah-nulth Nations (Huu-ay-aht, Uchucklesaht, Toquaht, Kyuquot/Checlesaht and Yuu?i?ath) signed the Maa-nulth Treaty Final Agreement, which removed them from the Indian Act and created a future of self-government and economic independence. The Nuu-chah-nulth Tribal Council (NTC), which centralises selected administration functions and specific programs for the 14 Nations, was established in its current form in 1979. One of the programs run by NTC is called Uu-a-thluk, which provides fisheries policy and technical support to the Nuu-chah-nulth Nations. Each Nation stewards and manages its own territory and resources, including fisheries.

### *Non-Nuu-chah-nulth governance*

Other natural resource governance forums exist in the *ha-ha-houlthee* of the Nuu-chah-nulth *Ha'wiih* that are not led by Nuu-chah-nulth Nations. Key fora are the West Coast Vancouver Island Salmon Roundtables, which are funded by the Department of Fisheries and Oceans Canada (DFO) and facilitated by West Coast Aquatic, a local environmental consultancy. The Salmon Roundtables convene local rightsholders and stakeholders in distinct areas along the West Coast of Vancouver Island to cooperate in providing place-based commercial and recreational salmon fisheries stewardship and management recommendations to DFO.

### *Recognition of the rights of Indigenous peoples*

Indigenous peoples in Canada have faced oppression, discrimination, and disenfranchisement from a variety of colonial policies and legislation at the Federal and Provincial scale since confederation. Legislation dating back to the Constitution Act of 1867 and the first Indian Act of 1868 have sought to subjugate Indigenous peoples and destroy their culture, knowledge, and rights. One of the many

harmful impacts of the Indian Act has been to remove Indigenous peoples from decision-making relating to their own territories and resources. Furthermore, Indigenous participation in stewarding their territories and resources within existing colonial governance structures has been harmed by other colonial forces. A particularly insidious colonial force acting against Indigenous peoples in Canada is the tyranny of Euro-centric ideas of what exists and how we can know things, for example reductionism. The Euro-centric knowledge hegemony is used to exclude Indigenous peoples from decision making and planning. As such, Indigenous peoples in Canada today face epistemic injustice, whereby an individual is “wronged specifically in their capacity as a knower, wronged therefore in a capacity essential to human value” (Fricker, 2007). As the rights of Indigenous peoples to steward their own territories are revived, so the need increases for Indigenous voices, ways of knowing, and knowledge to be heard, respected, and honoured.

Placing Indigenous rights in Canada at the centre of land, water, and resource management and planning in their territories is increasingly recognized as a moral necessity and acknowledged in law. Progress is being made to advance Indigenous rights through legislation, building on the affirmation of existing treaty rights in Section 35 of the Canadian Constitution Act 1982. The rights of Indigenous peoples to steward their own lands, waters, and natural resources, irrespective of treaty status, have been recognized in Canada through federal (United Nations Declaration on the Rights of Indigenous Peoples Act) and provincial (Declaration on the Rights of Indigenous Peoples Act (DRIPA)) laws, following the United Nations Declaration on the Rights of Indigenous Peoples. The province of BC is beginning to recognize the right of First Nations to make meaningful decisions about their territories through formal statutory joint decision-making agreements under the Declaration on the Rights of Indigenous Peoples Act, the first of which was signed with the Tahltan Central government in 2022 (Tahltan Central Government and Province of BC, 2022). Despite Canadian law beginning to recognize the rights of Indigenous peoples, the application of these laws and progress in eradicating wider colonial barriers to Indigenous Nation stewardship of their territories remains uncertain.

### *Risks to Nuu-chah-nulth salmon*

As Nuu-chah-nulth Nations prepare for a future in which their rights to steward the *ha-ha-houlthee* are increasingly recognized and enacted, understanding the risks that Nuu-chah-nulth salmon (salmon that call the *ha-ha-houlthee* home, and spawn and rear in the *ha-ha-houlthee*) face is useful to informing how the *Ha'wiih* and individual Nations steward salmon systems. There is no one accepted definition of risk, but candidate definitions often include uncertainty around an activity or event that may cause a negative outcome for something that humans value (Aven et al., 2018). The Intergovernmental Panel on Climate Change’s conceptualization of risk, when applied to salmon, is that it is a function of the *exposure* of salmon to a *hazard*, and the *vulnerability* of salmon to the hazard, where *vulnerability* is a function of *sensitivity* of salmon to the threat, that is to say the degree to which salmon would be harmed by the threat, and salmon’s *adaptive capacity* (Reisinger et al., 2020). The idea that risk should be defined through a systems-based approach and in part as a function of the state of the system (Haines, 2009) mirrors the Nuu-chah-nulth worldview of *hishuk-ish tsawak*.

Recent Canadian government efforts to document threats to Nuu-chah-nulth salmon for use in policy and decision making have been pursued through DFO’s implementation of Canada’s Wild Salmon Policy. Freshwater and marine risk assessments have been carried out in the *ha-ha-houlthee* in recent years by DFO, using the Risk Assessment Method for Salmon (RAMS) process (Hyatt et al., 2017). The RAMS process employs ecological and biological scientific evidence for the “diagnosis of factors driving state

changes for populations or CUs (Conservation Units) of interest, as well as to identify management intervention actions that may be effective in avoiding, stabilizing or (less commonly), reversing a decline." (DFO, 2019). Despite this progress, threats to Nuu-chah-nulth salmon are only partially understood, particularly when considered from a diverse, holistic, and systemic perspectives.

More completely documenting risks to Nuu-chah-nulth salmon is an urgent need, given their precarious state. Remaining gaps in this endeavour include: hearing Nuu-chah-nulth voices and perspectives; reflecting Nuu-chah-nulth knowledge, values, and worldview; identifying cumulative effects of multiple threats over time and place; acknowledging the historic healthy baselines from which Nuu-chah-nulth salmon have declined; and identifying the originating source of threats and the pathways by which they harm salmon. Upholding Nuu-chah-nulth knowledge, as well as non-Indigenous knowledge, can provide the fullest evidence of the risks that Nuu-chah-nulth salmon face but also identify potential points of connection between Nuu-chah-nulth salmon rights holders and non-Indigenous stakeholders. A more complete picture of risks to salmon can support the Council of *Ha'wiih* and Nuu-chah-nulth Nations in taking care of salmon and advance Nuu-chah-nulth Nations' rights to self-determination and to steward the *ha-ha-houlthee*.

### *Connections between salmon declines and harm to local communities*

*Nuu-chah-nulth-aht* and salmon are interconnected, and so by corollary, risks to salmon are risks to *Nuu-chah-nulth-aht*. Understanding these connections, and how past and present declines in salmon have impacted *Nuu-chah-nulth-aht*, is important to demonstrate the urgent need to steward Nuu-chah-nulth salmon systems effectively. Furthermore, social outcomes from salmon declines in turn affect decision making relating to salmon, thereby influencing salmon outcomes further. Given the *ha-ha-houlthee* is shared by Nuu-chah-nulth and non-Indigenous peoples, there is also value in understanding how salmon declines have affected non-Indigenous communities.

### *Research goals*

This research seeks to address the needs outlined above. Namely, to provide a Nuu-chah-nulth centred view of threats to salmon, and to identify community impacts from salmon declines. The research provides a qualitative assessment of threats to Nuu-chah-nulth salmon centring Nuu-chah-nulth worldview, voices, and knowledge using a de-colonized research methodology. Importantly, the research does not seek to, nor does claim to, provide the view of Nuu-chah-nulth Nations or the Council of *Ha'wiih*. The specific goals were to support the Council of *Ha'wiih* and individual Nuu-chah-nulth Nations in taking care of salmon by:

- (1) identifying threats to Nuu-chah-nulth salmon (salmon that spawn in the *ha-ha-houlthee*) and how each threat harms salmon.
- (2) describing cumulative effects risks to Nuu-chah-nulth salmon.
- (3) documenting harm to communities, and other life, in the *ha-ha-houlthee* caused by Nuu-chah-nulth salmon declines.

### 3.3. The Nuu-chah-nulth *ha-ha-houlthee*

This research is inherently place-based. To support readers in understanding where places that are described throughout this report are located, a map of key locations is provided (Figure 3).



Figure 3. A map of locations described in this report (satellite image credit: Google Earth).

The Nuu-chah-nulth *ha-ha-houlthee* on the west coast of Vancouver Island contains some of Canada’s most iconic and rich ecosystems. The *ha-ha-houlthee* has a mild mid-latitude temperate climate and is exposed to prevailing warm, westerly weather systems. Precipitation falls as rain at the lower and mid elevations, with most of these areas of the *ha-ha-houlthee* receiving >3000mm per year on average (Guthrie, 2005). Hucuktlis Lake, which is in the *ha-houlthee* of the Uchucklesaht First Nation to the south-west of Port Alberni receives an average of over 7 metres of rain per year (Environment and Climate Change Canada, 2023). As the beaches, long inlets and fjords give way to the higher elevations of the Beaufort Mountain range, which runs north-west to south-east through the middle of the island and reaches 2200m in elevation, precipitation may fall as snow.

The *ha-ha-houlthee* is home to fjords, and many short, steep watersheds that have historically supported five species of Pacific Salmon and steelhead trout (in Nuu-chah-nulth: sa-tsup/suuḥaa – (Chinook), hin-kuu-as (chum), tsu-wit (coho), chaapltḥ (pink), hisit/mii-aht (sockeye), ki-wah (steelhead trout); in western science: anadromous *Oncorhynchus* spp.). Several large lakes exist within these watersheds, and at least seven of these have traditionally sustained sockeye populations, including:

Muchalaht Lake in the *ha-houlthee* of Mowachaht-Muchalaht First Nation; Sproat and Great Central Lakes in the *ha-houlthee* of Hupacasath First Nation; Hobiton Lake in the *ha-houlthee* of Ditidaht First Nation; Hucuktlis Lake in the *ha-houlthee* of Uchucklesaht First Nation; Megin Lake in the *ha-houlthee* of Ahousaht First Nation; and Kennedy Lake in the *ha-houlthee* of Tla-o-qui-aht First Nation.

The *ha-ha-houlthee* supports a variety of marine life that sustained Nuuchahnulth communities including cod, halibut, flounder, herring, geoduck and butter clams, barnacles, cockles, tanner and dungeness crab, prawn, dog fish, humpback and sperm whale, sea otter, hair seal (also known as harbour seal), and sea lion. Terrestrial mammals found in the *ha-ha-houlthee* include black bears, cougars, grey wolf, deer, and elk. The *ha-ha-houlthee's* watersheds contain numerous plant and tree species including thimbleberry, cow parsnip, salmon berry, salal berry, cascara, yew, coast redwoods, western red cedar, western hemlock, as well as firs and sitka spruce (Foster, 1979; George, 2003).

The *ha-ha-houlthee* is often described with reference to the sounds that lie along its coastline. From north to south, these are Kyuquot Sound, Nootka Sound, Clayoquot Sound, and Barkley Sound (Figure 3). Each sound contains steep-sided fjord inlets and islands, including: Union Island in Kyuquot Sound; Nootka Island in Nootka Sound; Meares Island, Flores Island, and Vargas Island in Clayoquot Sound; and the Broken Group of islands in Barkley Sound. Three major DFO salmon production hatcheries are situated in the *ha-ha-houlthee* at Nitinat River, Robertson Creek, and Conuma River (Figure 3). These hatcheries enhance Chinook, coho, and chum salmon, with millions of young salmon released annually.

### **3.4. Positionality**

The first four authors are non-Indigenous researchers who, as allies, were working for, or seeking to further, the rights and equity of Nuuchahnulth First Nations at the time of the research. All other authors are Nuuchahnulth or non-Indigenous research participants who played a critical role in contributing their knowledge to the research and comments on the manuscript. As non-Indigenous authors, we undertook this work in the recognition and spirit of the responsibility we have to Nuuchahnulth Nations, leaders, collaborators, and colleagues. When analysing, thinking, and writing about the knowledge shared by Nuuchahnulth participants we were deliberately mindful of the western colonial biases inherent in our own lived experiences. In so doing, we sought to see and understand the issues at hand through the lens of Nuuchahnulth values and worldview, which developed as we learned further from the knowledge shared as the research progressed. We are conscious not to seek to speak for Nuuchahnulth people, but to analyse and represent the perspectives shared with us faithfully and transparently as we promised knowledge holders we would. As non-Indigenous people, we acknowledge that our description of Nuuchahnulth values and worldview is inherently incomplete and refer the reader to the body of Nuuchahnulth authors' work (e.g., see (Atleo, 2006; Atleo, 2005, 2012; Atleo, 2021; Coté, 2010, 2022; George, 2003; Happynook, 2022)).



# METHODS

## 4. Methods

### 4.1. Research partnership and co-production

The authors of this report have endeavoured to carry out this research in a de-colonized way and in the spirit of reconciliation that furthers Nuu-chah-nulth rights and self-determination. The research has been conceptualized, designed, and delivered using the principle of co-production through a partnership between Uu-a-thluk, the fisheries program of the Nuu-chah-nulth Tribal Council, and the Salmon Watersheds Lab at Simon Fraser University. During the Spring of 2021, Eric Angel (Uu-a-thluk, Nuu-chah-nulth Tribal Council) and Nigel Sainsbury (Salmon Watersheds Lab, Simon Fraser University) found common ground in seeking to better understand the causes of declining salmon populations in the Nuu-chah-nulth *ha-ha-houlthee*. This need was emphasized by unique river and stream salmon population declines being apparently ignored by the Federal government. Several principles for the research were agreed from the outset: that Nuu-chah-nulth voices, values, and worldview would be given centre stage; that the research would strive for the highest ethical standards, including in terms of research protocols, Indigenous Data Sovereignty, and being non-extractive; that all research participants contributing their knowledge through interviews and focus groups would be offered the opportunity to co-author the outputs; and that the research would only commence with the permission of the Council of *Ha'wiih*.

### 4.2. Research paradigm

This research seeks to contribute to the need for Nuu-chah-nulth-centred assessment of risk to salmon with Nuu-chah-nulth voices placed at the fore with complementary non-Indigenous contributions. As such the research paradigm adopted for this research had to have particular characteristics.

The first characteristic related to how the research deals with knowledge and worldviews. Definitions of knowledge types were adapted from Reid et al. (2022)'s summary, and are reproduced in Table 1. All knowledges and the manner in which knowledge is created were treated as being of equal value, irrespective of the identity of the individual or groups that created the knowledge or how the knowledge was created. Similarly, the history, culture, spirituality, and relationships that underpin individuals' knowledge were respected and valued. The research did not consider knowledge as being one of Indigenous or western or assume that Indigenous knowledge is only traditional knowledge and non-Indigenous knowledge is only scientific knowledge. Rather, the research recognised that Indigenous knowledge can take many forms, including traditional, western scientific, or local ecological. The research also acknowledged that non-Indigenous knowledge can be western scientific or local ecological, but not traditional. The research was carried out on the basis that these knowledges are complementary and when considered together create a more powerful

#### **Definitions of research participants**

##### **Nuu-chah-nulth knowledge holders:**

Members of Nuu-chah-nulth First Nations and experts in salmon and the *ha-ha-houlthee*, holding traditional, local ecological, and or scientific knowledge.

**Non-Indigenous experts:** Western settler people with local ecological or scientific knowledge of salmon and the *ha-houlthee*.



evidence base from which to understand risks to salmon and impacts to other life from salmon declines.

Second, the research was carried out in a culturally appropriate manner, with semi-structured interviews and focus group discussions that allowed Nuu-chah-nulth knowledge holders and experts (Nuu-chah-nulth First Nation members whose salmon knowledge may be traditional, local ecological, or scientific — ‘knowledge holders’ from hereon) and non-Indigenous experts the freedom to define risks to salmon and community impacts using their own worldviews and perspectives.

**Table 1. Definitions of knowledge types, adapted from Reid et al. (2022).**

Key Term	Definition
Western science	Scientific knowledge with roots in the philosophy of Ancient Greece and the Renaissance, favouring reductionism and physical law <sup>1</sup>
Indigenous knowledge	Knowledge created and/or mobilized by Indigenous Peoples that may include Traditional Knowledge and scientific knowledge <sup>2</sup>
Scientific knowledge	Systematic enterprise that gathers and condenses knowledge into testable laws and principles <sup>3</sup>
Traditional knowledge	Longstanding knowledge, practice, and belief, developed from experience gained over centuries (or millennia) and adapted to the local culture and environment, handed down through the generations. Traditional ecological knowledge specifically relates to the relationship between living things (including humans) with one another and with their environment <sup>4</sup>
Local ecological knowledge	Knowledge, practices, and beliefs shared between resource users relating to ecological relationships acquired through interaction with and personal observation of local ecosystems, which over centuries may become Traditional ecological knowledge <sup>5</sup>

**Note:** Sources: <sup>1</sup> Wilson EO., 1999; <sup>2</sup> Arsenaault et al., 2018; <sup>3</sup> Wilson, 1999; <sup>4</sup> Berkes, 2018; <sup>5</sup> Charnley et al., 2007.

Third, the research is based on the established idea that novel insights can be generated by eliciting a wide range of qualitative expert perceptions relating to a complex problem where there is a lack of documented evidence. Furthermore, the research considers that these insights can be used to inform salmon stewardship decisions. Inherent in this approach is that perceptions may differ between experts. As such, conflict of knowledge may emerge from the research whereby experts disagree on specific issues, which can be of use by informing further dialogue between rights and stakeholders. The research is also informed by a Nuu-chah-nulth worldview, namely that *hishuk-ish tsawak*/everything is one (as opposed to the reductionist and siloed position of western science).

Fourth, the research seeks to reflect the Nuu-chah-nulth values of *iisaak*, *uu-a-thluk*, and the reciprocity and responsibility of the research team to research participants and the Nuu-chah-nulth *Ha’wiih*.

### **4.3. Methodology**

The research employed semi-structured interviews and focus groups separately with Nuu-chah-nulth knowledge holders and local non-Indigenous experts to elicit their perceptions of risks to Nuu-chah-nulth salmon and perspectives on harm to local communities from salmon declines. The interview guide (Table 2) was designed to anchor discussions around the three key research aims (see Section 3.2), while

also allowing the interviewer to pursue relevant additional areas raised by research participants. Interviews concluded with the opportunity for interviewees to ask their own questions about the research. When all interviews were complete and analysed, interviewees were invited to separate focus group meetings for Nuu-chah-nulth knowledge holders and non-Indigenous experts to invite feedback and reflections on the initial results. Knowledge holders and non-Indigenous experts were treated as separate groups and only heard their own results in the focus group meetings.

**Table 2. Interview guide**

Section	Research aim	Main question
1	Indicators of salmon status in your local watersheds	To begin with, could you please tell us about the salmon and their watersheds in the <i>ha-houlthee</i> of your <i>Ha'wiih</i> ?
		What is it about salmon in the watersheds in the <i>ha-houlthee</i> of your <i>Ha'wiih</i> that indicates how well they are doing?
2	Identify harmful activities/climate change	Have human activities/climate change harmed salmon in the <i>ha-houlthee</i> of your <i>Ha'wiih</i> ? If so, please tell me about these activities.
		When did these activities/climate change start?
		How have the activities/climate change changed since then?
		Are you worried about how changes to these activities might cause further harm to salmon in future?
		Are there any new activities that you are concerned may take place in the future that would harm salmon?
		As interviews accumulate, ask about common land or marine activities raised by other interviewees.
3	How each threat harms salmon	How has <activity/climate change> affected salmon?
		How have salmon changed as result of <activity/climate change>?
		Does the degree of harm differ by salmon species?
		What is it about <activity/climate change> that makes you concerned for salmon? Is this the same for all species of salmon?
4	Harm to communities in the <i>ha-ha-houlthee</i> caused by salmon declines	Have salmon declines affected you? If so, how?
		Have salmon declines affected your community? If so, how?
5	Cumulative effects risks to Nuu-chah-nulth salmon	Have you seen an accumulation of harm to salmon over time from any of the activities you have discussed?
		Are the effects on salmon from one threat you have discussed made worse by the effects from another threat?

For the purposes of this research, Nuu-chah-nulth knowledge holders were defined as Nuu-chah-nulth Nation members with deep knowledge of Nuu-chah-nulth salmon. As participation was not restricted by knowledge type, participant knowledge holders included *Ha'wiih*, elected councillors, elders, managers, technicians, scientists, and fishers. 22 Nuu-chah-nulth knowledge holders from all the Nuu-chah-nulth Nations except Toquaht were interviewed. All interviews were conducted with one knowledge holder per interview except one interview with three knowledge holders and two interviews with two knowledge holders. Interviews were held at a location of the knowledge holders' choice.

Non-Indigenous experts were defined as individuals with deep rooted local knowledge of Nuu-chah-nulth salmon, community connections to salmon, and the *ha-ha-houlthee*. As the expertise of non-Indigenous experts was inherently place-based, the non-Indigenous sample of experts was geographically stratified so that perspectives covered as much of the *ha-ha-houlthee* as possible. In addition, the non-Indigenous sample of experts was stratified by their primary connection to salmon (Table 2). Some non-Indigenous experts had multiple connections to salmon in the *ha-ha-houlthee*. For instance, they may have been primarily identified to participate because of knowledge gained through recreational fishing but incidentally were employed in forestry, another sector relevant to the research. 18 non-Indigenous experts were interviewed, with one expert per interview. The sampling approach for all participants sought to maximize diversity in terms of age, gender, and (for non-Indigenous participants) race. Interviews were carried out until theoretical saturation was reached (no new analytical themes emerged).

**Table 3. Non-Indigenous expert sample primary connections to salmon**

Primary connection to salmon	Number of participants
Recreational fishing sector	5
Scientist or manager employed by Federal government	3
Enhancement	3
Scientist employed by a First Nation	3
Local and regional government	2
Commercial fishing sector	1
Environmental NGO	1

13 of the Nuu-chah-nulth knowledge holders and seven of the non-Indigenous experts attended their respective focus group meetings to provide comments on the draft results. The structure of the meetings involved several sections, each containing a presentation of draft results followed by facilitated group discussions to elicit comments and feedback. Attendees were encouraged to respond to each other's comments to generate group discussion. Participants were offered honoraria in line with Nuu-chah-nulth Tribal Council honoraria rates for their interview and attending the focus group meeting.

Participants were given the freedom to define the scope of threats to salmon and impacts of salmon declines through their own knowledge and perspectives. Interviewees were not restricted in the salmon species, the threats, the locations in the *ha-ha-houlthee*, or the timeframes that they could discuss. Hence, the research was intimately shaped by the interviewees and the results emerge through a process of their participation. The data were analysed using inductive thematic coding in Nvivo (QSR International Pty Ltd., 2020) as interviews were carried out. Nigel Sainsbury performed all coding and Eric Angel carried out coding of a data sub-set, which validated the coding hierarchy.

#### **4.4. Research protocol**

Uu-a-thluk (Eric Angel) and the Salmon Watersheds Lab (Nigel Sainsbury and Jonathan Moore) presented the research context, concept, method, and reporting process to the Council of *Ha'wiih*

Forum on Fisheries in June 2021. The Council approved the research. Research progress presentations were then given to the Council of *Ha'wiih* Forum on Fisheries in October 2021 and June 2022. Before the research process commenced, the research – methods, materials (including research participant recruitment materials), process (including free and informed consent process) – was approved by the Simon Fraser University Human Research Ethics Board (HREB) (#30000484) in August 2021, and renewed in August 2022. Nigel Sainsbury completed the associated training (Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2) – Course on Research Ethics). Participant recruitment began after approval from the SFU HREB.

Prospective knowledge holder participants were identified through Uu-a-thluk. Where knowledge holders could not be identified for a Nation, the individual Nations were asked to propose knowledge holders. The majority of Nuu-chah-nulth knowledge holder interviews took place in the *ha-ha-houlthee* and remotely from October to November 2021, with two interviews conducted remotely in April 2022. Non-Indigenous experts were identified by Uu-a-thluk through the West Coast Vancouver Island Salmon Roundtables. Where experts were not available for a location in the *ha-ha-houlthee*, snowball sampling (where existing participants were asked to recommend other experts) was employed and nominees were validated by Uu-a-thluk. Non-Indigenous expert interviews were carried out remotely in February, March, and April 2022.

All interviews were recorded with permission of the interviewees. As the research held that participants owned their own data and provided their permission for the research team to use it only for the period of research, each interviewee received their interview recording and transcript in digital (and hard copy where requested) and the research team permanently deleted all participant data when the research outputs were complete. Where research participants consented, interview transcripts were made available to the Nuu-chah-nulth Tribal Council to be held in perpetuity only for education and research purposes.

With the attendees' consent, the focus group meetings were recorded, and then transcribed and analysed. Meeting participants received a transcription of the meeting they attended. The research team permanently deleted the meeting recordings and transcripts when the research outputs were complete. With the consent of meeting attendees, the meeting transcripts were shared with the Nuu-chah-nulth Tribal Council for educational and research use in perpetuity. After the final data analysis was complete and this report drafted, the core research team engaged with the individual Nations of which participants were members and with all research participants. The draft report was shared with the 13 Nations from which knowledge holders participated. Nuu-chah-nulth knowledge holders participated on the basis that they were providing their own unique personal views and not representing the views of their own Nation, or that of other Nations. All quotes used in the results section of the report are anonymized unless a participant requested attribution, in which case participants chose their attribution. All research participants were invited to co-author the outputs through reviewing and commenting on the draft report. Participants that chose not to be an author of the report were given the option to be mentioned in the report acknowledgements. Before the report was finalized, it was shared with individual Nuu-chah-nulth Nations and meetings held with Nations where possible. During these meetings, the Nations shared their perspectives on the research, and emphasized select results relevant to them. Ahousaht First Nation chose to withdraw their participation from the study at this stage and consequently one Ahousaht interviewee chose to withdraw their participation.

#### **4.5. Study limitations**

The choices made in research design inherently require trade-offs, thus all research has limitations. The study's findings are not generalizable across Nuuchahnulth Nations or outside of the *ha-ha-houlthee*, because the expert knowledge on which the study is based is rooted in place. However, those stewarding salmon watersheds outside the *ha-ha-houlthee* in BC, and more widely, may find some of the insights transcend place and are of use more broadly. It does not follow that because a threat to salmon was described generally or for a specific Nation's *ha-houlthee* that the threat also exists in other Nations' *ha-ha-houlthee*. Similarly, not all social impacts described necessarily relate to all Nuuchahnulth people or Nations. Although interviews were carried out until no new themes emerged from additional interviews, restrictions in research resources and the availability of experts for each Nation's *ha-houlthee* meant that the results cannot be considered exhaustive for each Nation's *ha-houlthee*. That is to say that there may be threats to salmon and impacts from salmon declines that exist but were not included in the results. The research did not seek to quantify the relative impacts of different risks, although this would be a useful focus of future research.



# RESULTS

## 5. Results

### 5.1. Introduction

The primary goal of the research was to better understand risks to salmon in the *ha-ha-houlthee* of the Nuu-chah-nulth *Ha'wiih* to support the Council of *Ha'wiih* and individual Nations in taking care of salmon. The study aimed to place Nuu-chah-nulth voices and knowledge at the fore and to allow local experts to define the risks to salmon without restriction or limitations. The analytical method allowed result themes to emerge from the interviews and focus group data.

The results section is structured as follows. First, a summary of the results is provided to facilitate the reader in navigating the detailed thematic results sections that follow. Each detailed thematic section in turn begins with a description of the Nuu-chah-nulth results followed by a description of the non-Indigenous results. Quotes are provided throughout and refer to the preceding paragraph only. Each quote is attributed to the degree of anonymity requested by the speaker. All quotes taken from focus group meetings are fully anonymized.

### 5.2. Summary

A rich picture of salmon and the *ha-ha-houlthee* emerged from conversations with Nuu-chah-nulth and non-Indigenous experts. The breadth and connectedness of Nuu-chah-nulth experts' perceptions of risks to salmon reflected *hishuk-ish tsawak* and the different knowledges held by research participants. Colonial values of greed and individualism were seen by many knowledge holders as the foundation and driver of risks to salmon. Aspects of colonial governance, and a wide range of human activities, also emerged as risks to salmon. Risks from past and present human activities were described, highlighting the accumulation of harm to salmon in the *ha-ha-houlthee* over time. Nuu-chah-nulth participants revealed many ways in which salmon declines have created loss in their communities. Some solutions to the current plight of salmon were also shared. Risks and human impacts from salmon declines varied throughout the *ha-ha-houlthee*. Nuu-chah-nulth experts generally agreed in terms of specific risks to salmon.

Discussions with non-Indigenous experts were complementary to the Nuu-chah-nulth results, describing several ways in which governance and human activities harm Nuu-chah-nulth salmon. Governance and human activity risk themes overlapped to an extent with Nuu-chah-nulth expert results, but only a small number of non-Indigenous experts described colonial greed as a source of risk to salmon. Notable differences in perceptions of risk posed by current recreational fishing and forestry activities were expressed by experts working in these sectors compared to other non-Indigenous and Nuu-chah-nulth experts.

### 5.3. State of Nuu-chah-nulth salmon: Nuu-chah-nulth knowledge holders

The state of Nuu-chah-nulth salmon was described by knowledge holders in terms of abundance, size (weight), age and sex ratios, and fecundity, each of which are described in the following sections.

#### 5.3.1. Abundance

Wild salmon in the *ha-ha-houlthee* were described by Nuu-chah-nulth knowledge holders as being in a poor state in terms of abundance across all species. Knowledge holders also described declines in size, age, and fecundity, as well as shifts towards relatively fewer female salmon. Many descriptions were made relative to previous personal observations of, or traditional knowledge of, abundant salmon populations. A Uchucklesaht knowledge holder explained,

*“Our sockeye when I was a kid [estimated to be approximately 50 years ago], you could almost walk across the harbour on them because you couldn't look out there and not see a dozen fish in the air, that's how much sockeye we had when I was a young kid. They were really plentiful. We got returns of over 200,000. Now we're down to 5,000 to 15,000.”*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

Barkley Sound is home to Somass River sockeye, the largest sockeye population remaining in the Nuu-chah-nulth *ha-ha-houlthee*. An interviewee explained that Somass sockeye returns have been highly variable in recent years, with a good return considered to be 300,000 to 1.2 million, but with recent examples of 200,000, and 2 million single year returns. Elsewhere in Barkley Sound, a Hupacasath knowledge keeper explained that wild Chinook salmon returns in Hupacasath rivers are 300 in the largest river and less than ten salmon and often zero in others. Returns have fallen to similar levels for Uchucklesaht wild Chinook salmon. Streams once rich in coho and chum salmon in the Uchucklesaht *ha-houlthee* now see fewer salmon returning. A Uchucklesaht knowledge holder explained that coho are still considered to be doing relatively well, some chum still return, but pink salmon are rarely seen. One interviewee explained that beach-spawning sockeye abundance levels in Hucuktli Lake in Uchucklesaht First Nation *ha-houlthee* are uncertain because of poor water clarity but are far lower than historic baselines. One knowledge holders explained that Huu-ay-aht First Nation has seen salmon populations fall to 200 on the Sarita River. A Tseshaht interviewee explained that pink salmon have long been absent from the Somass River.

*“We're very fortunate to have the really abundant and naturally producing sockeye runs here. So, we have the Great Central sockeye and the Sproat Lake sockeye. And so this river right here [Stamp River], the sockeye will come up in the summer and go to Great Central Lake. Our sockeye run is probably one of the last self-sustaining healthy, abundant populations of salmon on the BC coast. I think six years ago, we had a record return of 2.1 million come back to Port Alberni but anywhere from 300,000 to 1.2 million is the normal range.”*

- Anonymous Hupacasath First Nation knowledge holder



A theme of individual river salmon extinction emerged from the conversations. In one case, a HUU-ay-aht interviewee described only four of their Nation's 35 salmon rivers having salmon populations by the mid-1990s. In Ditidaht *ha-houlthee*, to the south-east of Barkley Sound and the most southerly Nuu-chah-nulth Nation affiliated with Nuu-chah-nulth Tribal Council, a knowledge holder described steelhead trout populations in states of extreme decline. In addition, the knowledge holder explained that Hobiton River, whose headwaters are in Pacific Rim National Park Reserve, retains a small return of sockeye salmon, as does Cheewaht River, and chum and coho populations have disappeared from all Ditidaht streams, with the exception of chum in Hobiton River.

*"That's when [1995] I learned of our 35 salmon rivers and streams, of which at that time, only four were salmon bearing."*

- Anonymous HUU-ay-aht First Nation knowledge holder

In Clayoquot Sound, the Kennedy River sockeye population was reported as severely declined. A Tla-o-qui-aht knowledge holder described pink salmon as being extinct in Clayoquot Sound. One knowledge holder described salmon in the northern part of Clayoquot Sound declining generally and a marked reduction in chum salmon. In Hesquiaht *ha-houlthee*, an interviewee explained that the three Chinook rivers no longer see any returns. They continued that chum populations have reduced, including a chum stream in Hot Springs Cove. A Tla-o-qui-aht knowledge holder explained that there are no wild Chinook remaining in the Kennedy or Tranquil Rivers, and that without the hatcheries operating in their *ha-houlthee*, there would be no Chinook at all.

*"Not too long ago, even what I witnessed when I was younger is that we had a very abundant salmon run in most of our systems and within just my generation alone, from what I seen when I was younger until now, is night and day. The salmon stocks and salmon numbers have just dwindled from what they were, from what I've seen. And going...back to what my grandparents used to talk about, the numbers were astronomical and it was great. It was sustainable, you can live off of it. But now it's a different story...my grandparents knew when they used to talk about dog salmon [chum] runs. That's all they used to see going up the river was bank to bank, is dog salmon. And now this year, like in my generation, we're lucky to see a few 100 to 1000 dog salmon in some systems. And that's a pretty dramatic change in the ecosystem for that to happen. It's mind boggling."*

- Anonymous Nuu-chah-nulth knowledge holder

In Nootka Sound, a Mowachaht-Muchalaht knowledge holder described the Gold River sockeye salmon population as healthy. The same interviewee explained that steelhead trout have declined significantly, chum have also declined although less severely, and coho and Chinook are enhanced by the Conuma hatchery in the Mowachaht-Muchalaht *ha-houlthee*. Another Mowachaht-Muchalaht knowledge holder depicted the disappearance of chum and coho from the coastal waters surrounding Yuquot.

*"I remember in Esperanza...you could walk across the river because it was so full of sockeye and now, there's none at all."*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

To the north of Nootka Sound, in Kyuquot Sound and Checleset Bay, a Kyuquot knowledge holder explained that salmon numbers have generally declined. They continued that a reasonable population of Hisnit River sockeye still return to Hisnit Lake but that Jansen Lake sockeye numbers are now very low. A Kyuquot/Checleset interviewee mentioned a specific case of local coho salmon extinction in a Kyuquot stream and that Fair Harbour salmon populations fell to zero in the 1960s before recently beginning to return.

*"There's a small creek that comes on from the school in Kyuquot. It had coho. Then they got the school built up there just past the former reserve and they had an oil leak, they were on generator, and diesel leaked and that snuffed out coho in that little creek...But it was just a small creek, it's only about three feet wide, but it had coho in there...They haven't been back."*

- Tyee Hawilth Francis Gillette - Che:k'tles7et'h' First Nation

### **5.3.2. Salmon size, age, sex ratio, and fecundity**

A frequent theme raised by knowledge holders was salmon returning to the *ha-houlthee* smaller in size than in the past. Ten interviewees explained that returning salmon weigh far less than they did in the past. This was predominantly raised in relation to Chinook salmon in Barkley, Nootka, and Kyuquot Sounds but also Barkley Sound sockeye and Nootka Sound coho. Anecdotal quantitative observations provided by knowledge holders were that the weight of Barkley Sound Chinook salmon (Uchucklesaht First Nation) have decreased by approximately two-thirds, Nootka Sound Chinook (Mowachaht-Muchalaht First Nation) have decreased in weight by approximately one third, and the weight of Kyuquot/Checleset salmon (species not specified, but excluding coho) has fallen by nearly half. A younger interviewee explained that they see the current state of salmon as normal, but their elders have to remind them that salmon are not as large as they once were. However, observations of declines in size were not universal. A Kyuquot/Checleset knowledge holder described coho salmon being nearly twice as big in the last 30 years compared to the 1960s.

*"...Sixty years ago, the difference we see from then to today, the salmon were huge. The Tyee salmon, the Chinook salmon were huge, averaged 60 pounds. Now today their average lucky day is 35-40 pounds and they seem to be chubbier and shorter. In those days they were big and awesome fighters...I'm sure that other nations have seen it too."*

- Ray Williams, Mowachaht-Muchalaht First Nation, Elder and Protector of Yuquot

A small number of knowledge holders described salmon returning younger, with fewer older salmon returning. A Tseshaht knowledge keeper reported that in a recent year, only jack sockeye returned. A Tla-o-qui-aht interviewee described Clayoquot Sound supporting seven-year-old Chinook until approximately 20 years ago, when they stopped returning. The same knowledge holder also noted that as females are returning smaller, they are less fecund, carrying fewer eggs (less than 4,000 eggs) compared to larger older females (up to 9,000 eggs). The issue of low Chinook female proportions was raised by a Hupacasath knowledge holder who noted that as well as low abundance, they have seen a sex ratio of 70% male in returning wild Chinook.

*"[Chinook] spawn in there [Henderson River] as well as up in Clemens Creek, [they] produced easy 60- and 70-pound Chinook. We've got pictures of them we caught and had on our float somewhere. I haven't [seen] them for a long time and those are the kind of Chinook that were brought into the cannery as well when it was operational... 'Smilies' we would call them because you look at them and you smile. None of those are left. They are 20 pounders now because most enhancement facilities for Chinook...that's what they produce. They are about 20 pounders, 20 to 25 pounders."*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

## **5.4. State of Nuuchahnulth salmon: non-Indigenous experts**

The state of Nuuchahnulth salmon was described by non-Indigenous experts in terms of abundance and size (weight). Each of these aspects are described in the following sections.

### **5.4.1. Abundance**

Non-Indigenous experts described a decline in salmon population abundance and size. Expert observations focused on changes relative to recent baselines (30-40 years). The experts made observations relating to all Nuuchahnulth salmon as well as describing the state of salmon in specific areas of the *ha-ha-houlthee*.

Observations about Nuuchahnulth salmon populations generally focused on declines throughout the *ha-ha-houlthee*. One expert explained that Chinook productivity has reduced in the *ha-ha-houlthee* and that intact watersheds have also seen declines. One interviewee explained that even in their baseline states, watersheds in the *ha-ha-houlthee* would not have had the capacity to sustain a commercial Chinook fishery and would have produced only a small fraction of the numbers produced by DFO hatcheries. Experts also described declines in sockeye and chum populations and one interviewee explained that the smaller sockeye populations in the *ha-ha-houlthee* are now at a stage where they have "lost their buffer" and require intervention. One interviewee emphasized the natural cycles in salmon population abundance and that 2020 saw excellent Chinook abundance in Barkley Sound. Two experts were concerned that lower Nuuchahnulth salmon abundance has resulted in them losing resilience to environmental change.

*“The population has gotten knocked down to such a low level by fisheries and that type of thing and now maybe the resilience of those stocks has really declined. And so, dealing with climate change, and all of these other issues on top of that, I think, is really preventing them from rebuilding... Several rivers have totally been extirpated, so that they don’t have that genetic resilience anymore, due to habitat or hatchery influence...So that coupled with them being brought down to this 5%, or whatever percent that’s left, makes it hard for them to deal with all these other issues going on. And that’s my sense, when we rack our brains wondering why certain rivers won’t rebuild, that’s where I get. That’s where I start to get concerned about how can we ever make this happen without hatchery input and knowing that when you put hatchery fish in a river, and then you stop, they decline?”*

- Anonymous Non-Indigenous expert

The abundance of Nootka Sound salmon populations has declined, according to non-Indigenous experts. Interviewees explained that the Gold River has the second largest sockeye population in the *ha-ha-houlthee* with 30,000-40,000 fish in a good year, comprised of five distinct populations spawning in different environments. One expert explained that the abundance of all the salmon populations in Nootka Sound is unknown, because there is no rigorous assessment programme. However, interviewees described declines in several populations including chum, the extirpation of Gold River/Muchalaht Inlet winter steelhead, and near extirpation of pink salmon in the Burman River from a population of 175,000 in the mid-1970s down to a current population below five salmon. One expert explained that “there are lots of Chinook to catch”, but that wild Chinook stocks are in trouble.

Cheewaht Lake in Ditidaht First Nation *ha-houlthee* was described as having a stable coho and sockeye population. One expert explained that the sockeye population has been stable for the last 40 years, varying around 3,000-6,000. However, the expert added that one of the three tributaries of Cheewaht Lake lost its sockeye population in 2015.

The bleakest picture for Nuuchahnulth salmon was painted by non-Indigenous experts for Clayoquot Sound. One expert reported an analysis of historical records suggesting that Clayoquot Sound watershed salmon populations are at 5% of their healthy baseline. It was reported that Chinook populations have not recovered from a crash in the 1990s despite harvesting management measures, and several rivers have lost all their salmon. One expert explained that the Kennedy watershed had one of the greatest sockeye populations in the *ha-ha-houlthee* but is now near extinct. Kennedy Chinook abundance was described as being down to three fish in 2020. One interviewee explained how pristine Meares Island stream chum populations are extinct. The only positive note was that experts described coho populations as having declined but remaining relatively healthy compared to other salmon species.

#### **5.4.2. Size and age**

A small number of experts spoke of adult Chinook salmon returning younger and smaller (lower weight) in Nootka and Clayoquot Sounds. They described seeing many smaller three-year-old males returning as well as seeing more four and five-year-old females but less six-year-old females. Some recreational fishers explained that catching a Chinook weighing over 30 pounds in Nootka Sound is now a rare event.

## 5.5. Colonial greed and individualism risk to salmon: Nuu-chah-nulth knowledge holders

A recurring theme of the risk to salmon posed by systemic colonial greed and individualism emerged from discussions with knowledge holders in two ways: decision making by colonial institutions; and the displacement of traditional Nuu-chah-nulth values by colonial economic systems. In this context, knowledge holders spoke extensively about traditional Nuu-chah-nulth values, including the importance of reciprocity.

*"[If I could change one thing] it would be restoring our values and having our worldview and values respected by mainstream society, Canada, DFO. I think of DFO and my tummy tightens. So, if I could change anything, it would be that our relationship values are restored, especially connection to spirit, especially understanding that the salmon are a gift from the Creator, just like we are, and how we treat the salmon. We have to treat the salmon with honor, respect, care, helpfulness because what I give...they're going to give back, and the way it's been, it's just take, take, take from the salmon with not much being given back."*

- Anonymous Yuuʔuʔiʔath First Nation knowledge holder

The traditional Nuu-chah-nulth values discussed by knowledge holders were *uu-a-thluk*, meaning taking care of, and *iisaak*, meaning respect with caring. *Uu-a-thluk* was described as the value relating to taking care of salmon over the long term of seven generations, and informs everyday life, traditional stewardship practices and community sharing of resources. One interviewee explained that Nuu-chah-nulth Nations have closed their fishing on many occasions when there are concerns for the size of a salmon return. Another knowledge holder explained how *uu-a-thluk* informs traditional harvesting approaches in times of conservation. One knowledge holder described how *uu-a-thluk* means avoiding pollution. They gave an example of a rule that people returning from sea in their canoes had to bail the sea water out of the canoe into the sea, it was forbidden to transfer sea water into fresh water. Another interviewee described how their grandmother was taught *uu-a-thluk* by being instructed not to catch young fish, and to differentiate between trout and sockeye so as to avoid catching sockeye. Several knowledge holders described community sharing of fish harvests to ensure that those in need, and who could not access fish themselves, were taken care of.

*“Uu-a-thluk — to take care of — is to sustainably harvest through traditional ecological knowledge in our areas and many areas in times of conservation. I'll just use an example of coho. When there's issues of conservation, we still took coho, but we didn't take any females. In order to do that, we banged a wooden stick in the creek on the bottom, in the creek on a rock, and the male coho are curious, the females don't come, they can continue up the stream to spawn. Male coho come and harvest those either by spear by hook or by...a small gillnet. Or we used fish weirs with rocks and used the force of the tide. They'd come in and go in and go in circles and go out on the tide or in there or they could dry up on the beach and we could go and pick them up. So those are some of the ways that we dealt with conservation of salmon resources that may be at risk in the early times.”*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

*iisaak* was explained as defining how salmon are treated. Many interviewees described respect for salmon meaning never to take more than you need, to never waste any salmon or any part of a salmon.

*“My grandpa instilled that iisaak, respect the salmon, respect environment, never take more than you need. It's absolutely criminal if you take too many and let it go to waste. That's the biggest no.”*

- Anonymous Hupacasath First Nation knowledge holder

In contrast to the Nuu-chah-nulth values of *iisaak* and *uu-a-thluk*, colonial greed was described by many Nuu-chah-nulth knowledge holders as driving decisions that are causing salmon declines. Themes emerged from the interviews of decisions made placing economic considerations above conservation, ministerial decisions made against local and scientific advice, an unwillingness to make hard decisions that reduce resource income and to acknowledge the harm caused by human activities to salmon, and the influence of sector lobbyists to further resource extraction interests. Herring was cited by several knowledge holders as a resource that managers allowed to be unsustainably harvested at a time of high demand. Another interviewee raised the issue of greed informing insufficiently precautionous salmon pre-forecast numbers, which define the number of fish that can be harvested. Also in a fishing context, one knowledge holder observed that greed leads to waste in the form of bycatch.

*“We have the technology to make all the money in the world, but is that a solution? We have the technology and the knowledge to kill every salmon. We have that knowledge right now. But how do you manage that knowledge? How do you take economics out of it? Economics as the driving force, how do you slow that down? So, to me it's scary.”*

- Anonymous Nuchahlaht First Nation knowledge holder

Many knowledge holders expressed concern about the colonisation of values in Nuu-chah-nulth communities, whereby the colonial greed and individualism are in some cases displacing traditional values, and that this in turn poses a risk to salmon. One knowledge holder explained that some younger community members see traditional values as “old fashioned”. Some interviewees expressed the need

to re-affirm Nuuchahnulth values but worried about the challenge of regaining traditional values once they are lost.

*“No matter what we do in life, whether that's going to collect bark or going for a walk on the beach, fishing, we always start with connection to spirit, prayers of gratitude. And I think that shifted, after the waves of oppression and colonization, where the dominator values started to be enforced upon our people, and those values are individualism.”*

- Anonymous Yuuʔuʔiʔaʔ First Nation knowledge holder

The way that colonialism changed livelihoods and fisheries management approaches affected Nuuchahnulth values was also raised. Some interviewees explained that when *Nuuchahnulth-aht* began commercial fishing, they began harvesting for money, not for their community. When the quota system was introduced, it further advanced individualism. One knowledge holder explained,

*“We started having less salmon when outsiders came. And they started exploiting the fish. It was 'fish get money, fish get money'. We got fish and we ate it and...and we had ceremonies and we had gatherings and we all shared it. And there was no money exchange. It started changing at contact, I guess. Slowly and then, now even our people do the same thing. Getting fish for money, and it's sad.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

The difficult decisions faced by Nuuchahnulth and non-Indigenous people in the *ha-ha-houlthee* in having to trade off salmon outcomes with human wellbeing was also acknowledged by knowledge holders. Interviewees explained that whilst some activities might pose a threat to Nuuchahnulth salmon, the activities are also important direct contributors to community wellbeing. Two Nuuchahnulth knowledge holders provided examples of their Nation stopping fishing when salmon runs were weak to conserve salmon. One interviewee explained,

*“I have an Aboriginal right, but we give up that Aboriginal right sometimes to ensure that we have a strong run, and everybody else continues fishing. We have to change that and it's not because we want everything, we want to manage better to ensure those runs carry on, that they are strong and that they're healthy.”*

- Anonymous Nuchatlaht First Nation knowledge holder

Trade-offs between community wellbeing and harm to salmon involved in industrial activities were also raised several times. Some elder Nuuchahnulth knowledge holders recounted working in the logging industries and recognising with retrospect that they were harming the *ha-houlthee* and that they were part of the problem, but felt they had little choice given the new colonial system in which they were forced to live. One interviewee expressed their concern for the personal impact on Nuuchahnulth people working on fish farms, and the connected harm to salmon.

*“I think about the people on the coast who know that the fish farms are not good, but that's the only source of livelihood available, what that does to our spirit? Because I know when I think about it, it doesn't feel good. But in a hard place, if you have a family, kids to feed, and the only place that you know will hire you is the fish farm. And I know that it affects our spirit and how everything is connected, it does impact the salmon.”*

- Anonymous Yuułuᑭiᑭath First Nation knowledge holder



## 5.6. Colonial greed and individualism risk to salmon: non-Indigenous experts

One non-Indigenous expert described the risk posed to Nuu-chah-nulth salmon by economic greed driving decision-making. The expert explained that the pursuit of money causes over-harvesting of salmon by non-Indigenous groups at many of the adult stages of the salmon lifecycle, which directly reduces the abundance of Nuu-chah-nulth salmon populations and creates inequitable outcomes for Nuu-chah-nulth Nations.

*“Let the rivers recover, slow down on our harvesting. But nobody wants it. They all want money, money, money, now, now, now and the whole thing of Chinook salmon is an infringement of Nuu-chah-nulth rights. Their priority is fish and in Canada, we kill them in the north, we kill them all the way home, and then say, ‘Oh sorry, there’s no more [left for Nuu-chah-nulth Nations]’.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

One interviewee described how a focus on economic values manifests in policy making through DFO decisions that prioritize economic outcomes and the avoidance of invoking the Species at Risk Act (SARA) for Nuu-chah-nulth Chinook.

*“What we're doing is too many things to these fish at once that they're getting it everywhere. Nothing can take that. What would you call it? We're trying to exterminate them. And we're masking a lot of these stocks that are collapsed. Almost all the Chinook stocks in southern British Columbia, if they're not data deficient, they [should be] listed by SARA, but DFO has the ability to bypass these things. So, in order for the economy, they will come up with some deflective plan.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

Management of Nuu-chah-nulth salmon systems based on a goal of economic growth was raised as a risk to salmon in two ways. Two experts shared their concern about the inequitable and unsustainable outcomes from recreational fishing lobbying efforts to further the sector’s resource extraction interests. The allocation of resources based on economic priorities was also discussed as a concern. One expert explained their concern that basing natural resource decisions solely on economic considerations inevitably places recreational and commercial fisheries above First Nations rights and therefore prioritizes economic outcomes above people and salmon.

*“My other concern is that cost benefit ratio where when you look at harvesters’ politics... some folks might say that the value derived from a commercial or recreational fishery generates more revenue than a First Nation and that [accompanying] social economic value. I struggle with that, where money becomes more important than people and fish.”*

- Anonymous non-Indigenous expert

Two interviewees described the risk to Nuu-chah-nulth salmon posed by DFO prioritizing resources on only economically important stocks, with experts providing Chinook and the three major production hatchery salmon runs as examples.

*“We've become really Chinook-focused in Nootka Sound, and that's been what everybody is concerned about. That's where the money funnels to from the Federal money through DFO. And so, I've seen a lot of changes in terms of some of the other species especially now the pinks are pretty much gone from the west coast of Vancouver Island. Coho and chum, particularly chum have had a pretty rough ride in the last little while and the stocks are down quite low on chum. Coho has had moments where it's been up and down, but it's, I call it Chinook-centric, because it seems like everybody wants to talk about Chinook and all the money gets spent on Chinook and in some ways, it's not really a holistic way of looking at it.”*

- Anonymous non-Indigenous expert

Though not specifically related to values as a risk to salmon, several experts acknowledged the challenges involved in making decisions that trade off economic and salmon outcomes. The primary sentiment from most non-Indigenous experts was that industrial extraction and farming activities, such as forestry and aquaculture, should be carried out in a more sustainable way, with minimal economic impact. Two interviewees emphasized the need for jobs and the lack of alternative employment the outside resource extraction and aquaculture sectors. One expert argued that local people would not be prepared to accept the economic impacts that would flow from acting to conserve Nuu-chah-nulth wild salmon. Another expert recounted a story of the reaction from a senior forestry sector figure to the idea of more sustainable, fish-friendly logging practices,

*“At a meeting a couple of years ago in Port Alberni, for the Barkley Roundtable, they had invited all the heads of local forestry...I proposed that they...[follow the forestry in Clayoquot Sound guidelines, which involve fish-friendly logging blocks] throughout the province. I had a seventy-year-old head of a forestry company just about jump the table, like I was gonna get in a fight like I would have in junior hockey. He said, ‘How would you like to be responsible for putting half of the forestry workers out of work? We'll put your name on it’.”*

- Anonymous non-Indigenous expert

## **5.7. Governance risks to salmon: Nuu-chah-nulth knowledge holders**

In this section of the report, themes emerging from the research data relating to how the governance of the *ha-ha-houlthee* causes risk to salmon are described.

*“It's like the elder said, if that bird is there, you know everything's going to be okay. All the salmon aren't, they are not going to be okay. We all depend on each other. Everybody seems to think that people are the ones running the world. We're not. We're supposed to be taking care of it. We're not. We're abusing it terribly and it's bleeding. We're bleeding out, that's what's happening. And the whole system is crashing.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

### 5.7.1. Colonialism in governance

A consistent theme emerging from Nuuchahnulth knowledge holders was the risk to salmon from past and current colonialism in natural resource governance, particularly relating to salmon fisheries.

Knowledge holders spoke about risks to salmon from poor decisions resulting from colonial exclusion and erosion of Nuuchahnulth knowledge and data, and Nuuchahnulth exclusion from governance of salmon and the *ha-houlthee*.

*“We allowed somebody else to make the management decisions, and they didn't do a good job.”*

- Anonymous Nuchatlaht First Nation knowledge holder

Nuuchahnulth knowledge holders reported that their knowledge and expertise has been consistently excluded from natural resource decisions by Canadian governments and companies operating in the *ha-ha-houlthee*. The interviewees described this exclusion applying to traditional knowledge, local ecological knowledge, and Nuuchahnulth scientific data. One interviewee explained their frustration that government agencies will only act on published science. Many knowledge holders described simply being ignored over decades, despite in many cases Department of Fisheries and Oceans Canada (DFO) funding the roles and knowledge creation that they then choose to ignore. One knowledge holder described advice given by *Ha'wiih* to forestry companies and government agencies being ignored. Another interviewee detailed how their extensive data collection on salmon has been ignored by DFO,

*“It's quite discouraging with all the science that's been done, from First Nations to DFO, the years of data we presented them and the years we've been ignored. All that knowledge that we've been sharing, we have the most intensive database, and anything compared to DFO. And their cookie cutting decision making on how fish are being caught is the most discouraging part about it. And again, it falls in with the risks to salmon as well, too. We've been telling them, how those stocks have been, and then continued to be ignored. We've put so much work into it. All the fishing, all the people that work in fisheries, and how many years they've been working on the rivers just being constantly ignored, is really huge in terms of all the decision making.”*

- Anonymous Nuuchahnulth knowledge holder

### 5.7.2. Insufficient and inaccurate knowledge, data, and monitoring

Insufficient and inaccurate fisheries data collection was raised by several Nuuchahnulth knowledge holders as a risk to salmon. One interviewee was concerned about a lack of ongoing monitoring of freshwater salmon, which leads to an absence of baselines for comparison when monitoring begins in response to population declines. Another knowledge holder described the risk to salmon posed by incorrect salmon assessment from an insufficient number of freshwater assessment swimmers who do not spend enough time in the water. They explained that assessment swimmers need to be in the water for several months to generate an accurate count, and that one month is insufficient. In addition, concerns were raised by the knowledge holder about assessment swimmers from outside the *ha-ha-houlthee* having insufficient knowledge of local species and systems. They also explained that these

problems with salmon assessment have led in the past to over-estimates of salmon returns, which in turn leads to over-harvesting. Other interviewees raised the risk of overharvesting salmon caused by underreporting catch because catch and release and discards are not reported.

*“We ignore the fact that each fish that is caught and released is a mortality. So, whether that fish is caught or released, it's still a part of the catch. Again, it's dead fish as soon as you throw right back in the river. That's not being accounted for. And we've explained that over and over again.”*

- Anonymous Nuu-chah-nulth knowledge holder

A strong theme among Nuu-chah-nulth knowledge holders was the uncertainty in recreational fishing sector catch from voluntary catch reporting and insufficient monitoring. Although it was recognised that voluntary reporting of catch takes place, some interviewees expressed concern that the recreational fishing sector in the *ha-ha-houlthee* has become increasingly commercialised and efficient, which together with under-reporting, elevates the risk that total salmon harvesting across all sectors is unsustainable. These concerns were often paired with feelings of inequity because Nuu-chah-nulth commercial fishers have always faced compulsory reporting and disproportionately high levels of monitoring.

*“The guides at lodges that go out....do multiple trips a day and they're all voluntary reporting and so they don't have to report their catch but every other sector, First Nations Food and First Nations commercial and all the commercials have to report all their catch. So, they definitely underestimate how much the sports sector catch we believe, and we've been arguing to DFO, ‘we definitely think you're underestimating how much of our Chinook they are catching’ and because they're not including the commercial outfit guides, whose job is to catch fish, and they're catching so much more and it's definitely under reported.”*

- Anonymous Hupacasath First Nation knowledge holder

The way in which DFO uses knowledge in decision making was raised by several Nuu-chah-nulth knowledge holders as a risk to salmon. Given the high levels of uncertainty in fisheries data, two knowledge holders raised concerns about the lack of precaution in management decisions relating to allowable catch. Other knowledge holders expressed concern that DFO are selective in their application of science, and even generate data to justify access for commercial and recreational harvesting sectors. Connected to this lack of trust, one interviewee described how government agencies do not freely share data to support co-management.

*“Trying to get information from the [Federal] government is really hard, even as a treaty partner and a co-signer to treaty, we still have to argue and coerce and encourage and everything else under the sun to try to get the information just so we can try to co-manage with them.”*

- Anonymous Nuu-chah-nulth knowledge holder

One knowledge holder described how the siloed philosophy of science and the divorced nature of science from world view and values causes failures of stewardship,

*"I watched, when they did the Cohen report, about the missing fish, and it really put my mind in a bad place. Because I started to think well, here we are. Science, I never agreed with science, I don't agree that you need to, because I'm tied up with hishuk-ish tsawak. So, in order for us to deal with governments, we have to do this exercise where we think about the siloed effect, come at it from a hishuk-ish tsawak perspective, give our perspective on those little thoughts that they're asking about. And then they go and they take our hishuk-ish tsawak approach, narrow it down, pull that one little piece of information out. The world doesn't change like that. We need to incorporate indigenous knowledge, local knowledge. Like fishermen who have fished 40, 50 years have a pretty darn good idea of the characteristics and what those fish are going to do, and I think we get carried away sometimes in science, and we start to over-analyze. Instead, science needs to be directed so that we aim it towards things like hishuk-ish tsawak, iisaak, and uu-a-thluk so that we're looking at it from a world view and from the view of is it going to be here for seven generations...Not looking at it from our worldview of everything is interconnected, and anytime you look at and manage anything like that, it's not going to work."*

- Anonymous Huu-ay-aht First Nation knowledge holder

### 5.7.3. Failure of adaptive management

The failure by colonial government to adapt to emerging data was a theme among some Nuuchahnulth knowledge holders. In a short-term context, interviewees described the pre-forecasting process of setting allowable catch based on expected salmon returns. Concerns were raised that the allowable catch is not altered as the actual run size materialises, sometimes leading to over harvesting. In the longer-term context, one interviewee highlighted the slow rate of improvement in DFO's approach to fisheries management. Another interviewee described an example of DFO's failure to adapt fisheries management over the long-term,

*"When Chinook were in trouble, they cut you back but...increased the coho catch. Well guess what 10 years later, we had a coho problem. And they said, 'Well, Chinook has recovered, we'll just put that back up'."*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

One knowledge holder expressed frustration with ongoing harm to salmon occurring while Canadian governments fail to take meaningful action. The knowledge holder explained that under Canadian governance structures, the type and extent of action required to allow salmon populations to recover is withheld until the Species at Risk Act (SARA) is invoked, which has never happened for Nuuchahnulth salmon species.

*"SARA is a very, very poor excuse for management. We need to eliminate SARA altogether, why do we have to wait till something is extinct before we start doing work."*

- Anonymous Nuuchahnulth knowledge holder

Several knowledge holders described DFO allowing over-exploitation of herring stocks by not responding to evidence of declining populations. They explained that Nuuchahnulth Nations adopted their own better, more restrictive, management in isolation, before convincing DFO to shut the herring fishery.

*“So, we convinced DFO to shut the herring fishery down until it recovers completely for more than one herring cycle. It's been shut down ever since. I don't know how many years it has been. They're coming dangerously close to wanting to reopen it. Their science doesn't allow them to open. They finally looked at their science, they were ignoring their science before that. We're overruling their science...Outsiders are telling them to shut down. That it's okay to do.”*

- Charlie Cootes, Sr., Uchucklesaht First Nation knowledge holder

Two interviewees expressed frustration about the multi-year lead times involved in changing forestry regulations and the harm done to salmon in the meantime when the “barrel is close to being empty”,

*“Everyone knows that forestry is one of the biggest detriments to salmon. It could cost us a lot of salmon to understand that and realise that, decades later...no one's ever made any changes towards that Forestry Act with regards to the protection of salmon.”*

- Anonymous Nuuchahnulth knowledge holder

#### **5.7.4. Centralized management**

A theme of centralized fisheries management and its risks emerged from several knowledge holders concerned by the lack of place-based knowledge and management. These interviewees explained that poor fisheries decisions are made because people making those decisions regionally or nationally do not have the local place-based knowledge to fully understand local systems. Some knowledge holders explained that better outcomes for salmon would be achieved through local communities working together regionally to manage fisheries. A knowledge holder observed that funding would be a challenge for more localized management, and another argued that fees and taxes applied to natural resource extractors should flow to Nuuchahnulth Nations to support local management.

*“They create the system where the Minister is supposed to have unfettered discretion and do the right thing based on good science. Well, it's pretty evident that that is broken.”*

- Anonymous Huu-ay-aht knowledge holder

#### **5.7.5. Jurisdictional silos**

Several knowledge holders highlighted risks to salmon from the abdication of responsibility for salmon and salmon systems by DFO, justified by jurisdictional overlap with the province. The jurisdictional overlap exists because DFO and the Provincial government share responsibility for freshwater fish and

fish habitat. Knowledge holders explained that where land-based issues are harming fish, DFO points towards the province for a solution despite it being their responsibility.

*“The Feds, they got the mandate to look after the river systems, but this...belongs to the province and it's just how the governments operate...handing blame to somebody else.”*

- Anonymous Nuu-chah-nulth knowledge holder

### 5.7.6. Management of pinnipeds

The threat to Nuu-chah-nulth salmon from a failure by DFO to manage pinnipeds – a predator group affecting salmon – was raised by two knowledge holders. Although it was noted that some degree of traditional Nuu-chah-nulth management of pinnipeds is allowed, the interviewees explained that pinnipeds and sea otters have been allowed to proliferate by an absence of management since they were provided protected status in the 1970s.

*“They don't address the predators, that's one of my beefs. Because they're right in the rivers...The white man changed it. They told us they're protected, we're not allowed to kill them, we're not to throw anything at them. That's what changed and then like anything, if you keep letting something come, it'll certainly start going where it wants to go. But if you keep them away with stones and a .22, it protected the river. They know they can't come back. So little things like that. And when we were kids, we used to chase them.”*

- Anonymous Hesquiaht First Nation knowledge keeper

### 5.7.7. Lack of transparency and accountability

A theme that emerged from a small number of Nuu-chah-nulth knowledge holder interviews was how a lack of government and business transparency and accountability harms salmon. One interviewee explained that fishing allocation decisions are made without adequate explanation or transparency, with inexplicably high catch allowances despite poor returns. The same knowledge holder described how unsustainable allowable catch decisions create inequity and mistrust because the fish belong to the Nations and the Nations have spent decades fighting for commercial fishing rights, winning several court cases, and yet have seen no meaningful implementation of these rights by DFO.

*“We've been fighting for fishing rights for a long time and we're still fighting to this day...We've won in Federal court three times and we're still fighting for this piece of the pie that's already ours. This pie is ours. And we're still fighting for crumbs off of our own piece of pie, which is ridiculous.”*

- Anonymous Nuu-chah-nulth knowledge holder

Another knowledge holder described the lack of accountability for resource extraction businesses. They explained that while the businesses leave behind the destructive consequences of their activities and avoid any responsibility by either ceasing to exist or change into a new business entity, *Nuu-chah-nulth-aht* have to live with the consequences.

*“The thing that bothers me the most is that the province, the logging companies, they can walk away from the problems. It's your problem because you live there. They've done a lot of damage. We have a reserve where they logged above our reserve, we must have about that much [interviewee showed a large depth using their hands] silt on that reserve. Now it's absolutely useless to us. But we can't do anything because the logging company is long gone.”*

- Anonymous Nuchatlaht First Nation knowledge holder

### 5.7.8. Insufficient enforcement

Several knowledge holders described the risk to salmon posed by insufficient enforcement of resource extraction required in regulations and the execution of enforcement as required by regulations. Two interviewees focused on the lack of enforcement in recreational fishing harvesting, which connected to other concerns raised about voluntary catch reporting in the sector. The risk was also raised for logging, where a knowledge holder explained that little is known about how much harvesting has occurred and that the agency overseeing the forestry sector has “insufficient teeth” to enforce regulations. Another interviewee described the elevation in risk to salmon from fish farm sea lice because DFO does not monitor and enforce lice per fish regulations.

*“The whole thing needs to change. The logging practices need to improve and the environmental agency needs some teeth. There's no sense making rules and regulations if they can't do anything with them.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

### 5.7.9. Fisheries management

Nuu-chah-nulth knowledge holders raised several ways in which fisheries management poses a risk to salmon. A theme of mismanagement of mixed-stock fisheries was described by some knowledge holders. One interviewee explained how fisheries management shifting from multi-species licenses to individual species licenses led to extensive unreported salmon mortalities through bycatch.

*“If you're not allowed to catch some of the bycatch with it [the target fish species], then you will move. You'll reduce the amount of stuff that you're not allowed to catch on your own because you're focusing in a siloed world that says boy, you're only allowed to catch coho right now and incidentals don't count. But it's a reality that they happen, bycatch happens.”*

- Anonymous Huu-ay-aht First Nation knowledge holder



Another knowledge holder reported that salmon management in a mixed fishery, without restricting to only terminal fisheries, requires managing to the weakest stock, which has never happened resulting in overharvesting of salmon.

*“On the ocean, it's a crapshoot. It's a mixed stock. And they don't go by what they say in their books: you manage to the weakest stock. They don't do that. Otherwise, there would be no open fishery because they would have to manage to the Clayoquot Sound stocks, that's the weak stock. They don't want to do that because that throws a wrench in everything. They don't do what they say: manage to the weakest stock. I think part of it is losing their revenue from licence fees. They don't want to lose their revenue. Nobody does, but it's coming at the expense of our natural resource that we cannot let slip, go into extirpation.”*

- Anonymous Nuu-chah-nulth knowledge holder

Management of recreational fisheries as a risk to salmon was a recurring theme. Two knowledge holders drew equivalence between guided recreational fishing and commercial fishing, because of the skill, knowledge and technology used by guides and the intensive repetitive nature of their fishing trips. The price of recreational fishing licenses was also raised, with one knowledge holder explaining that licenses are too cheap, which provides too easy access to salmon harvesting. One interviewee observed that recreational fishing for Chinook salmon is the cheapest hunting trophy in Canada. Fishing quota also emerged as a theme. First, for equity reasons because of the transfer of halibut quota from commercial to recreational harvesting sectors. Secondly, because irrespective of salmon return projections, the recreational sector is allowed to catch the same number of salmon, which made two interviewees concerned about over-harvesting and inequality.

*“The sport fishing industry, for example, their allocation is 60,000. Regardless whether the stock is strong, or whether it's weak. It got 60,000 fish. If they go over it, DFO expects the commercial guys and the First Nations to take a cut in their allocation to support the sports sector. My view, whatever they go over, that's what should be subtracted from their allocation.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

Several themes were raised by individual knowledge holders relating to risks from commercial fisheries management. One knowledge holder described DFO's historic failure to prevent stock over-harvesting, but another observed that DFO has a good grasp on overfishing issues. Three knowledge holders observed that Nuu-chah-nulth salmon lose out on focus and allocation of DFO budgets to bigger systems such as the Fraser River watershed salmon. One explained that efforts to bring traditionally rich but declining Nuu-chah-nulth salmon river populations to DFO's attention, but these were ignored because they were not big salmon producing rivers at the regional level. Another knowledge holder expressed concerns about the inequitable nature of the Pacific Salmon Treaty in terms of benefits to the Nuu-chah-nulth Nations from Nuu-chah-nulth salmon harvested in Alaskan waters.

*“They were managing it and we believed they were doing a good job of managing it. So, they said, ‘Go. It’s a derby, go catch what you can while you can.’ So, everybody did it. 400 boats, 400,000 fish a day. We believed the people that were supposed to be there for management and protecting the resource.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge keeper

### 5.7.10. Forestry management

Themes relating to crown land forestry governance centred around the insufficient protection of salmon habitat by current regulations. Some knowledge holders explained that although forestry practices in the *ha-ha-houlthee* have improved over time when compared to the past wholesale destruction of watersheds, current regulations still permit harm to salmon habitat that continues and cannot be afforded, given historic practices. Buffers around waterways were raised by several interviewees who commented that although buffers are a positive step, in that watersheds should not be logged to the water’s edge, the size of buffers is currently inadequate to prevent habitat damage. One interviewee stated this is particularly true in higher elevation tributaries where practices are less restricted.

*“We’ve been fighting with DFO and the province, saying ‘You guys need bigger buffers’, and the buffers [have] to go higher in the mountains. The...higher up into the smaller order streams then they have less and less protection.”*

- Anonymous Hupacasath First Nation knowledge holder

Two knowledge holders explained that buffers, with clear cut removing the protection of the forest behind them, are at greater risk of wind throw (being thrown into the water) during extreme wind events or getting washed into the river by heavy rains. One knowledge holder expressed the view that buffer size should be proportional to waterway size, with main parts of rivers having much larger buffers. A Kyuquot/Checlesht knowledge holder explained that through their treaty they were able to negotiate larger buffers than BC regulations.

*“Even though they have these buffer zones, the winds around here, we just call them our travelling cut blocks. They go with this line. It’s 50 meters from this creek. But the wind comes in it just moves it ever closer. Eventually the trees are falling across the creek and into the creek. So, they make them wider now 100 meters, but...it’s just something that delays the inevitable, of the affect it will have on the creeks. Even if they do have 100-meter buffer zone, it will break through it eventually.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Other themes relating to crown land forestry included the current practice of variable retention logging (described by one knowledge holder as clear cutting with small patches in between), which does little to mitigate the harm caused by clear cutting. One knowledge holder described logging practices taking place behind newly erected gates, which prevent observation of forestry practices. Having accessed these areas, the interviewee described a failure to follow regulations, including logging to the rivers' edge. The province of BC's unwillingness to engage is also an issue that blocks co-management and the improvement of salmon outcomes. One knowledge holder described inviting the province to many meetings to discuss forestry, but they never attended. One interviewee drew attention to changes in the stumpage calculation, which has traditionally been used to fund the mitigation of past damage. They explained that when this was done, all past damage was removed from the scope of the fund, so funding was no longer available to address historic destruction.

*"The other thing is that the stumpage from harvesting is now based on business planning, as opposed to repairing past damages. And when they changed it from FRBC to the Forest Investment Account, they erased all of the past damages, like they weren't there, and made it impossible to get funding to fix it."*

- Anonymous Huu-ay-aht First Nation knowledge holder

Private land forestry governance was also raised separately to crown land governance concerns. Two knowledge holders explained that privately held land does not come under the jurisdiction of crown land forestry regulation and is less stringent. The knowledge holders explained that private land forestry is increasingly common in the *ha-ha-houlthee*, and the effects are being felt through damage to salmon habitat. One knowledge holder gave the examples of China Creek, south of Port Alberni, and Franklin River, the main river on the east side of the Alberni Canal, which have seen heavy private land logging.

*"You can see, if you look at the Beaufort private lands now, they're creaming the mountainside because they don't have to go under the original provincial rules. And what does that mean for how the river is being looked after, whether or not there's overharvest? More and more mud and stuff flowing into the Somass, as opposed to with managed-as-forest lands. So, people complain about it in Port Alberni but nobody's ever studied it and whether or not it has an impact. I think it does, but I don't know if it's been measured or not. So that's been happening now for over 10 years."*

- Darrell Ross Sr., Tseshaht First Nation Knowledge Holder

## **5.8. Governance risks to salmon: non-Indigenous experts**

### **5.8.1. Data, monitoring, and scientific research**

Several areas of risk to salmon relating to data, knowledge, and scientific research emerged from discussions with non-Indigenous experts. Experts described inadequate data collection relating to fisheries and salmon populations inhibiting appropriate management decisions, which leads to negative outcomes for Nuu-chah-nulth salmon. Two interviewees emphasized the necessity of including different

ways of knowing into the management of salmon systems, describing the status quo approach to the use of knowledge as ineffective. Several experts explained that much is not known through western science about salmon systems in the *ha-ha-houlthee*, and that the failure to include traditional and local ecological knowledge in Federal and Provincial government decision making acts as a barrier to effective action. One expert described how the reductionist nature of the scientific paradigm is ineffective as the sole source of evidence to manage complex salmon systems such as the *ha-ha-houlthee*, particularly given the lead times inherent in carrying out and publishing science. Another interviewee described the lack of coordination between research efforts in the *ha-ha-houlthee* diminishing its total value. One expert expressed concern at the lack of precaution in management of salmon given the magnitude of uncertainty in available knowledge and data. Four interviewees described how the political bias in the production and use of science by DFO for salmon management leads to harmful outcomes for salmon populations.

*"I've also participated, and seen, in different processes, including CSAS processes, where the science is manipulated to achieve a desired outcome, and we shouldn't be doing it."*

- Anonymous non-Indigenous expert

One expert explained that budget cuts at DFO have led to time periods without fisheries data collection. Another interviewee described the absence of data for most of the salmon runs in the *ha-ha-houlthee*. One expert explained that with the reduction in commercial fishing effort, catch data for salmon stocks has declined but has not been replaced by complete and reliable data from the recreational fishing sector, leading to a reduction in stock monitoring data. Others described inadequate assessment of juvenile salmon abundance and the omission of sex ratios from data collection, which they explained leads to an over-estimation in the abundance of returning females.

*"It's mismanagement. But it's because they [DFO] don't have the right tools or the right information. We all know they would do better if they had better information."*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### **5.8.2. Failure of adaptive management**

Several experts observed a risk to salmon from the failure of DFO to adapt their management decisions to past outcomes and a changing environment. Three interviewees described how fisheries management has not kept up with salmon population declines or learned from historic failures to prevent over-harvesting. Two experts explained that the lack of urgency to adapt fisheries management and policy to the declining state of Nuu-chah-nulth salmon has exacerbated the situation. Two interviewees were concerned that a failure by DFO to adapt their management to the changing climate has also put pressure on salmon.

*“Nothing is constant, and that's part of the problem with humans...we like to understand things by putting them in a box and going, ‘Good, I understand that. Perfect. I don't need to think about it anymore. I've solved that problem. It's over here.’ And we do the same thing over and over and over again. And then nature changes and we haven't changed. And then we scratch our head and go, ‘How come we're not getting back as many hatchery fish as we used to? Oh, hatcheries are bad’. No, hatcheries aren't bad...It's that we didn't adapt with the changes that are going on in the ecosystem, which is complex. We didn't do our homework...to be good stewards.”*

- Anonymous non-Indigenous expert

### 5.8.3. Centralized management

Two experts spoke of the harm to salmon caused by centralized decision making. One interviewee explained that the land use plan for forestry in Nootka Sound was created in the 1990s without local consultation, at the same time as Clayoquot Sound logging was being stopped by Nuu-chah-nulth First Nations taking direct action. The consequence, the expert explained, has been the widespread destruction of salmon habitat in the area. Another interviewee described how Conservation Units, the scale at which DFO manages salmon populations, are a symptom of centralized management, which leads to the devaluing of salmon genetic diversity in individual streams and rivers.

*“Considering genetics at a scale finer than we do currently in management is something that I think should be focused on. We have unique genetic diversity in systems that we just don't manage at that level currently. So, I personally think that's something that needs to be reviewed and included within our assessment framework and identifying risks. And really, how does that tie back to genetics? And what does that mean for the health of that population? And I just say that, because for some of our risk grading, genetics has been a huge data gap, more so sometimes than other things...Why don't we have that information? I'm always pushing for that. And there's genetic diversity of such small scales that people don't comprehend sometimes. And again, we don't know what's going to be important for climate change. So, preserving that and trying to be mindful of that is extremely important in my view.”*

- Anonymous non-Indigenous expert

### 5.8.4. Jurisdictional silos

Non-Indigenous experts described the threat that jurisdictional siloes pose to Nuu-chah-nulth salmon habitat. One example cited was that DFO have a legal responsibility to protect salmon habitat, but do not have jurisdiction over terrestrial habitat, which is the domain of the Province of British Columbia. The interviewee argued that salmon are threatened by DFO's abdication of their responsibility to protect fish habitat, and explained that DFO representatives have adopted the position that risks to salmon predominantly exist in the marine stages of the salmon lifecycle negating the need to protect freshwater habitat. Another expert emphasized the historic extent and continuation of logging impacts

on salmon freshwater habitat that have taken place without DFO intervention. One interviewee described the siloed jurisdiction relating to municipal residential development, citing Sproat Lake as an example. The interviewee explained that the regional district government cannot include waste considerations in their decisions relating to sockeye lake-side development applications that will involve septic tanks being flooded by seasonal lake height variation because that issue comes under the jurisdiction of the Provincial health agency.

*“They [DFO] have abrogated their responsibility to protect fish habitat for Canadians and just turned aside and let this logging go on.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### 5.8.5. Management of pinnipeds

Two experts cited the protections afforded to pinnipeds, which prevents management to control pinniped predation of salmon, as a threat to Nuu-chah-nulth salmon.

*“So, another thing that I'd call human caused or induced problems is predators like pinnipeds. That if you look at what's happened, natural balance is out...because we made a policy decision that we would take a natural predator out of the equation. So, humans used to interact with and take lots of pinnipeds. But we said...in 1973 no one can go harvest any seals and sea lions. So, all of these communities that used to harvest seals and sea lions, we're told that's against the law, you can't do it.”*

- Anonymous non-Indigenous expert

### 5.8.6. Lack of transparency and accountability

A lack of transparency and accountability in governance leading to management decisions causing harm to salmon was raised by several experts. One interviewee spoke about DFO's failure to release salmon data when requested, which inhibited local management. Three interviewees described the lack of transparency in DFO decision making relating to aquaculture. They observed that DFO having responsibility for fisheries and aquaculture creates a conflict of interest and spoke of hearing DFO employees speak up in what they perceived to be a biased supportive way for fish farms. One expert explained that the lack of transparency is evident in a failure to report disease incidences at fish farms. Another expert described the lack of accountability shown by forestry companies for not restoring damage they have inflicted on salmon habitat.

*“We know there's a lot of cover ups. It's a small town. I know people who work tugboats and all sorts of things who've had to, [in an] emergency go and remove a big bunch of fish from a farm because they had some disease that was never talked about, and no one ever gets to hear about.”*

- Anonymous non-Indigenous expert

### 5.8.7. Insufficient enforcement

A lack of monitoring and enforcement of regulations in natural resource sectors was raised by several experts as a risk to salmon. Crown and private land forestry, recreational fishing, and fish farms were specifically identified as having insufficient enforcement, but some experts explained that the issue exists across all sectors. Interviewees explained that people with responsibility for enforcement of regulations need to be overseeing all relevant resource extraction activity. An expert from the recreational fishing sector was less concerned, explaining that recreational fishers generally stick to the rules and in some cases, the community enforces regulations. Another interviewee expressed concern that DFO is not the appropriate agency to carry out enforcement of fishing regulations,

*“There’s nobody checking up on them at all. It is the fox in charge. And in the case of fish, DFO is the fox, and they need to be taken out of the henhouse and stuck over in the corner. And really, we need a conservation department to step in and replace them that has ethical and moral responsibility to the law. And they [DFO] don’t follow the law.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### 5.8.8. Fisheries management

The risk posed to Nuu-chah-nulth salmon by DFO fisheries management was a recurring theme. Recreational fisheries management was most frequently discussed, although there was disagreement between some recreational fishing experts and other experts. The uncertainty in Nuu-chah-nulth salmon recreational fishing catch levels caused by the voluntary nature of catch reporting was the most frequently cited risk. One interviewee explained that there is an “expected catch” for Chinook, which if exceeded, the excess catch is applied as a reduction to commercial sector quota.

*“The recreational fishery catches more fish than the commercial [sector] and have less regulations and monitoring. So, they catch on the west coast, for Chinook, the most of any groups, and they have the lowest standard of monitoring and regulations. So that’s I think where most people’s eyes are going now, ‘Okay, we had commercial fisheries, we brought them in, we’ve managed them, they have much, much better control over those fisheries now. The rec fishery that’s pretty out of control’.”*

- Anonymous non-Indigenous expert

Five interviewees described the voluntary nature of recreational sector catch reporting in the form of logbooks, IREC – an online catch self-reporting tool – and creel surveys. One interviewee recounted how during the DFO CSAS (Canadian Science Advisory Secretariat) process for IREC, the outcome was that creel surveys should be used to ground truth IREC data and that changes would have to be made to the creel surveys to achieve the desired outcome. The expert explained that the creel survey was not amended, nor was enough funding allocated to run the survey, but that the creel survey for sockeye salmon in Alberni Inlet and Barkley Sound is likely more accurate than others because of the confined nature of the fishery and the extensive local effort put into the survey. An expert from the recreational

fishing sector explained that the catch estimation process begins with creel surveys, then DFO observational overflights and voluntary guide logbook data are used to complete the catch estimation. A recreational fishing sector expert argued that although it needs improving, Canada's recreational fishing catch estimation is "gold standard" in North America. They also emphasized that the recreational fishing sector has been arguing for mandatory catch reporting, but that DFO has failed to adopt it.

*"To understand how recreational catch estimates are done, it's a pretty complex estimation system where they're pulling together data from a number of different sources, which, of course, starts from creel. So they do creel surveys to establish for example, what is the average cost per unit of effort. And then there's overflights that take place to go and actually count vessels that are out fishing and then applying that catch per unit effort to the number of vessels that they see out there fishing for particular species of fish, because they can tell a difference between when somebody is out fishing for halibut or fishing for salmon. That's also included in that as they pull real data off of guide logbooks. So guides have logbooks, not all of them because they're not mandatory, yet. That is going to change. So the department [DFO] has responded to the Sport Fishing Advisory Board's request to make guide logbooks mandatory, in other words, the law. So it is true that the recreational sector has been asking for, trying to promote the department [DFO] to invest the resources into establishing even more robust catch monitoring than they do today. If you look at for example, the difference between the recreational catch monitoring that's done by DFO in the halibut fishery versus what's available when we sit at the IPHC [International Pacific Halibut Commission], and...Canada actually is gold standard, in terms of its estimation and catch monitoring, by comparison to other jurisdictions. Now, that doesn't mean we're perfect. There's definitely room to improve. But I think it's probably not a fair statement that the recreational fishery hasn't been trying to lead the way and push the department [DFO] on this. It's the department [DFO] that has been dragging their feet on going forward with making enhancements to catch monitoring."*

- Anonymous non-Indigenous expert

Two experts argued that the risk of insufficient catch reporting in recreational fishing is amplified by what they described as the "commercial style" of guided recreational fishing. The interviewees explained that recreational fishing guides have the knowledge, technology, and number of customers to harvest salmon more efficiently than an average individual fishing in their own boat. However, a recreational fishing sector expert disagreed, arguing that guides merely support members of the public fishing under their own license.

*"The guides and lodges should...have their own quota. This needs to come out of the commercial catch. It should be recognised that they [DFO] do not track the recreational catch well enough at all. And it only takes a few bad apples to really hurt a coastal population of fish out there, right? I sent a letter to the former fisheries minister, when we were last negotiating the split between the recreation and the commercial catch, and I lobbied her that guide outfitters should not be part of the recreational quota. They should pay for their own quota just like a commercial*



*fisherman. Because I see what they're doing out there. I fish out there. I see them, they have their waypoints. They go to the same spot day in and day out and catch everything under the sun. And I see that you can't catch anything where I used to catch fish anymore. No wonder. They have how many lodges in Nuu-chah-nulth territory? How many days do they have anglers there? You do the math. How many salmon [individual fisher] limits? That is a lot of fish. Unlike a regular Joe Blow from wherever motoring, trailering his boat all the way out there and fishing there for a weekend or something.”*

- Anonymous non-Indigenous expert

The threat to salmon from institutional issues within DFO was raised by several experts. One interviewee focused on the loss of corporate knowledge resulting from experienced employees leaving the organization following defunding. Another interviewee described the failure of leadership in responding to repeated extreme environmental events. One interviewee reported DFO's continued use of a flawed fish population modelling approach as a solution to insufficient funding for necessary salmon assessment. Two interviewees explained that management approaches to mixed stock fisheries are harming salmon. The experts described the harm to salmon caused by siloed management by individual fish species. They also explained that basing allowable catch levels on production hatchery returns and insufficient sampling of genetically unique Nuu-chah-nulth salmon populations leads to overharvesting of less abundant wild salmon populations.

*“We make...[an] assumption that these hatchery stocks represent the distribution and survival of the wild ones, which they don't, because we know they have different age structures. So, we're looking at using 20 or 30 stocks to predict what's going on with over a thousand [stocks]. It's not a sufficient sample size, you should be looking at 200. So, and a lot of that is under funding, they could do a better job. But I think the Department of Fisheries got quite a few hits to its budgets and stuff over the years. They got forced to take aquaculture back, they had to start to deal with First Nations with the Aboriginal Fisheries Strategy, and there was no new money for these things. They just took it from somewhere else. And they've lost a lot of their corporate knowledge now, because a lot of people are retired and are replaced.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### 5.8.9. Forestry management

Most experts described how forestry practice regulations in BC remain a threat to Nuu-chah-nulth salmon despite improvements to practice regulations over the previous three decades. Interviewees described forestry practice regulations changing in the late 1980s to reflect connections to fish, before more dramatic changes were made in the 1990s. Many interviewees explained that the current forest practice regulations are inadequate to prevent harm to salmon. The most raised threat to salmon was insufficient buffer size along salmon rivers and streams.

*“In the 60s there was little regulation. I've seen pictures of it, they look awful. Now, today, pictures look awful, too. So to my eye, the only thing I see is a bit of a buffer left around streams. Now, the buffer, which I'm pretty sure they go by the regulations, but the buffer itself, sometimes it's less than one tree length. So if you were to drop one tree, like the width of the buffer is less than that, they're tall trees, right? We've got like 50-meter-tall trees...in my estimation, the minimum buffer you need is something like maybe three to four tree lengths...where you will have a hard time seeing through it. But if you can see through it, like if you see the light through on both ends of that buffer, it's no buffer, right? Especially for the streams that are known to... support large or sizable salmon populations. If you're concerned about salmon, you really need to widen those buffers...I understand people need to read paper, people need to work, trees need to be cut and so forth...But if salmon are to be allowed to live, and exist in natural populations, it cannot be sustained in the long run with the current forest practices.”*

- Yuri Zharikov, Non-Indigenous Expert, Parks Canada

Some non-Indigenous experts explained other ways in which current forestry regulations pose a threat to Nuu-chah-nulth salmon. One interviewee explained that buffers are not required where no fish are identified in waterways or above where fish are identified in waterways, and that first order streams (those highest in the watershed) do not require buffers under the current regulations. Another expert explained that there is a high degree of variation in forestry practices within the current regulations and that the choices of individual foresters define the risk that logging poses to salmon. Two experts reported that forest practice regulations for private land logging are less onerous than for Crown land. Specifically, private land logging does not have to follow the same buffer codes, and the rate of cut, harvest mechanisms, types of equipment, and reporting requirements are all less than that required for Crown land. One expert explained that this risk is amplified by the trend of Crown land in the *ha-ha-houlthee* being sold off and purchased by private investors for logging purposes.

*“If there was fish in a tributary, then it gets a buffer, but as soon as you get one metre, one foot, one centimetre beyond where the fish are, you can log bank to bank right? Disregard that channel, it is nothing. Which makes no sense. Because let's say you do that and you clear cut above it, then all that sediment is just going to come right down into the fish.”*

- Anonymous non-Indigenous expert

Experts working in the forestry sector explained that Crown land logging regulations are prescriptive for riparian logging, in order to protect fish. The experts expressed confidence that they are doing a good job but recognized that there are still opportunities to improve sediment management, particularly related to logging roads. The interviewees working in the forestry sector described the thought that forestry professionals put into road construction to reduce sediment transport, and into planning logging activities to minimise harm to water and fish. One expert described forestry now using “smaller size cuts” and being more diligent about protecting forest ecosystems. Another interviewee observed that the forestry industry operating in the *ha-ha-houlthee* expects a profit margin of 15-20%, but that 5% is a sustainable level. One forestry expert expressed the view that hydrology in the *ha-ha-houlthee* is not significantly affected by logging in the medium and long term and that a failure to maintain the logging road network is a bigger impact.

*“Comparing the harvesting practices of 50, 60 years ago to today, if you pick a fish bearing stream, there’s a tremendous amount of protection...and the focus again when you’re planning and thinking about fisheries and salmon then downstream impacts and sedimentation, that’s the shift in mindset and values that people now have, as opposed to, ‘Alright, we’ll just log away...’. Do I think it’s improved? I definitely [think it has] improved. I think there’s always room for improvement. I think there’s still opportunities to improve sediment management and the practices.”*

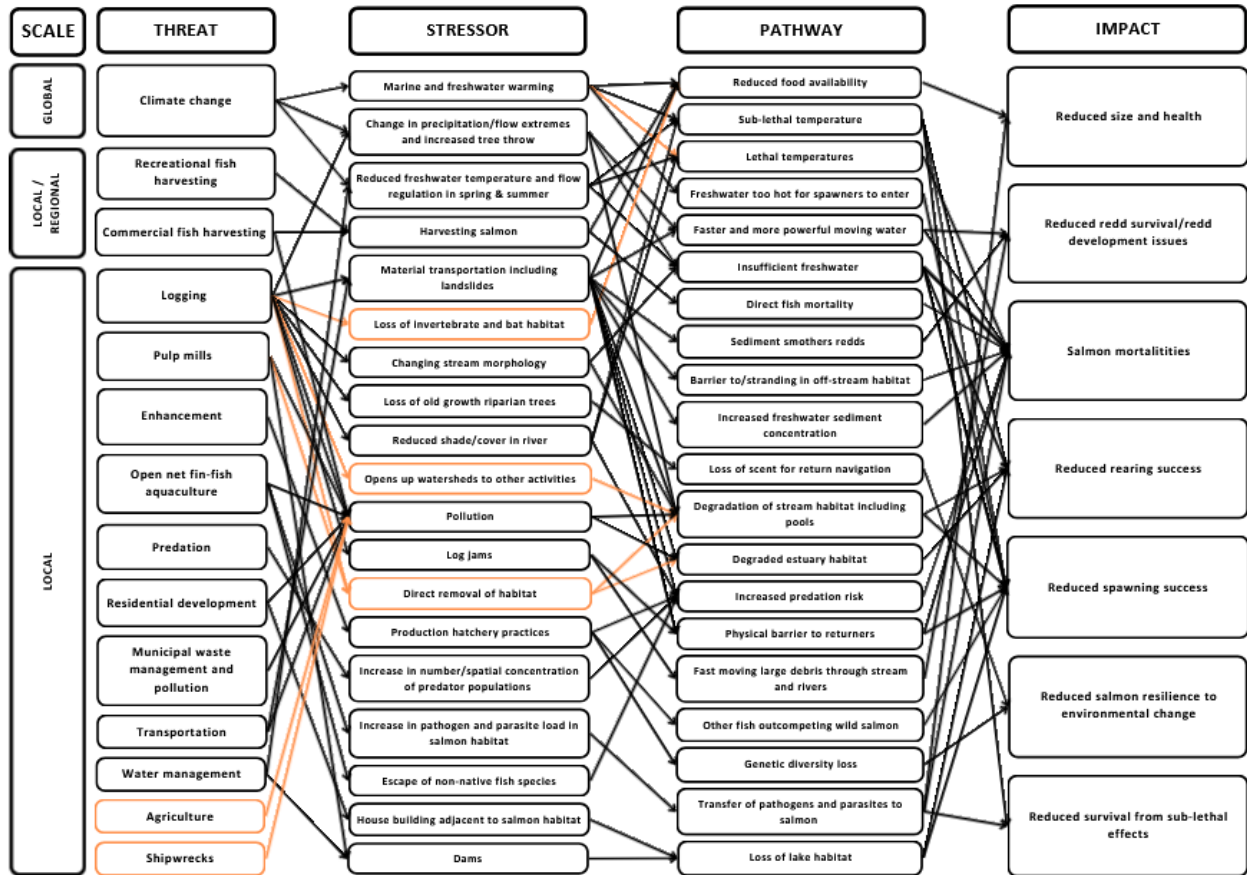
- Anonymous non-Indigenous expert

## **5.9. Ecological risks to salmon: Nuu-chah-nulth knowledge holders**

Several themes of ecological risk to salmon emerged from discussions with Nuu-chah-nulth knowledge holders: climate change; logging; commercial fish harvesting; recreational fish harvesting; enhancement; fish farming; predation; pulp mills; residential development; municipal waste management and pollution; transportation; and dams. The Nuu-chah-nulth artist, Joshua Watts, created a work entitled “The Cycle of Life” (Fig. 4) to provide a Nuu-chah-nulth interpretation of ecological risks to salmon results. Each of the risks identified and their pathways of effect (Fig. 5) are described in detail in the following sections.



*Figure 4. "Cycle of Life" was created by Nuu-chah-nulth artist Joshua Watts, who provided the following description: "This piece shows the journey of a single salmon. For every one salmon that makes their journey to the ocean, and returns to its home to spawn, there are many other salmon that do not. These salmon are represented as different heads floating below the salmon that lives. The bottom shows a salmon being buried by the aggregate that has collapsed into the river from human resource extraction in the forest. The second shows a salmon infested with sea lice. The third shows a young salmon caught in a commercial fishing net. The fourth shows a salmon being caught by a sports fisherman. The last shows a drooping salmon that has been symbolically melted from climate change in the waters. Though this is shown last, out of all factors that affect wild salmon, climate change has the widest reaching impact, effecting all stages of life, and environments. For all these salmon that succumbed to the hostile environment that our waters host in this present day, there is a salmon that survived. She will return to her home and lay her eggs in the same stream she was born, to carry on the generations. Inside her she carries the future generations of salmon."*



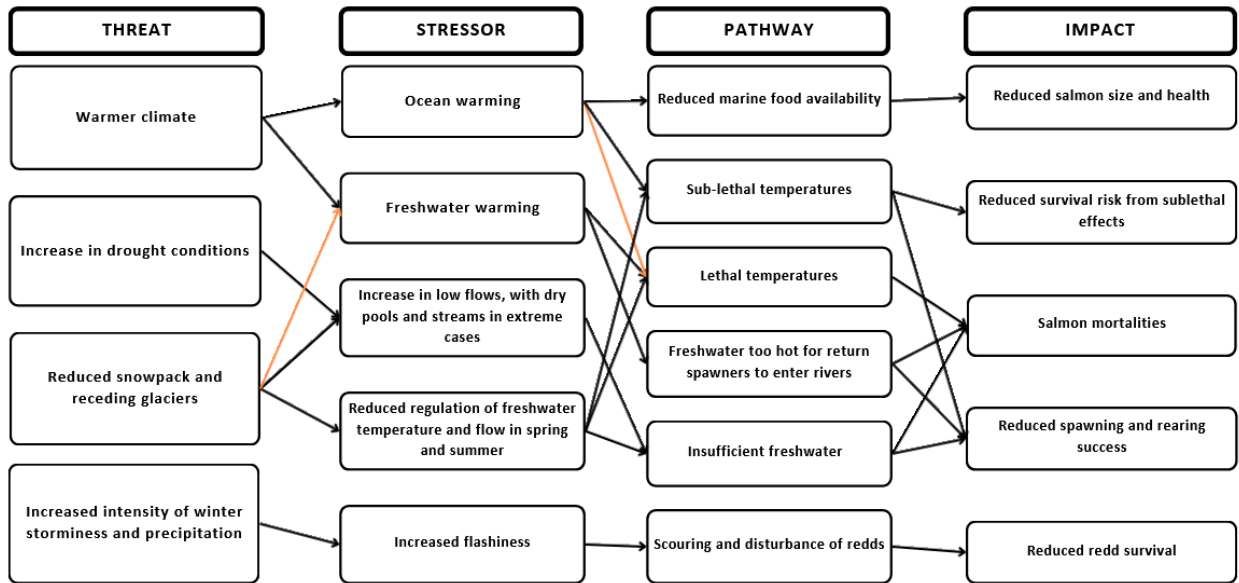
**Figure 5. All pathways of effect identified by all participants. The human threat is shown on the left-hand side, flowing through stressors to pathway, and finally impacts to salmon. Orange boxes and arrows represent additional non-Indigenous expert contributions to perspectives shared by Nuu-chah-nulth knowledge holders, shown by black boxes and arrows.**

### 5.9.1. Climate change

Knowledge holders described several ways in which climate change threatens salmon in the marine and freshwater environments (Fig. 6).

*“Last summer, we probably hit one of the hottest spells I’ve ever seen in my entire life, here in Port Alberni, we hit over 40 degrees.”*

- Anonymous Huu-ay-aht First Nation knowledge holder



**Figure 6. Climate change pathways of effect identified by participants. The human threat is shown on the left-hand side, flowing through stressors to pathway, and finally impacts to salmon. Orange boxes and arrows represent non-Indigenous expert contributions additional to perspectives shared by Nuu-chah-nulth knowledge holders, which are shown by black boxes and arrows.**

*Ocean warming*

The impact of ocean warming on Nuu-chah-nulth salmon was raised by several knowledge holders. One knowledge holder explained that in recent years, the ocean has been noticeably warmer. Interviewees described how ocean warming in and around the *ha-ha-houlthee*, and particularly the recent ocean ‘blob’, has reduced the availability and quality of the food for salmon in the ocean, in particular zooplankton, which reduced salmon size and health. One knowledge holder added that warmer oceans lead to alterations in ocean currents, which changes in turn affects food availability. Another knowledge holder observed that several years of sockeye that had spent their ocean life stage during the blob returning smaller than usual. They explained that the sockeye returned to normal size as the blob diminished. Another consequence of ocean warming raised by interviewees was alterations in migration timing. One knowledge holder described particularly warm ocean conditions keeping salmon holding offshore until cooler conditions arrived, when sockeye, then Chinook suddenly returned all at once.

*“There was more return than they forecasted, but they came back a lot smaller...we had to actually reduce our gillnet mesh size to catch them, because they were just so much smaller and that's definitely a sign of them going out into that marine heatwave, and not having the good zooplankton and food sources and whatnot. So I definitely noticed that it is all about numbers, but it's also...the quality...one fish doesn't fill your jars, it's not good enough to feed yourself or your family. [You] need two instead of just one. So definitely climate change [is impacting salmon] and, what we see is the health of the resource is more than just numbers. It's also like the size and the quality, the fatness, like thick meat versus small skinny fish.”*

- Anonymous Hupacasath First Nation knowledge holder

### *Freshwater warming*

Knowledge holders described observing freshwater warming and the effects on salmon. One interviewee described the increase in river temperatures observed through temperature loggers and their grandparents' experience,

*"We're finding that in the summer some of our Clayoquot Sound temperature loggers are approaching 23 degrees Celsius, 24 degrees and those are lethal temperatures... And I remember my grandparents saying they never used to be at all this hot when they were kids."*

- Anonymous Hupacasath First Nation knowledge holder

A number of themes emerged describing how warming freshwater is impacting salmon in the *ha-ha-houlthee*. The most frequently cited was delayed return migration into rivers. Several knowledge holders explained that delayed migration causes mortalities while the salmon are waiting for the river to cool enough to enter. One knowledge holder explained that salmon may decide to try to complete their return migration up-river but die due to heat before they reach their spawning grounds.

*"We were hitting 38, 42-degree temperatures this year. We were getting pretty darn hot and the salmon, they could start going belly up in 24, 23-degree water."*

- Tom Tatoosh, Hupacasath First Nation knowledge keeper

Some interviewees described the salmon losing condition during their wait to enter the river, which in turn affects spawning success. One knowledge holder described returning adult salmon beginning to experience elevated stress when handled in water temperatures above 16 degrees Celsius, and that the temperature of the Lower Kennedy River now remains above this level at the end of the summer for 7–10 days longer than they used to. One interviewee explained that as the salmon get warmer, they get sick, and become more vulnerable to parasites, and do not taste as good as healthy salmon.

*"The longer they wait, then the darker they get. And so, they're going to get slower, lethargic. They're expending a lot of their energy, when they want to be going up and using that energy to spawn. So, it changes their health, their state. Then you have to think of how successful the spawning is when they're in a poor state."*

- Anonymous Uchucklesaht First Nation technical professional

Two knowledge holders raised some positivity relating to freshwater temperatures. One explained that they have seen variability over time, and that there have been good and bad years. In 2021 in Mowachaht-Muchalaht *ha-houlthee*, temperature conditions were sufficiently cool to allow their sockeye run to successfully reach Muchalaht Lake to spawn. A Tseshaht First Nation knowledge holder provided an example of a dam releasing cold water to cool the river water to support return migration.

*“This year, I think we've had about a total of two weeks of hot weather between 30s and 40s. Our sockeye came in at the regular time but they travelled all the way up to Muchalat Lake, which is their spawning grounds, where the water stayed hot...until they got really hot towards the end and then cooled off again, so that's really great. I like to keep an eye on the weather from year to year in terms of seasonal changes...this year was really interesting. I liked it! The weather was great, where the water levels were perfect. The fish had access to get all the way up to the spawning grounds and includes all the species, the coho, Chinook, all that.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

## *Drought*

Closely related in effect to freshwater warming described above, a common theme emerging from interviews with Nuu-chah-nulth knowledge holders was the impact of drought on salmon, described in terms of the low water flows and the drying up of rivers, streams, and pools.

*“We just finished one of the worst droughts in a long time. I see creeks, they never used to dry up.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Knowledge holders explained that when the water dries up, it causes harm to salmon by affecting returning migration, spawning, and rearing. Two interviewees explained that dry rivers and tributaries act as a barrier to returning migration, because the salmon simply do not have the water to enter the river or reach their spawning grounds,

*“Returning adults, they come back later, seems every year. We have the drought conditions, just before they get here, June, July, August. And then we see all the May run of sockeye don't come anymore. I never see them anymore. The return of coho, Chinook and late summer run sockeye, they're arriving later and later every year. That's, never mind the estuary we just, we don't even see them down there. Normally we can see Chinook salmon in Browning Pass...and we see them there in August, usually. It's still a ways from the estuary. But that's one of the places they like to gather up before they all take off up into the river. But it's been three or four years now that we go there, and we don't see them there in August anymore.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Knowledge holders explained that when adult or young salmon are in freshwater, drought conditions are causing stranding and mortality events, particularly with coho, which rear in small tributaries, side channels, and pools. Two knowledge holders from Nations in Clayoquot Sound described saving hundreds of coho stranded in shallow pools, but also finding large mortality events.



*“Up at Bedwell, right off the main stem. Penny Creek was dried up completely, almost dried up. We got there and there were a couple little puddles. And like, ‘Okay, we’re saving fish today’. So we took about 500 to 700 fish out of...a puddle that was probably about three, four inches deep, about six feet long, seven feet long. And then we took about 500 to 700 coho salmon out of there, and put them back into the main river system. And then there was another little puddle, it was a little bit deeper, about three feet deep, about 12 to 15 feet long and we pulled another 800 or 900 out of there. It was a total of 1500 fish we took out of those two little puddles because that side channel dried up. And when we went back to the second one the next day to rescue the second batch, that first puddle we were at was drying up. So if we didn’t do it that day, all those fish would have been dead. And the second one we took out and put in this main system after that...when the numbers are really dwindling like they are, saving that amount of fish is a big deal...I think it was luck, though...It gives perspective to some people who don’t know what’s actually going on in these river systems. If nothing was done, all these fish would have just died when the water dried up. And we did lose some fish there. It wasn’t all good because higher up in that same system there was a couple more pools that dried out and then a bunch of fish died up there.”*

- Byron Charlie, Nuuchah-nulth knowledge holder

One knowledge keeper explained how everything is connected, and consequently other aspects of watersheds are impacted by drought,

*“There’s not enough for the bears anymore. For a little while, there were happy days for them because they catch all these little fish in the dried up little ponds, because the rivers dried out, they could eat all they wanted. So they [the salmon] didn’t get a chance to lay so the run is getting smaller and smaller. The climate is affecting all of that, and it’s affecting the ground. They need moisture for all the little microbes that all the little creatures depend on, and some of the fish depend on, that the bigger fish eat. It’s just a big chain that gets affected. There’s a break in it and it destroys everything. If there’s lots of bugs, there’s lots of birds. And like I was saying, if there’s lots of birds it means there’s healthy fish. Nowadays...I haven’t seen those birds down there for 30 years. And this heat...seems to be getting worse and worse and seems to be drying up the rivers more every year. It wasn’t so bad this year, as it has been in the past, I noticed that myself, and the river did get low, but the salmon managed to go up. We had an early run and I think they may have been affected. This run I think did really well because it was not as hot for as long this time. I think the river seemed to be doing a bit better this year, which means that all the little creeks and the rivers that feed the lake are doing good too or have been doing good. But it takes more than a year of being steady and it used to be steady long ago. The cycle was steady and unbroken.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

### *Changing winter storminess and precipitation*

Knowledge holders expressed mixed views on whether winter storms have changed in the *ha-ha-houlthee*. Although two interviewees expressed the view that rain events are either unchanged or become less intense, most interviewees that spoke on this issue described rainfall events becoming even more intense and lasting longer, creating flashier water movement through watersheds. A Tla-o-qui-aht knowledge holder observed storms increasing from between two to three-day duration to ranging from five to seven days. A Ditidaht First Nation knowledge holder explained that storms during the fall are becoming more frequent in the Ditidaht *ha-houlthee*. Another knowledge holder explained how summer (drought) and winter (storm) precipitation is becoming more extreme with watersheds now transitioning from drought in summer to more intense storms in winter, neither of which are positive for salmon. One interviewee explained that winter precipitation that would have fallen as snow is increasingly falling as rain, exacerbating the issue of increased flashiness. Some knowledge holders described the harm that increased flashiness causes to salmon. They explained that salmon redds and their habitat are scoured by water moving quickly through the system, either disturbing or destroying the eggs, thereby reducing survival.

*“We've always had rain, but now the rain just flashes right through, you don't really have that steady contribution. And it's just more flashy, flashy and fast...So you have your rainy flashy flooding events that are going to scour the system and potentially just push out any eggs or at least disturb the eggs. So, you have a different environment that they're going to have to try to adapt to.”*

- Anonymous Uchucklesaht First Nation professional technician

### *Reduced snowpack and receding glaciers*

Six knowledge holders described reduced snowpack accumulation during winter in the *ha-houlthee*. One interviewee explained,

*“There's almost no snow now. I was really surprised the snow up there the last few days. And I was like, ‘Yahoo!. Snow on Mount Arrowsmith, that was really wonderful.’ One of the elders used to say, ‘You guys are so weak nowadays. You guys can't do anything’. And I was feeling a little bit insulted. And she was saying, ‘Well, the young men’, she said, ‘I would tell them, go get me some snow. I want to have a cold drink’. And she said they would run up the mountain get her some snow and bring it back. And she said, ‘You can't do that’. ‘No’, she said to us...‘There's no more snow up there now’, she said. So, the snow used to be there all year round and it never all melted and disappeared like it does now. So that makes a huge difference as well.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

A Kyuquot/Checlesht knowledge holder provided another story of how climate in the *ha-ha-houlthee* has warmed and snow and ice extents have reduced,

*“When I started school, we used to have to walk the beach because on the ground, it was 2, 3, 4 feet of snow. So we'd have to walk at low tide on our little island to get to school. Then in the seventies it started disappearing. Even the bay in Kyuquot used to freeze. Two kilometers out of Fair Harbour it was frozen. One of our guys walked in from two kilometers, walked all the way into Fair Harbour. And it's about a kilometer wide. But he made it. Everybody watched him and said you're crazy.”*

- Tyee Hawilth Francis Gillette - Che:k'tles7et'h' First Nation

Several knowledge holders explained that less snowpack means that water flow and temperature in watersheds are less regulated during spring and summer, which causes lower flows and warmer water in the summer, both of which are a risk to salmon successfully reaching spawning grounds. On a more positive note, a Mowachaht-Muchalaht knowledge keeper described seeing more snow and cooler temps in recent years,

*“You have these hot summers where the snowpack traditionally starts to keep the river at least in an equal state. But if you don't have that then we end up with a really dry river...it's been getting cooler the past few years...It's been a lot cooler, we've got snow...I remember when I was young, and I seen it get a really good amount of snow, lots of snow, lots of fish...[Then] we got super dry weather, barely any fish making up to spawning grounds. Now the weather is starting to taper off and get cooler. So, I'm hoping for that we're starting to get back into that a little bit of an equal level of cool weather, more rain, more snow on the mountains to provide pathways for those fish when it comes to being really dry.”*

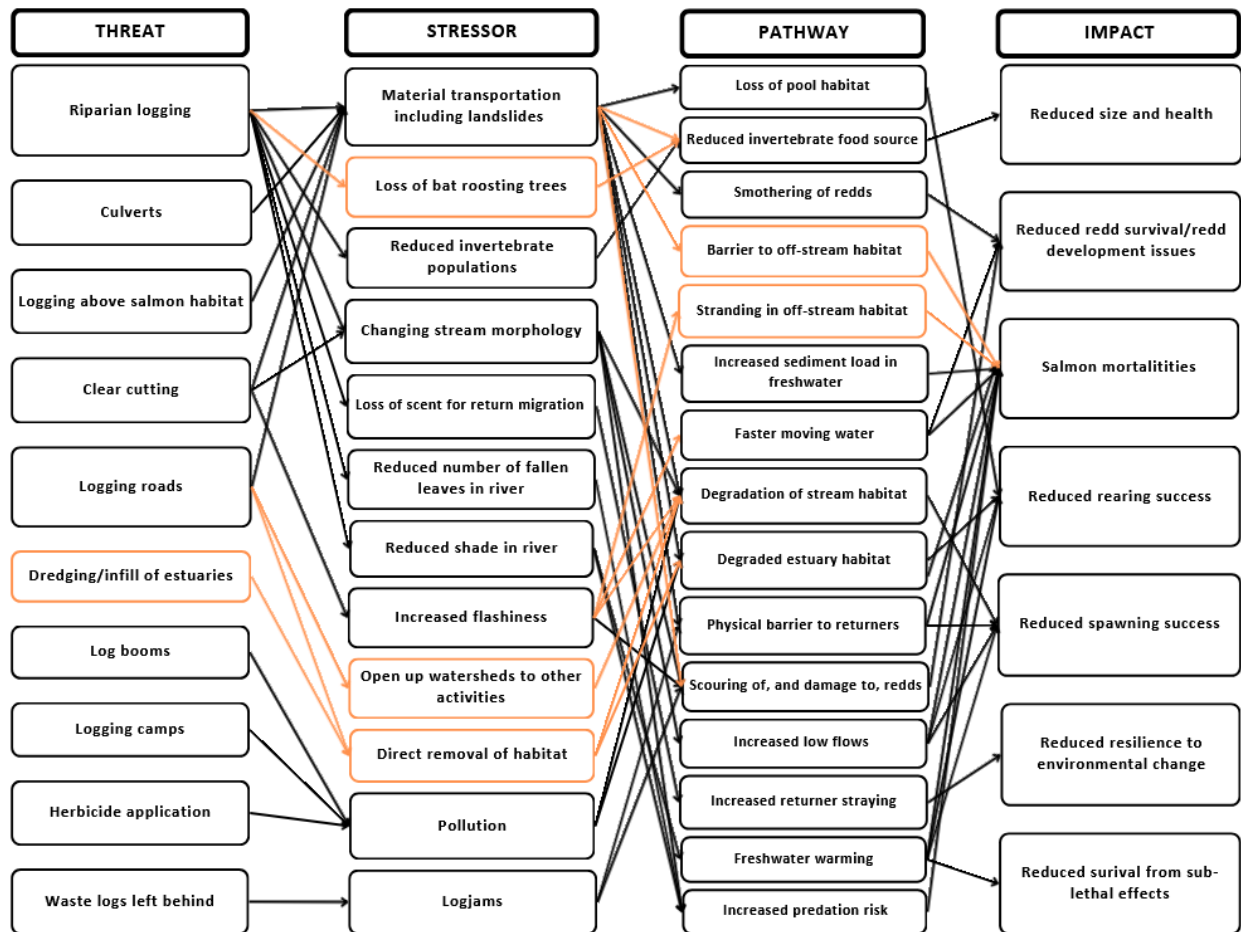
- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

## 5.9.2. Logging

Logging emerged as the most discussed, complex, and detailed threat to Nuu-chah-nulth salmon. Knowledge holders described older and current logging practices, and the pathways by which they continue to harm salmon and the wider *ha-ha-houlthee* (Fig. 7). A picture emerged of cumulative destruction of salmon freshwater habitat over more than a century, in which older practices still pose a threat to salmon in addition to current inadequately regulated practices.

*“I've had the luck and the opportunity to swim on unlogged rivers in Clayoquot Sound system. Fully intact untouched watersheds. Not even logged...so like Moyeha River. We get led in to do snorkel surveys, we get hellied in [by helicopter] in our dry suits, snorkel down the river and counting all the salmon spawning. And then I go to all the other rivers that are logged, logging roads we drive up and swim down and just to see the night and day difference of an unlogged river and a logged river. You can just tell the habitat is so much better.”*

- Anonymous Hupacasath First Nation knowledge holder



**Figure 7. Logging pathways of effect identified by participants. The human threat is shown on the left-hand side, flowing through stressors to pathway, and finally impacts to salmon. Orange boxes and arrows represent non-Indigenous expert contributions additional to perspectives shared by Nuu-chah-nulth knowledge holders, which are shown by black boxes and arrows.**

### Older logging practices

Knowledge holders described aspects of older logging practices that did, and continue to, harm salmon. Some of the knowledge holders had worked in the logging industry earlier in the lives and spoke from personal experience. They explained that whole watersheds were clear cut, with trees cut up to the banks of rivers and streams.

*“My father, he was a logger...He was part of the problem that he logged, did what he was told to do, and they logged everything. Got to a river like, he told me in his own words, and we walked across started the chainsaws and started logging from the other side.”*

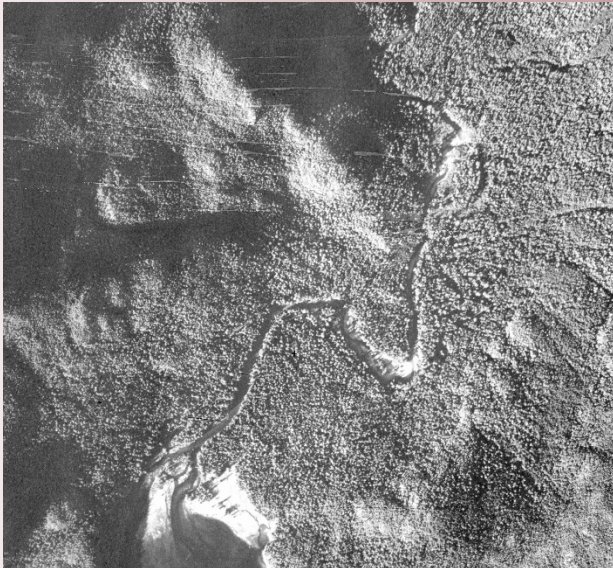
- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Old growth trees were felled over waterways and used as bridges. Logging then continued from the other bank. Knowledge holders described how logs would be dragged through streams and rivers to transport them down to estuaries. Several interviewees described logging camps being built in watersheds. Ota Hupacasath knowledge holder provided an example of a river in Clayoquot Sound that was decimated by older logging practices in which every tree was removed.



*Clear-cut logging (photo by Tla-o-qui-aht First Nation and Redd Fish)*

A Ditidaht knowledge holder explained that elders told stories of how deterioration in their salmon populations began with the creation of logging roads. Several interviewees explained that monocultures of ecologically incorrect tree species were replanted after logging, based on which species was in high demand at the time. Consequently, logging companies replanted large areas of fir at lower elevations, which are now diseased.



*Aerial images of hitsyaq̓lis (Tranquil) in 1937 pre-logging and in 1970 immediately following logging (photos by Tla-o-qui-aht First Nation and Redd Fish)*

*“Every creek is impacted. And it's because in the early days, when the damage was done, there was absolutely no respect for any system. They dragged logs through there. They cut right to the banks. So, every creek that we have is impacted by poor logging.”*

- Anonymous Nuchahlaht First Nation knowledge holder

One knowledge holder contrasted traditional wood harvesting to modern logging,

*“There has to be old people and middle people and young people and babies. There has to be the same with the trees and all the bushes. And that's not happening. Not anymore. The old trees help to fertilize the ground and now they're not. They're all the same age and they're all crowded. Our people used to manage the forest, they wouldn't go out there and cut them all down, they would select it from certain places. Because the people had knowledge of how much there should be in a piece of land and how many species there should be. And they knew what they would do with each tree and they would use every bit of it. They didn't leave stumps and roots and they didn't leave the branches laying there and they didn't have to. It happened naturally. It's in its own cycle. And it [modern logging] happens all in one big space at one time and it just gets destroyed. The old people used to go in there. If they wanted to build a house, say, they would take the lumber out of a cedar, but they wouldn't kill the cedar. And they would let it grow. And they would take what they needed from the tree and leave it. They very seldom took a whole tree down and killed it.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

### *Current logging practices*

Some knowledge holders acknowledged improvements in logging practices from the 1980s onward but emphasized the risk they still pose to salmon. Interviewees described small, insufficient buffers that are left adjacent to larger rivers and streams where salmon presence is identified. They also explained that some trees are left standing between clear cut areas. Some knowledge holders described logging of upper reaches of watersheds by helicopter, where it is not possible to build logging roads. One knowledge holder explained that second growth is not maturing as fast as logging companies expected, and so has not become economic to harvest. Thus, logging high elevations, which was once uneconomic, is now being pursued. One interviewee explained that logging roads have not been deactivated and are built improperly. As mentioned previously in this report, some knowledge holders reported gates erected by logging operations to prevent people from observing their activities, and private land logging with less regulation causing harm to salmon. Wasteful logging practices were criticised by three knowledge holders, who described cut blocks where vast numbers of trees have been cut down and left on the land as “pulp”, just to target one old-growth tree.

*“They don't leave enough buffer zone, for one. There's a lot of erosion, silt and mud, road construction, improper road construction, no deactivation, no proper deactivation.”*

- Paul Sieber, Ditidaht First Nation knowledge holder

## *Pathways of effect*

### *Sediment, gravel, and rock transportation*

The deleterious impact on salmon habitat of increased transport of sediments (e.g., silt and sand), gravel, and rocks from logged areas into freshwater was raised by many knowledge holders. Two knowledge holders observed that logging roads and the ditches that run alongside the roads, and culverts play an important role in sediment transportation. Interviewees explained that without trees and root structures to hold the soil together during rain events, increased volumes of sediment, gravel, and rocks runoff the hillside into rivers and streams.

*“MacMillan Bloedel didn't fix a thing. They pulled out some first and second growth timbers, they pulled a lot of volume of lumber out of our watersheds, and our watersheds couldn't recoup after...Nowadays, that water that comes out of the sky, there's nothing there to hold it, there's no trees to hold it. So now that gravel is just gravity fed straight down to the mountain. And then it just builds up into our rivers and streams.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

One knowledge holder explained that sedimentation is a threat to salmon, even when logging is occurring at higher, previously unlogged, elevations.

*“They're still taking old growth out of our territory. Some of that old growth is still by creeks and rivers that are known salmon producers. Mind you, the habitat where they're logging now is beyond their reach, but what happens above affects below, right? So even though I've heard the argument, 'Yeah, but we're way up there. Fish don't go way up there', and it's like, 'Okay, well, all that sediment has to go to go somewhere – they [sediments] get into the creek, they're not going to stay up there, they're still going to go down there'.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Another interviewee described whole streams being lost to sedimentation in Nootka Sound,

*“We've lost a lot of small streams within Nootka Sound area because of logging. A lot of them, ranging from the small ones to the really big ones that we've had. Gold River itself is situated within the municipality of Gold River, that's why it hasn't been really logged so close to the river. But if you get outside the municipality, and you go further up as soon as you pass that line, you'll see nothing but logging all the way up alongside rivers, both sides of the valleys, everything. And the more logging goes, it continues to affect the more streams as you get further upriver, you're just looking at maybe four streams for one side, five streams on the other just pushing sediment down all at the same time. And then it hits the main river system, and then it just drains all the way down.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

Interviewees also revealed that the sediment is transported down into watershed estuaries and into the marine environment. A Nuchatlaht First Nation knowledge holder described seeing sediment, “the brown”, washed miles out to sea. Another knowledge keeper explained that sediment deposition in estuaries is covering salt marsh and eel grass habitat important to salmon smolts during a critical life stage transition.

*“I was involved with one of the programmes, it's the Nahmint programme in the Nahmint River, which is halfway down the Alberni canal and hang a right. When I was a young fella, my job was to turn around and do beach seining and get the brood stock for the Chinook and take the females to Robertson Creek [Hatchery]. My job was to turn around and swim in the water and bring the net to the beach. And as we bring the net to the beach, we would pick the lead line up and drop it over the boulders and carry on to the beach closer and closer until we get our job done...Those boulders used to be about four or five feet deep, I'd have to pick my net up and go over that. Now those boulders are just the top, so the sediment debris from the logging practices that are going on in our territories is absolutely sickening how close they're coming to, in my words, old words, stage one fishing, fishing protection streams, the red zones.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

Connected to the increased transport of materials into waterways due to logging was the theme of landslides. Several knowledge holders explained that clear cutting combined with logging roads increases the risk of landslides, during which enormous amounts of material enter the water at once. As one interviewee noted, landslides have always occurred in the *ha-ha-houlthee*, but their frequency has increased dramatically because of logging.

*“Atleo River was just decimated by logging. There's a picture from the plane of the logging. There's not a single tree, just see the river and all a logged area. And then it started land sliding and it's filling in and the whole river used to have ten, twenty, thirty thousand chum. We're counting hundreds, maybe two, three hundred. So that is a clear example. If you log like that, it landslides and you blow a river out and forever ruined.”*

- Anonymous Hupacasath First Nation knowledge holder

Knowledge holders explained how increased transportation of materials into rivers and streams destroys salmon habitat. Interviewees described pools, which are important habitat for young salmon, filling in until they are unproductive. Degradation of spawning habitat was a recurrent theme. In the most extreme examples provided, whole streams have been destroyed, removing any spawning habitat. Knowledge holders explained that spawning beds are filled with silt, so that either spawners cannot use them or if they have already spawned, the eggs are smothered or suffer developmental issues due to a lack of oxygen. Such “smothering” of eggs or spawning habitat was described in rivers, streams, and lakes. Furthermore, knowledge holders described silt exposure killing fry, and spawners before they can spawn.



*“It [sedimentation] changes the bottom of the river. And that run-off from the logged-out areas is washing all kinds of dirt and stuff into the rivers. And those clog up the gills of the ones [salmon] that are there. And so, some of them don't even lay because they're dying from it. I mean, if we breathe in dust and dirt, we will die, too. So, I don't know why they think that these little creatures would live through that.”*

- Gina Laing, Uchucklesaht First Nation knowledge keeper

Sediment transported from logged areas and down river accumulates at the mouth of tributaries and rivers, according to several knowledge holders. They explained that sediment builds up into a barrier that prevents returning salmon from entering a waterway.

*“Our fish can't get into the tributary into their rivers because they got, example, a dike that was created from the sediment and those are not getting cleaned up, they're just getting deeper, they're going from six feet high to the next year, it's going to be 20 feet deep, the next year will be 30 feet deep.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

#### Rate of water flow during fall and winter

A theme commonly raised by knowledge holders was the reduced ability of logged land to retain water during fall and winter rains. Interviewees explained that when forests are intact, the root systems of trees and other plants hold rain and release it slowly, but without intact forests to control the rate at which water moves through the watershed, rain from intense precipitation events runs straight downhill into streams and rivers causing flash flooding. Although knowledge holders described how the *ha-ha-houlthee* has always seen intense rainfall and the systems have thus always experienced flashy hydrological events, they also emphasized that logging increases flashiness dramatically.

*“In the wintertime, it's coming out so fast and so high, it's just washing everything away. It's not at all the same as it used to be. The land used to be able to deal with the rain and absorb it and it would help things to grow, the things that needed to be in the ground to reproduce and carry on. But that's not happening so much anymore. Even some of the new trees they plant get washed out. And it just ends up with bare rock. I wonder how long it'll be before they will all just be bare rock. It's scary.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Many knowledge holders described how the increased flashiness of the watersheds leads to scouring of redds and therefore the loss of eggs in the deluge. Another interviewee noted that habitat for spawning is washed away during these increased severity events. Conversely, one interviewee, acknowledging that increasing drought conditions are affecting summer flows, explained that their elders described how creeks between Clayoquot Sound and Barkley Sound, which had never dried up, started drying up during summers after the watersheds were logged.

*“You get the redd scouring...the flows get too high in the winter. They start scouring the river and disturbing the redds and killing the salmon eggs.”*

- Anonymous Hupacasath First Nation knowledge holder

### Changing stream geomorphology

Knowledge holders frequently raised logging as a driver of changing stream morphology in the *ha-ha-houlthee*. Interviewees explained that this change happens through two mechanisms. In the first, when old growth trees were logged from the riverbank, bank stability decreased resulting in bank erosion. Rivers became wider, shallower, and straighter. In the second, the deposition of sediment, gravel, and rock, as described previously, made streams and rivers shallower. Consequently, the waterways burst their banks flooding the bush, causing braiding of the river into many shallow streams. Such flooding also caused erosion around remaining old growth trees, which eventually fell into the rivers.

*“The rivers have deep channels with so much sediment...it builds the wall, and then the river splits and then we call it braiding, and it sprays into the forest. And so rather than being one deep channel, it spreads into multiple, through the forest and trying to form open channels. And then it's super shallow non-productive habitat.”*

- Anonymous Hupacasath First Nation knowledge holder

Knowledge holders described changing stream geomorphology harming salmon in several ways. First, it removes shade provided by riparian trees, which increases the risk of predation. Secondly, the shallower, straighter morphology of the rivers creates a greater flush action, which leads to increased scouring of eggs and less spawning success. Furthermore, knowledge holders described habitat becoming more likely to dry out during droughts and experience low flows, resulting in less access to returning salmon, more strandings, and greater egg loss.

*“When you start dealing with sediment and you get your trees falling down and then your river starts to widen, [become] shallower, and now it's going straighter [so] that you're starting to get that flush action. So, then you start risking those fish eggs...and because now your flood's just washing all that sediment bearing all your fish eggs for your next years' stock right. And that's quite detrimental because then your fish doesn't have any habitat to spawn in anymore.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

### Logjams

Knowledge holders explained that logjams are created in the mouth of streams by logging debris, predominantly logs left behind by logging on the land and washed into waterways, but also trees falling into streams and rivers because of bank erosion caused by sedimentation, increased flashiness, and stream morphology change. Interviewees described these logjams acting as barriers to returning spawners, who cannot pass them, resulting in lower recruitment. One knowledge holder explained that because returning salmon cannot get past a logjam, they will often spawn in lower reaches of a watershed below the logjam, rather than in their traditional spawning grounds. Other interviewees described logjams getting flushed out and causing damage to downstream eggs.

*“Like the Kyuquot one was only sometimes 5-10 returning to that lake because it's not healthy enough. And nobody's stood up to do anything about it at all. I went there with DFO a few years ago,...logjam at the outside of Jansen Lake and none of the fish were really getting by that.”*

- Tyee Hawilth Francis Gillette - Che:k'tles7et'h' First Nation

### Riparian logging impacts

Older and current logging practices of removing riparian trees was a common theme among knowledge holders. Interviewees reported that older riparian logging practices have contributed to changing stream morphology (described previously). Three knowledge holders described the inadequate width of riparian buffers left under current forestry practice regulations, which has resulted in buffer trees being blown or washed into streams and rivers. Interviewees discussed reduced riparian tree presence removing shade in two ways. Knowledge holders explained that riparian logging has removed shade critical to providing rearing juvenile salmon with refuge from predators. Furthermore, they described riparian tree logging increasing water temperatures because the trees are critical to protecting water from direct sunlight. One knowledge holder described loss of riparian vegetation reducing habitat for invertebrates that fish rely on as a food source. Another knowledge holder explained that losing riparian trees reduces the number of leaves that float downstream in the fall, which provide protection from predation, particularly to larger fish. One interviewee described the important role that riparian old growth trees play in salmon navigating home and how the loss of these trees causes salmon to increasingly stray from their home river on their return migration,

*“Historically, fish DNA from those carcasses from the past is stored in those [mother] trees that allowed a lot of our salmon to navigate to those spawning grounds, that held that smell from the past parents. Now those logging trees are knocked down. So that also plays a big part in all this straying as well too, which involves enhancement and climate change.”*

- Anonymous Nuu-chah-nulth First Nation knowledge holder

### Pollution

Three knowledge holders highlighted pollution from logging practices entering rivers and streams and harming salmon. Herbicides were described being used to clear logging roads and remove salmon berry bushes. Pollution from logging camps was also highlighted, including human trash, and abandoned mechanical equipment. One knowledge holder explained that salmon berry bushes are linked to salmon abundance,

*“They spray to kill certain plants, like salmon berries, and the salmon berries are so important. The old people say that the more salmon berries there are, the more fish there would be. And here they are killing the salmon berry bushes.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

### Estuary log booms

Holding harvested logs in estuaries in log booms was described by two knowledge holders, who expressed concern about how bark released from logs affects estuary habitat. One of the knowledge holders mentioned the impact of falling bark on herring spawning grounds in Clayoquot Sound. Another was concerned about the impacts of log booms in Alberni Inlet, where logs are transported in and out.

*“I mentioned the pulp mil. I guess I'd like to share how much of an impact all the dragging all the log booms round [is]. It's like they float all the logs in the harbor, and I don't know how that impacts the bottom...bringing in all the bark and trees into the river mouth...There's always a couple of ships in. So, they are booming logs into the harbor from any part from the rest of Alberni, wherever. Probably the rest of the West Coast and I'm not sure where the furthest comes [from], but it's been that way ever since they started harvesting. I guess it's always been booms all up and down through the Inlet all the way right down to probably China Creek.”*

- Anonymous Tseshah First Nation knowledge holder

### *Hishuk-ish tsawak*

*Hishuk-ish tsawak*, the Nuuchahnulth worldview that everything is connected, everything is one was a recurring theme in relation to logging. One knowledge holder explained,

*“What's having a negative impact on our fish in our territory and our ha-houlthee for Uchucklesaht is overharvesting in the ha-houlthee, logging right down to...the riverbanks because it seriously disrupts the natural way of protecting the forest and feeding the animals, the bears and other things that feast on the salmon: the eagles, the birds, and the salmon to fertilize the big trees. But they're not there anymore. Because traditionally, bears drag salmon up into the bush and they*

*eat what they can, the rest fertilizes the trees. It's got to do with hishuk-ish tsawak...which means everything is one, everything is connected. So, if you break the chain of survival, whether it's for the salmon or whether it's for the forests, or whether it's for medicinal plants, or the spawning beds, it creates weak links and your, your hishuk-ish tsawak is only as strong as your weakest link. And it's very detrimental if you don't manage the habitat, and everything that contributes to habitat and your ha-houlthee and the actual fishery."*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

One interviewee explained that harvesting mother trees is detrimental to nearby smaller trees, which rely on the mother tree for resources. Another knowledge holder explained that logging destroys the cycle of life by removing all vegetation, not only trees, and replanting a single species, which removes the naturally complex tree age and species structure of the forest on which life depends in the watersheds of the *ha-houlthee*.

*"And they did the same thing with the different species of berries, and they knew what they could eat and what they couldn't and when and how much from each tree and how much from each branch and the medicines and they needed all that stuff. [It] is disappearing. I used to go out with my elder and I used to help her gather medicine from the forest. And she was teaching me about that. She would show me a medicine, show me how to pick it without destroying that tree or the animal or whatever or the bushes or grass and she would show me how to preserve it if it needed to be preserved. She told me how to use it and not to go back to it the next year, to go somewhere else, and all that kind of thing, and...some of those berries are not there anymore. And some of those grasses and medicines are gone. They plant some of the trees, but they don't put the other things back that they destroy. And you don't have those things going back into the ground like it's supposed to, and it's dying. The cycle is broken, and many things are not contributing back towards the fish and the fish aren't because there's barely any. There's not enough of it to go back into the earth and into the animals...I remember an elder saying to me, that tree, it can handle the sun, that one can't. Like, they're different types of trees, right? And so, they grow underneath the bigger trees, because the bigger trees can handle it. And she was saying, they're almost gone now. All the trees are the same size. And that's the only thing they replant. Like even the berry bushes...they need a certain environment, and it's not there anymore. And the bears depend on it, all the other little creatures depend on it, the birds do and their droppings make a difference. And all of that, it all is a big cycle. It's all being broken in all those areas."*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Other connections were described by knowledge holders. One interviewee explained that barriers to returning adults cause spawning to occur in lower reaches of watersheds, depriving higher areas of nutrients that flow from salmon decomposition. Another knowledge holder emphasized the connection between the lower and higher reaches of watersheds, and how actions at the top of watersheds impact salmon at the bottom. Two knowledge holders explained that clear cutting followed by sediment runoff has left some watersheds devoid of soil, which means replanting fails and any existing trees are less likely to remain standing.

*“We’ve got Malk-toop Inlet...They tree-planted it four times, nothing came back, all the soil was washed away from clear cutting in the 50s. But they tried replanting it and it got flattened, since everything got washed away. All the soil has gone. It looks green. I don’t know how it looks green. Just bushes, I guess... We got one mountain that’s dead from clear cutting all the soil washed off. I don’t know if there was anything done about that. Nobody apologized...or said, ‘What can we do to help?’”*

- Tyee Hawilth Francis Gillette - Che:k'tles7et'h' First Nation

### 5.9.3. Pulp mills

The threat of pulp mill pollution to Nuu-chah-nulth salmon was raised by several knowledge holders. One knowledge keeper described ongoing oil seepage from the decommissioned pulp mill in Gold River, and one interviewee ascribed the loss of pink salmon in the Gold River to the Gold River pulp mill. However, most interviewees focused on the threat posed by effluent from the Port Alberni mill to Nuu-chah-nulth salmon. Interviewees discussed what one referred to as a “dead zone” where mill effluent has sunk to the bottom of the Alberni Inlet, killing the seabed biota in the affected area, which salmon will not enter.

*“In the past, you would not believe the ugly stream that would come out of that pulp mill sediment pond to where it looked like a different river coming into the lower Somass River, and that was the piping and the tubing that was going into the river. Now example of this is the river going down. This portion here was the sediment that’s coming out of the settling pond. The fish wouldn’t go in it. The fish stayed on that black line, and they wouldn’t go into it. And that would go all the way down to the lower end of the Somass river. So, whatever...the pulp mill turns around...it’s not good enough, because...the fish will not venture into that...they’ll stay away from it.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

### 5.9.4. Commercial fish harvesting

#### *Historic overfishing*

A theme of overharvesting during the twentieth century was discussed by many knowledge holders. Canneries were described opening in the early 1920s and targeting salmon at the mouth of rivers and lakes using mechanized methods. The cannery at Kildonan in Uchucklesaht *ha-houlthee* was mentioned by two interviewees. One knowledge holder described the inequity of the Nation’s exclusion from the fishery on their doorstep while the cannery exploited sockeye using industrial donkey engines to drag in beach seines.

*“We used to have boatloads and boatloads, deck loads, holds all full. Hundreds of them delivering Chinook salmon to the cannery at Kildonan. And we weren’t allowed to fish. They used to have big seines in front of our river at Kildonan in the 1920s...a boat that would set the seine and a donkey engine on shore that would pull it in and pulling tens of thousands of sockeye while we sat on the banks and were not allowed to fish.”*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

One knowledge holder described the cannery at Nitinaht Narrows, the inlet to Nitinat Lake in the *ha-houlthee* of Ditidaht First Nation, decimating their salmon run,

*“The [inaudible] cannery opened up just beside Nitinaht Narrows, which...decimated our run...So eventually that cannery had to leave because the run was down, and they decimated it over 10 years or so.”*

- Paul Sieber, Ditidaht First Nation knowledge holder

Commercial overfishing was ongoing in the 1950s and 1960s.

*“When they were harvesting in the 50s and 60s, they thought, oh, there’s so much salmon, it’ll never end. But they were wrong.”*

- Anonymous Huu-ay-aht First Nation knowledge holder

Hobiton Lake, in Ditidaht *ha-houlthee*, had been a traditional source of salmon, until the population was overharvested in the 1950s,

*“My mother told me...they used to go to Hobiton River Lake. Not just them but all the families...They may have had one or two small cabins that people lived in year around...My grandmother used to actually stay in a big smokehouse, catch the sockeye and smoke it and live in it. It was big enough to stay there while they were smoking, and she did tell me there was enough of that then. But there was a commercial fishery in there also, maybe in the 1950s. They would come right out the river mouth in the lake and fish right at the river mouth. Like everything, that was a never-ending resource, right?”*

- Paul Sieber, Ditidaht First Nation knowledge holder

A Tla-o-qui-aht knowledge holder explained that in the late twentieth century, commercial overfishing was still occurring,

*“And back in the day, eight to a thousand fish a day was not uncommon. Catching that many in one day. 10 days. Go home, sell your catch, grub up and head right back out...our boat we used to catch 600 a day.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Commercial over exploitation of herring was discussed by four knowledge holders. Interviewees also described the important connection between herring and salmon, and how salmon rely on herring as a food source. One knowledge holder described the connections between herring and other life in the *ha-ha-houlthee*,

*“Yeah, it’s like when herring really flopped and tanked, there was no salmon around, no ducks around, no seals, no sea lions, nothing. It got pretty bad until the herring got strong enough to invite everyone else back so that we could all eat.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

### *Current overharvesting*

Several knowledge holders expressed the view that too many Nuu-chah-nulth salmon were being commercially harvested given the current state of abundance. Some of these knowledge holders explained that there were too many active commercial fishing boats operating in the *ha-ha-houlthee*. Three interviewees described the increased fishing pressure from greater efficiency of larger boats and fish finding and navigation technology. One interviewee stated that this is a particular problem with seine net boats. Several knowledge holders described stock levels being unable to tolerate any form of additional intercept fishing outside the *ha-ha-houlthee*. Many knowledge holders explained that commercial intercept fishing of Nuu-chah-nulth salmon off the coast of Alaska and the west coast of continental USA is unsustainable. Some interviewees described the risk of industrial high seas fishing outside the *ha-ha-houlthee*. The repetitive risk to salmon posed by miles-long “ghost” nets abandoned by high seas fishers was raised by two knowledge holders.

*“I know a guy that was a scuba diver for them [DFO]. And he said they pick up some of these nets. And he said they’re so long, he told me how many miles long they were...And he said those are the most dangerous things to our fishing. He said they set the net and when they see Fisheries [DFO] coming, they cut it and it sinks because it’s full of fish. The net goes to the bottom, when it gets rotten it comes back up and it catches fish and it goes back down.”*

- Tom Watts, Tseshaht First Nation knowledge holder

### **5.9.5. Recreational fish harvesting**

Similarly to commercial fishing, many knowledge holders discussed their concerns about the threat of recreational fishing over-exploiting Nuu-chah-nulth salmon (predominantly Chinook) in the *ha-ha-houlthee* and along the BC coast, particularly the central coast. Nuu-chah-nulth knowledge holders described observing a growth in the recreational fishing industry in the *ha-ha-houlthee*, in the number of



lodges, guided fishing trips, boat sizes, and fishing technology over time. Many interviewees described the arrival of larger boats enabling faster access to fishing grounds further offshore. Some knowledge holders equated recreational fishing guides with commercial fishers, because of their knowledge, boat capabilities, technology, and repetitive fishing trips in a single day.

*“You go out there and there’s 50 boats fishing offshore, all sporty boats all catching. And then you see guys get one set, and they go back in, and they grab another, new guests, and they come back out. And then they go back in. And then they’ll do multiple trips a day and they’re pros. They know where the fish are...I go rec fishing. I’m like, ‘I don’t know what the fish are, I get to go there all the time and get skunked, like I don’t get any fish’. And then you know what? They never get skunked...they are like professional commercial fishermen.”*

- Anonymous Hupacasath First Nation knowledge holder

Some knowledge holders described the risk to salmon from a practice of high-grading in recreational fishing, whereby smaller salmon caught are discarded (and die) in the hope of catching a larger fish. One interviewee explained that the largest salmon are returning females and so their loss is more harmful. Another knowledge holder described the wastefulness of recreational fishers disposing of all parts of the fish except the fillets. One interviewee described an example of additional pressure on salmon from questionable practices by a recreational fishing lodge in the Nuu-chah-nulth *ha-houlthee*,

*“My son...fished for that fishing lodge for over ten years and he told us what’s happening there. He said they go out even though the customers get two each...get their catch for the day, they’re sent back out by the boss to get three or four more and then put it in their cooler for other customers that arrive that don’t get any. And it’s cheating.”*

- Anonymous Nuu-chah-nulth knowledge holder

### 5.9.6. Enhancement

Enhancement (through large-scale production hatcheries, rather than small-scale conservation hatcheries), was a recurring theme of risk to wild salmon in conversations with Nuu-chah-nulth knowledge holders. The differences between the three main DFO production hatcheries and smaller conservation-focused hatcheries in the *ha-ha-houlthee* was emphasized, with risks pertaining to production hatcheries. The risks to wild salmon from production hatcheries identified by knowledge holders included deterioration in the wild salmon gene pool, changes in salmon size, fecundity and age, and increased mortalities. Knowledge holders also discussed the balance between enhancement masking the plight of Nuu-chah-nulth wild salmon and the reliance on production hatcheries to deliver sufficient salmon in the *ha-ha-houlthee* to mitigate impacts to *Nuu-chah-nulth-aht* from wild salmon declines.

Several knowledge holders described production hatcheries harming the Nuu-chah-nulth salmon gene pool in two main ways. First, interviewees explained that hatchery practices inherently diminish the gene pool by interfering with natural selection and that a smaller gene pool equates to lower resilience to environmental change. Second, knowledge holders explained that hatchery practices reduce the

likelihood of enhanced salmon returning to the hatchery watershed. Consequently, hatchery salmon return to other watersheds to spawn, or in some cases, return to completely different areas of the *ha-ha-houlthee*. One example was given of the DFO Conuma hatchery in Nootka Sound, where historic practices led to widespread straying, with many of the returning salmon choosing to spawn in Clayoquot Sound watersheds. As one knowledge holder described, if salmon in each river and stream have evolved to their unique home freshwater environment, then introgression of enhanced salmon weakens the genetic adaptations of salmon to a particular stream or river, reducing their chance of survival. Given the gene pool of hatchery fish is impoverished, as described above, the risk of introgression is even greater.

*“Conuma and Nootka Sound, they’re growing millions of fish and so what happens is, you know how salmon populations each are genetically distinct, and I’m sure those genetics are made that way for each river and their conditions and their inlets and estuaries and whatnot. Well, what happens is we noticed in Clayoquot Sound...hundreds of Chinook returning...You have all these hatchery fish, their genes aren’t as good and [they were] inundating those small populations...like Moyeha river, 50% of the fish carcasses were Conuma hatchery, a whole sound over. So, they were coming in and spawning. Now they’re polluting the gene pool of those distinct salmon populations with their non-adapted genes for that system...If you have homogenized populations and they lose that genetic diversity, you lose the resilience, right?...Hatcheries are a good thing for us, because we get fish coming back here, but when they start spreading to other rivers, they start potentially having the negative impacts on those populations by polluting the gene pool.”*

- Anonymous Hupacasath First Nation knowledge holder

Knowledge holders connected reduction in size, fecundity and returning age of salmon with hatchery production. Two interviewees described how hatchery practices of releasing juvenile smolts caused the fish to return smaller (lighter weight). One knowledge holder observed that salmon are also returning less fecund (less eggs per female) and at a younger age.

*“I know what a wild salmon looks like. You remember how big they used to be and how wide they were. Whereas now you’re just getting these skinnier and longer fish, they don’t have the fat, the big meat muscle like they used to have anymore, right? They are just getting these supercharged fish that are growing super-fast.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

The risk of enhanced salmon outcompeting wild salmon was raised by two knowledge holders. They explained that hatchery salmon are released at a larger size than wild salmon peers and consequently hatchery fish out-compete their wild counterparts for resources, which reduces their chances of spawning successfully.

*“Hatcheries, they have all these fish, and they release them at a certain size. They’re let go when they’re bigger than the wild stocks. So, they’re more aggressive for the food. And these little guys, well, the bully is going to eat first because he is bigger and, and the little guys that are wild, they really hope that there is enough food to go around. So that makes a fish unhealthy too...they don’t enjoy a good meal. They got to work. They got to really hunt and scrounge for food. And of course, they’re skinny. There’s years here that we fish, and the fish are all skinny. They’ve had a hard life. And because they didn’t grow, they didn’t get fat, they didn’t have lots to eat. And we see it. So, we have the proof that it does happen and it’s not just one or two fish. It’s a lot of fish. They’re so skinny. When they have good diets, they store up their fat to come into the streams, and then they stop eating, they start spawning, so it impacts all of it.”*

- Anonymous Nuchatlaht First Nation knowledge holder

The single release of enhanced salmon in one large group by hatcheries was discussed by two knowledge holders as a risk to salmon. They explained that they have observed pinnipeds learning the timing of hatchery releases and arriving at the mouth of the river in which the salmon are released, concentrating predation pressure on any salmon in the area, including wild salmon.

*“We released 600,000...they [sea lions] won’t bother the fry if there’s not lots, but because they were released in one big bunch they were...targeting our fry. They learned the timing for when we release.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Many Nuu-chah-nulth knowledge holders stated the importance of hatchery fish to their Nations for food security and economic opportunities while also describing the risk posed to wild salmon by enhanced abundance creating perceptions of healthy wild salmon populations. Some knowledge holders explained that hatcheries were introduced because harm to habitat from logging had suppressed wild salmon populations, but Nations have subsequently become reliant on hatchery fish for food supply and economic activities. One interviewee described hatchery production masking the poor state of wild salmon and thereby preventing action to support wild salmon recovery. Several knowledge holders predicted that without hatchery production, the enhanced populations would not sustain themselves and the salmon populations would crash. Some knowledge holders expressed the view that while enhancement is bad for wild salmon, it is necessary until a better way to ensure salmon abundance is found.

*“Well, the wild salmon are struggling because of all the mosaic of problems...and so, I just know that we need the hatchery now. And then if we start saying that we want to do more for wild salmon, and so we’re going to lessen production or stop production...the run is likely going to collapse, and then our people are going to really, really suffer...So, it is definitely an inner conflict of knowing that we need it but knowing the negative consequences of it.”*

- Anonymous Hupacasath First Nation knowledge holder

One knowledge holder observed that, *hishuk-ish tsawak*, the impact of enhancement on run timings impacts connections to salmon predators,

*“That’s just the hatchery thing. It’s the same thing with run timings and how that also affects the wildlife...when you start changing that [run timings], then they’re going, ‘what’s going on here? You should be here already’.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

### **5.9.7. Open-net fin fish aquaculture**

Open-net fin fish aquaculture, the farming of fin fish in sea water pens that allow water to pass through them, was described by interviewees as currently taking place in Nootka and Clayoquot Sounds. Fish farming also takes place on land in the *ha-ha-houlthee*. One knowledge holder described two land-based fin fish farms currently operating close to Great Central Lake, which feeds into Alberni Inlet and then Barkley Sound. Knowledge holders explained that marine fish farms pose a threat to Nuu-chah-nulth salmon through the propagation and transfer to Nuu-chah-nulth salmon of parasites and pathogens, pollution of the marine environment, and escape of non-native farmed fish.

Many knowledge holders described open-net in fish aquaculture causing elevated populations of sea lice that pose a risk to Nuu-chah-nulth salmon. The knowledge holders explained that sea lice are parasites that propagate particularly well in open sea net pens, which often contain over half a million farmed fish. A small number of knowledge holders described the methods used by fish farms to control sea lice populations, including delousing processes, hydrogen peroxide cleaning, and a pharmaceutical called ‘Slice’. Some interviewees described how the sea lice populations that grow in the net pens are able to escape into the marine environment where they can come into contact with out-migrating juvenile salmon, returning salmon, and salmon using near-shore marine habitat. Knowledge holders described the position of the farms being close to Nuu-chah-nulth salmon migration paths, increasing the proximity of salmon to escaping sea lice. One knowledge holder described native fish species entering the net pens. Another interviewee explained that the timing of sea lice breeding appears to coincide with the timing of chum salmon out-migration. Another knowledge holder shared a story from 2018, when resistance to Slice led to growing sea lice populations, resulting in observed increases in sea lice found on chum salmon. Another knowledge holder explained that in recent years, the frequency of sea lice per farmed fish has been above the DFO threshold of three lice per fish.

*“That’s the thing the fish farms say, sea lice are naturally in the environment. So, they just say ‘Oh, that’s just natural, that lice load on the fish, that’s just natural. It’s always been like that’, but there’s just no way that when the farms are having half a million fish and they have five, eight lice per fish...That’s millions and millions and millions of lice on a farm and they’re just open-net pens so they’re free to jump off and the larvae are obviously spawning and spreading this around the environment so there’s definitely more lice on our fish because of the fish farms. There’s not a doubt in my mind. They’ll say ‘No, you don’t have any proof, you don’t have any baseline data before fish farms were put in’, but it’s not rocket science. You have fish, there’s lice on them, and the fish swim by the farms. They’re going to get infected with lice.”*

- Anonymous Nuu-chah-nulth knowledge holder

The threat of sea lice to Nuu-chah-nulth salmon was described as both lethal and non-lethal. Interviewees explained that lethal effects are more likely in out-migrating salmon that are smaller and more vulnerable to the impacts of parasites. One knowledge holder observed many out-migrating juvenile chum salmon dead and “littered with sea lice”. One interviewee suggested that observed decreases in the size of returning chum salmon could be reduced growth from the resource drain of carrying sea lice. One knowledge holder explained that there used to be two fish farms in San Matteo Bay in Barkley Sound, and that the high number of sea lice on returning salmon disappeared after the fish farms were closed. Another knowledge holder highlighted that there is still uncertainty about the risk of sea lice to Nuu-chah-nulth salmon.

*“Well, there used to be a fish farm down there, there were a couple of them, down the canal there. San Mateo Bay. There used to be I think two in there. And our fish just were covered in them [sea lice] when they’d come up [return]. And we would catch them and had to scrape them off. Some of them would leave sores on them. And we never wasted the fish though, we cut that part off and we ate it...They’re healthier now, today. They’re healthier than they were now those fish farms are gone...and the lice that they had on them, that’s gone now too.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Five knowledge holders raised the risk of pathogens passing from farmed fish to Nuu-chah-nulth salmon. Some of the interviewees spoke in general terms about the risk of disease, other mentioned the specific pathogens Piscine Orthoreovirus (PRV) and Tenacibaculum.

*“A few papers from UBC just came out with talk of PRV and Tenacibaculum. And it’s really affecting a lot of the salmon on the coast here...It was never here. It was introduced from Norway. It came with Atlantic salmon farming and it’s a heart and skeletal disease and it’s having a big impact on sockeye stocks and Chinook stocks.”*

- Anonymous Nuu-chah-nulth knowledge holder

One knowledge holder drew a parallel between the introduction of fish diseases by fish farms with the introduction of human disease by European settlers,

*“It was like when Europeans first come here, our people didn’t know those diseases, and they died from them. So, these fish are coming here from another country...and they’re bringing these new diseases to these fish here too. So, it’s taken a toll.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Pollution from fish farms was raised in discussions with some knowledge holders. Waste from net pens in the form of feed and faeces was described by several interviewees. They explained that they have observed the state of the seabed under fish farm net pens in the *ha-ha-houlthee* and described it as a “sludge” covering everything. Knowledge holders described pollution falling from net pens impacting rockfish, sea snail, and sea cucumber populations. One interviewee observed that since everything is connected, they expected the impact on the seabed to harm salmon. Knowledge holders also discussed the release of hydrogen peroxide in the near shore environment, which they explained has been employed to reduce sea lice populations.

*“They have their pressure washer barge, and they have hydrogen peroxide barges where they soak the fish in hydrogen peroxide, and then it causes the sea lice to bubble off. But they don’t die, and then they’re just dumping the hydrogen peroxide and the live lice back into the inlets.”*

- Anonymous Nuuchah-nulth knowledge holder

One knowledge holder raised the threat to Nuuchah-nulth salmon in the Somass watershed from escaped Atlantic salmon. The interviewee recounted catching adult Atlantic salmon in Great Central Lake, which they suggested might be connected to a land-based fish farm rearing Atlantic salmon on the shores of the lake. They expressed a concern that Atlantic salmon would increase predation risk on juvenile Nuuchah-nulth salmon.

*“We started to look into the Atlantic [salmon] issues in Great Central Lake because I caught a 25-to-30-pound Atlantic male in the mid-river. I caught two spawning Atlantics, one in Lindsay Creek on one side of Great Central Lake and then on the other side of Great Central Lake, Browns Bay, another spawning Atlantic...They could come out and come in and spawn and go back out and come in and spawn and go back out. Based on the sizes and that I’ve been looking at, they can eat anything they want...They could eat jacks based on the sizes that I’ve been seeing...They would definitely cause some havoc in my territory, if they came in the wrong time.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

### 5.9.8. Predation

Predation and disruption of salmon spawning by sea lions and seals was raised by knowledge holders concerned that diminished Nuu-chah-nulth salmon populations are unable to tolerate this threat. Some interviewees explained that seal was a food source up until earlier in their lifetimes and that seal populations were controlled through harvesting with the meat preserved by smoking and canning. Knowledge holders explained that pinniped populations have increased due to legal protections put in place in the 1970s and that sea lions have become an increasingly persistent presence as the local climate has warmed. Knowledge holders described sea lion populations at Long Beach (Clayoquot Sound), Barkley Sound, and in Kyuquot/Checlesheht *ha-houlthee*. Knowledge holders explained that sea lions and seals are targeting large single releases of hatchery salmon and coming up rivers and waiting for salmon at the mouths of tributaries. A Kyuquot/Checlesheht knowledge holder reported 60-70 seals preying on sockeye in the inlet to one of the Nation's lakes. A Hupacasath knowledge holder explained that a group of 50 seals feed on returning salmon in the mouth of the Somass River, targeting females for their roe. One interviewee observed that the distribution of seals and sea lions in the *ha-ha-houlthee* correlates positively with the abundance of salmon populations.

*"They're [seals or sea lions] not going to stick around if there's no fish...I used to see maybe three dozen in Clayoquot Sound...Upper Kennedy I used to see 20 seals in that river,...I see two or three now...we see very little on the Lower Kennedy River...the seal counts have gone way down because our Chinook numbers are down, our sockeye numbers are down...it's a matter of time, they'll figure it out that, 'Hey, there's coho'. Just wait just a little longer, then they're going to come back. But right now, they come in when the coho and the sockeye come in...But we were starting to see sea lions in the lake just before the next decline of sockeye about eight years ago, where we first noticed one or two and then I think the highest the crew counted was six...Those were big sea lions where we never used to see them, and it was always common to see seals, fur or hair seals. You'd see hair seals in there. Never sea lions."*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

The threat of other salmon predators was raised by a small number of interviewees. One knowledge holder mentioned that mackerel come closer to shore during hotter years and predate on juvenile salmon. Mergansers were also noted preying on juvenile salmon and directly affecting the success of out-migrating fry and smolts in Uchucklesaht *ha-houlthee*.

*"Other predators like mergansers, they feed on a lot of fry coming out of the rivers and in the rivers and their hatchlings...I see them as a direct influence on the outgoing fry and smolts."*

- Charlie Cootes Sr., Uchucklesaht knowledge holder

### 5.9.9. Residential development

Residential development, primarily around Sproat Lake in Hupacasath First Nation *ha-houlthee*, which feeds the Somass River, was a recurring theme of risk to local salmon for knowledge holders around Barkley Sound. Interviews described residential development steadily increasing around Sproat Lake in recent times. One knowledge holder explained that most of the development is large single homes with a dock and recreational boats. One interviewee expressed concern that some residential development around the lake does not conform to shore habitat development regulations. Sproat Lake is one of two large lakes that feed the Somass River along with Great Central Lake. The largest population of sockeye salmon in the *ha-ha-houlthee* spawn and rear for one year in both lakes. Knowledge holders expressed concern about the risk to salmon from residential septic tanks leakage causing harmful algal blooms, oil pollution from road transport and recreational boating, and copper roof runoff. One knowledge holder also discussed the risk in Port Alberni of runoff pollution from hillside roads into salmon-bearing streams that feed Alberni Inlet. Some knowledge holders raised concerns about the risk to sockeye salmon from septic pollution emanating from float homes on Sproat Lake and Great Central Lake, and in Nootka Sound.

*“We have a lot of speed boats, sewer issues, septic issues, drainage issues, copper roof issues, all of these issues come into play because these homes are put on the old streams that feed our lake [Sproat Lake].”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

### 5.9.10. Municipal waste management and pollution

A small number of knowledge holders raised the risk of pollution from municipal sewage and landfill systems harming Nuuchahnulth salmon around the Alberni Inlet and Somass River. They described two municipal unlined septic lagoons, which they explained are built on coastal flood plains in a tsunami zone, as a risk to salmon. One knowledge holder observed that the lagoons have flooded at least once in the past, and overflowed into the surrounding area, which contains tributaries that flow into the Somass River. Landfill was raised by one interviewee who described the historic unmanaged leaching into the Somass River from the Port Alberni landfill, which is next to a Tseshaht First Nation reserve, and highlighted the potential future risk if the landfill leachings are piped into the city’s septic lagoons.

*“Back in the day I used to hunt across the river, and you would not believe the mess that it’s in, that whole sanctuary. Whatever goes into the city sewer has over flooded and overflowed into, I’m going to say a mile radius, a half a mile radius from the sediment pond. And all of those are little finger tributaries that go into the lower Somass. So you got the whole bird sanctuary, estuary, that has been flooded on many occasions in the past. Now all of that sewer debris is in the bushes and it’s been there since I used to hunt over there.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder



### 5.9.11. Transportation

The threat of transportation and road construction to Nuu-chah-nulth salmon was discussed by four knowledge holders. One knowledge holder described the threat to salmon from toxic runoff, including from road salt, from the highway to Tofino and Ucluelet from Port Alberni. The highway runs along Kennedy Lake and Upper Kennedy River, which are home to sockeye, coho and Chinook salmon. The same interviewee described how roads increase the flashiness of rain events, in the same way as logging (described previously). They explained that roads channel rainwater into creeks, which through the road-concentrated force of the water, displaces sockeye spawning gravel downstream, covering Chinook spawning beds. Consequently, both sockeye and Chinook are harmed by this phenomenon.

*“About [the] transportation corridor. Our highway...Kennedy’s right there. All the runoff, the salt that we put down there to make it safe for us to travel has an impact on our river...it’s a major concern. Even after you leave the Upper Kennedy River and you go to the lake, well guess what? The highway runs by all the lake side there, it’s all sockeye spawning habitat, all of it. Guess what, we haven’t seen sockeye on those beaches for 20 years now. It’s a little bit every year, but eventually you hit that threshold where it’s become undesirable habitat now...it’s something that has a major effect on our lake-spawning sockeye, our tributaries in the Upper Kennedy that have coho, [and in] the main river affecting the small Chinook populations.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

One knowledge holder described how road construction has harmed salmon in the Mowachaht-Muchalaht *ha-houlthee*. The interviewee explained that building the road from the Gold River pulp mill and landfill to the town of Gold River involved blasting rock, which ended up in the Gold River, introducing several drops in the river that returning salmon must now navigate. Chum salmon, they explained, are unable to make it up the drop and so they cannot access their spawning grounds.

*“When they built the road...from the old reserve, the pulp mill, up to where the village of Gold River is...they blasted rock and threw it all into the river. And that obstructed chum [salmon]. Being the laziest fish, they [chum salmon] probably traditionally made it all the way through where we are now and then up through Nimpkish. They don’t make it past that drop because they can’t make it up that obstruction anymore. So now that we don’t have chum that reach all the way up here. They all stay down there down below because they can’t get over that fall. Whereas Chinook, sockeye, coho all being bigger fish, they have the strength to get up those falls...Without that rock being there, chum could have been making it all the way up here with the sockeye and spawning in great numbers.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

### 5.9.12. Other risks to salmon

Several risks to salmon that were only discussed by one or two knowledge holders are briefly described in this section.

Two knowledge holders explained how dams in the *ha-ha-houlthee* pose a risk to salmon. A Tseshah knowledge holder described the paper mill dam that impeded salmon migration on the Somass River for four years in the 1890s. The Somass once had a pink salmon run, they had been told by an elder, which was wiped out by the pulp mill, which they suspected was caused by the dam. Another interviewee expressed concern about the implications for the management of the dam at the outlet of Great Central Lake, which they saw as a risk to sockeye salmon spawning shelves at the rear of the lake.

*“We challenged Great Central Lake dam, they wanted to pull all of their stock plugs to try to get down to a natural table...Now when you start pulling [dam] logs at Great Central Lake, you pull one log that’s two feet, a foot and a half by 20 feet long, and you’re pulling a handful you’re gonna start playing with those shelves in the back. So that’s a big issue for Hupacasath when it comes down to that Great Central dam. You can’t turn around and, don’t mind me, play God with a dam when you’re trying to look after salmon species behind it. That salmon species has coho, very few Chinook, and a lot of sockeye.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

An Uchucklesaht First Nation knowledge holder described the historic pollution created by the Kildonan cannery, in Uchucklesaht Inlet at the mouth of Hucuktli Lake.

*“I remember when the cannery was going full tilt, everything went into water. Everybody’s garbage went into water. Yeah, there was no garbage system...And that was including oil and gas and everything else. Dyes from the pens and stuff. They had pens there for dying nets. It all went into the water. And they had canned food and those cans went over into the water...And all those posts that they built the cannery on, they all had that creosote on them. That stuff is deadly. And that was leaking out too. And probably still is, there’s still some of them down there. Well, it did its job alright preserved them but sure it’s still doing damage. I wonder how many other chemicals they never told us about or that I don’t know about, right? The ones I know about are scary enough, affecting all animals around there.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Two knowledge holders described the glass and plastic waste that washes up in the *ha-ha-houlthee* and their concern for the harm that this pollution does to salmon. One interviewee explained that their husband found plastics in salmon stomachs when dressing fish on his fishing boat. Styrofoam was identified both in the waste washed up on beaches and found inside salmon.

*“He was saying that when he was still fishing, and he would be dressing the fish right on the boat, they would be full of styrofoam, plastics. Things they considered were food, keep finding them in the stomach. So, we’re eating plastic now when we’re eating fish.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

One knowledge holder described their memory of the 1964 earthquake and tsunami might have harmed salmon. They explained that the tsunami caused a mass fish mortality event in Ehattesaht *ha-houlthee*, and how that fish population never returned,

*"I remember in 1964 when that big earthquake happened, and there was a tsunami in our territory. I just came out of church. And we were going to that place where I told you we'd go fishing. The whole bay was loaded with fish swimming upside down. Because their bellies got full of air. And their tongues were out. And they couldn't swallow their tongues. So, we were...flipping fish into the boat. And we brought the fish to the hospital so that could feed patients. And I don't think that whole area reproduced again."*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

### 5.9.13. Hishuk-ish Tsawak

Hishuk-ish tsawak (everything is connected, everything is one) imbued many of the themes and observations of risks to salmon described in this report. Here, themes of *hishuk-ish tsawak* that were related to salmon declines, accumulation of harm to salmon over time, and where more than one risk to salmon are described. As an introductory quote to this section of the report, a Tseshaht knowledge holder describes *hishuk-ish tsawak* and its connection to Tseshaht past, present, and future.

*"It is something that I wrote it's called, 'Everything is connected'. Tseshaht, we've been here for thousands of years. The lands and waters have always given us life. Tribes in the Barkley Sound historically, they've lived in harmony and nature thrived. As historically before contact with Europeans there were once 10,000 people living and thriving throughout Barkley. That is ten times more people than the number of people that live in Barkley Sound today. Food was plentiful, our system was in balance, mainly as a result of harmony laws passed on to Tseshaht man and woman after they were spiritually created and Tseshaht, our home village on Benson Island, that this core Tseshaht belief of principle of balance is called in our language 'hishuk-ish tsawak'. It means all spirits are one. It is the understanding that everything is connected, from fish to trees to the great whales, we are the Tseshaht and the complex [inaudible] speaks of the great whalers because we were guided by our spiritual core belief of hishuk-ish tsawak. Hishuk-ish tsawak core teachings ensure that the whales and salmon thrive in our homelands. Our name is inseparable from these teachings. Tseshaht means people from rancid smelling place because of the plentiful bodies of the whales that were harvested made the village rancid and smelly. That is a sign of honourable wealth gained from upholding this core teaching. Living the hishuk-ish tsawak life is a very intentional act, established through all these individual spirit quests, high in the Tseshaht mountains and daily morning spiritual cleansing in Tseshaht waters. If one was patient and worthy to the Creator, [the Creator] will pass the spirit quest medicine to you. This belief always enabled Tseshaht to become more successful. In this the Tseshaht life and teachings of iisaak, respect, and for all that is a spirit, which is everything. On contact with mumulne, floating on large boats, the hishuk-ish tsawak teachings were greatly disrupted. When the European traders arrived, in ten generations*

*the Tseshaht world changed, just like a multitude of great tidal waves. Traders wanted high value sea otter pelts in numbers you've never imagined. The capacity for sea otter was far beyond our wildest dreams. Our people understood the teachings of sea otter. The sea otters were predators, they hunt for sea urchins, and when the sea otters went away, the urchin population exploded resulting in kelp forest loss and then devastating impact of hishuk-ish tsawak. Without the part of the environment, you can't harvest a fish and can't set out a way of harvesting because everything's connected, and everything disappeared. Our people moved away from the Broken Group. Before commercial whaling ships arrived, we always saw a vast thriving ecosystem and Tseshaht were part of that ecosystem. You could see over 2,500 humpback whales inside Barkley Sound. You're now lucky to see five or six. When the Tseshaht whales went, other species declined. The orcas became hungry because they like to eat whales and they ate the seals instead, and they would eat the otters and urchins instead, fewer predators, more [inaudible]. For the past couple of centuries, our Tseshaht population dropped 90% because everything is connected. As Tseshaht look to the future, how does one reintegrate into this great system of hishuk-ish tsawak given to us by the Creator because if we truly value our teachings of hishuk-ish tsawak, the recovery of nature means that Tseshaht will also be restored. After all, everything is connected, our core belief of hishuk-ish tsawak, and new scientific knowledge together confirm, that all is connected and this is very important to the survival of all species, including us. Our people are starting to relearn the principles of hishuk-ish tsawak. Our people are returning to the Broken Group. We have people learning how to look after the beaches and interacting with tourists and talking about our knowledge. We hope that restoring balance and a healthy ecosystem, we can move back to the islands and through ecotourism and sustainable harvesting of food, the recovery of nature may also be restored. So that part of teaching I think, we have to relearn and re-understand it from everyday perspective as people want to learn that and it's important."*

- Darrell Ross Sr., Tseshaht First Nation knowledge holder

### *Connections between salmon declines and other life*

The negative impact on predators and plant life from declines in salmon emerged as a theme from several discussions. Knowledge holders reported observing the impact on eagles, other birds, and bears. In many cases the impact was noted as a reduction in life, for instance fewer eagles and bears.

*"With the lack of salmon in Clayoquot Sound, and we swam rivers count barely a fish. A healthy river should be teeming with bears and eagles and we're swimming in a river that had no fish. There's no wildlife on the rivers. It's just like us in this, quiet, empty river. I remember me and him every year. I'm like, 'Man, I can't believe we didn't see a single bear', it's like there's no fish for them, so they're going to go try and find it somewhere else."*

- Anonymous Hupacasath First Nation knowledge holder

One knowledge holder told a story of how salmon and their predators were once connected through people,

*“One of the elders she was on the beach, and she was gutting her fish. And there was a bear sitting behind her, and the bear got impatient and started to get closer and she hit it like this [slapped it on the nose]. And then she took a piece of the fish and gave it to him, and he ate it. And he sat there [behind her] and every fish she gave him part of it...I think we have a picture of [named person] too cleaning fish on the beach. And there’s a big eagle sitting right behind him. And he’s feeding it. So, all the animals that used to profit from the fish...they’re just not there anymore.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Some interviewees described the visible deterioration in appearance of bears, which they attributed to declines in salmon.

*“And it’s when the salmon don’t live the bears don’t fertilize the ground. The berries don’t grow, the birds don’t eat. It’s a cycle. Somebody has to care. You get different plants growing in different areas that never used to grow before. Everything’s changing. Animals are hungry now too...They used to be healthy, they used to have really beautiful shiny fur. And they used to be really chubby. When they walk their fur just went like this and their whole body would like this. And they would walk strong and healthy. And now they’re looking jittery, and they’re looking scared and they’re looking hungry. And it’s not the same. Everything’s changing.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

One knowledge holder described declines in wolf abundance resulting from salmon declines.

*“There used to be plentiful wolves. And a lot of people don’t think that wolves eat salmon, but wolves will come down to the river and they’ll take salmon out of the river. And usually, the wolves will just eat the head, like the brain part of the fish. And sometimes they’ll eat the whole thing. But for the most part, wolves will eat the brains and leave the rest of the fish in the forest. And yeah, there used to be a lot more wolves around and like I said, everything being connected, it’s all with the salmon dwindling, everything else is too.”*

- Anonymous Nuu-chah-nulth knowledge holder

The lost connections between salmon and jellyfish were described by one interviewee, who explained that when salmon runs declined in Uchucklesaht territory, large populations of white jelly fish that used to follow them to the mouth of the river disappeared.

*“The other thing I remember about, and this never happens anymore, basically after the fish are almost finished going up, the mouth of the river used to look white, and it was jellyfish. There were millions of them. And it looked like you could walk on them. That’s how many there were. And it’s not there anymore. What happened to them, it was part of the system, it’s gone. That’s what I mean, it’s gone. Once in a while, you might see a jellyfish on the beach or something now, but you don’t see that anymore. You don’t see the fish like that anymore, either.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

The harm to plant life from reduced fertilization from salmon carcasses deposited by eagles, bears, and wolves was described by some knowledge holders.

*“When the bears, the eagles, bring the salmon carcasses into the forest, it causes the trees to grow better.”*

- Anonymous Hupacasath First Nation knowledge holder

### *Connections in restoration*

Another knowledge holder described how complex connections make human interference in ecological restoration futile.

*“This is like the circle of life. You try to fix one thing, something else can happen...Forever winning or forever losing. So, if you start altering one thing, it's going to eventually start altering another thing and another thing. We just have to learn to sit, let nature take its course.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

### *Connections between people and other living things*

Several interviewees spoke of how people, salmon, and other living things are equal in the Nuu-chah-nulth worldview,

*“If the Creator put us here equal to everything that is alive, that we are no better than any one thing, we will have respect for everything as a brother, and care for everything in the same fashion. And so, if you learn to look after mother nature, it will look after you forever. So, that's a little bit on the land. When you talk about animals, or mammals, I'm another living entity that has a spirit. We believed that they're our brothers. I learned of stories when I was a little boy, about when all the animals wanted to meet and talk about how we're going to get along. Hishuk-ish tsawak, they would all meet and take their coat off. The bear took his clothes off, hung it up. The eagle took his coat off, and hung it up. The wolf took his coat off and hung it up. And they were all Kuu-us like we are today. So...there was a time when some did not want to put their coat back on again, they became the first human beings, they had to learn how to live, they had to learn how to sustain life. So, they learned by praying and being grateful to the Creator and thanking their brother Salmon for giving up its life to sustain... the brother bear or the deer and vice versa. So, by paying homage or gratitude to the Creator for the spirit of each one of those animals or Kuu-us, then those will always come back to you.”*

- Anonymous Huu-ay-aht First Nation knowledge holder

### *Cumulative effects over time and place*

The accumulation of harm over more than a hundred years to Nuu-chah-nulth salmon from climate change and many varied repetitive human activities across the space of the salmon life cycle was discussed by many knowledge holders. Some knowledge holders explained that no single human activity is the sole cause of salmon declines, but that it is the combination of all the activities and climate

change. One interviewee explained that there is also an accumulation of harm by one activity over time in a single place, for instance logging within a watershed moving from one logging patch to the next. Some interviewees used the term 'cumulative effects' to describe this phenomenon.

*"I was a really young teenager in the day when I was lucky enough to experience the last [of commercial fishing]. I only commercial fished for three years but it was still good...When I left it, it was still good when I left. Not too long after I left, that's when everything, all the small things combined, they [salmon] just couldn't handle it anymore. Overfishing, destruction of their habitat. Now it's global warming here."*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

One interviewee described the accumulation of harmful activities that sockeye salmon must survive to reach Sproat and Great Central Lake to spawn.

*"So, sockeye returns...they spawn in Sproat [Lake], Great Central [Lake]. The numbers are pretty good. It's amazing for a wild salmon, [that] it's still resilient enough to get through the Alberni Inlet and get through all the commercial and sport and ocean fishery, American fishery, their migration. They can go through the pulp mill through the city sewer, swim by us and into the lake, by all the different developments of the Somass River because there's houses on both sides of the Somass River now, so I'm always just amazed that they can still return. I guess maybe because the lakes, they're getting a little bit more developed now but it worries me that the lakes are going to be too developed and the sockeye aren't going to be as plentiful."*

- Darrell Ross Sr., Tseshaht First Nation knowledge holder

References were made to early European harm to the *ha-ha-houlthee*. One Hupacasath First Nation interviewee described non-traditional forest harvesting practices beginning in the "Spanish days", when Nuu-chah-nulth timbers were valued for European ship building. A Kyuquot/Checlesheht knowledge holder told a story of their father logging spruce to build bombers during the First World War. Logging activities were described as being continuous throughout the *ha-ha-houlthee* and gradually becoming more extensive and efficient as technology improved. A knowledge holder provided an example of the town of Gold River, which began as a logging camp and from which logging activities and camps have proliferated in the watersheds around Nootka Sound since the 1960s.

*"The stories we were told is that way back in the Spanish days, they liked the length of our timbers. They liked those big sails, they liked those big stream poles. And then they came back for those after they went back to their country. So when did they start logging? Well, the first contacts like our lumber for their ships, and then it just got carried away from then."*

- Tom Tatoosh, First Nation knowledge holder

The continuous long-lasting effect of human activities in the *ha-houlthee*, whereby activities from decades ago are still harming salmon now, was also raised, for instance for cannery pollution, logging,

and commercial fishing over-harvesting. A Ditidaht First Nation knowledge holder described an example of logging clear cuts from 40 years ago greening up and reducing sediment transport. The same interviewee observed that in some ways the *ha-houlthee* has been irreversibly altered by logging, whereby the movement of sediments, gravel, and rocks from the land into freshwater and into the ocean cannot be undone.

*“And even before the start of restoration, from logging practices in the 80s it is very small tributaries, large gravel, large boulders and they put sediment traps up to try to catch some of that but it's still coming down from the 80s.”*

- Paul Sieber, Ditidaht First Nation knowledge holder

### *Salmon population baselines*

When talking about the accumulation of harm to Nuuchah-nulth salmon over time, many knowledge holders described the baseline state of the *ha-ha-houlthee*, before impacts on salmon began to be observed. Some referred to earlier in their own lives and others to stories they were told by parents, grandparents, and elders. Baselines of incredible salmon abundance, and the size of individual salmon were shared by knowledge holders. Baseline diversity of salmon species in some individual rivers were described, with all salmon species and Steelhead trout in many watersheds.

*“...looking at the resource growing up, I was already hearing stories of declines, hearing stories of ‘You should have seen it when I was your age., you should have seen how much fish was in Sarita Bay’, when they would tell stories about when a sea lion would rush into a school of fish. Numukamis Bay, which is Sarita Bay, would sound like thunder, because of all the fish taking off instantly. And so that tells you the magnitude of fish [abundance].”*

- Anonymous Huu-ay-aht First Nation Knowledge holder

A description of baseline abundance levels of herring, an important source of food for salmon and other marine animals in the *ha-ha-houlthee*, was provided by one knowledge keeper,

*“When we were kids when I was young, when I was fishing, trolling, we'd go to bed with herring on top of the ocean...you'd go to sleep with the herring flipping, millions of herring. Now we know we pray that herring come back to the Nuchatlaht. We pray and it's a big, big change.”*

- Anonymous Nuchatlaht First Nation knowledge keeper

One knowledge holder described how baselines of the state of Nuuchah-nulth salmon are shifting across generations.



*“Stories my grandpa told me and...the picture when he was a kid holding a fish taller than him, a classic Chinook salmon, 50 pound plus. He used to go down with a wooden stick and a line and a hook and catch monsters. I like to hear the stories of what it used to be and what the normal runs and sizes looked like. And then I feel, for me to sit here, it has that shifting baseline syndrome...to me this is just what I've seen my whole life, so it looks normal. But then if you think about it intergenerationally, I'm sure my grandparents would be like, ‘Oh man, I love these ones. Look how tiny they are’. And then to us it's like, ‘Oh, yeah, look how healthy they are’.”*

- Anonymous Hupacasath First Nation knowledge holder

### *Connections between two or more risks to salmon*

In addition, direct connections between two or more risks to salmon reported by knowledge holders are described in this section. Such connections have been categorized as either interactive, in which one risk amplifies or reduces the impact of another risk, or additive, in which one risk directly adds to another risk to create greater risk to salmon.

#### *Interactive combinations of risk*

Most interactions described by knowledge holders involved risks caused by logging interacting with climate change risks, and most were only described by a single knowledge holder. Three interactions of logging and climate change were described by two knowledge holders. The first of these interactions was increased sediment transport into freshwater systems from logging filling up stream pools, which amplifies the risk of climate change-driven freshwater warming to salmon. In short, the pools get hotter from climate warming because the pools are shallower. Similarly, another knowledge holder described how forestry-driven sediment flow into rivers and streams amplifies the impact of summer low flows caused by climate change. The second interaction raised by two knowledge holders was logging reducing the sponginess of watersheds and climate change increasing the intensity of rain events. The third interaction, two knowledge holders described shade reduction from riparian logging amplifying the impact of climate-driven freshwater warming on salmon, where the warming is caused by atmospheric warming, reduced snowpack, and reduced ground water. One interviewee explained that log booms exacerbate the impact of seal predation, because the booms offer an excellent point from which seals can target salmon. Another knowledge holder explained that logging causes soil to retain less water, which then amplifies the impact of climate-driven warming by further drying the land in watersheds, which in turn exacerbates sediment transport and consequential harm to salmon.

*“So you have these extreme rain events, and it causes the flow of the rivers to shoot up way more than they historically did. So, there is that concern of ‘That’s nothing to do with logging’. It is, hishuk-ish tsawak, it’s all connected. When you have an unlogged river, the flow from a big rain is a longer big hill if you look at flow over time [curve describing the slow release of water over time]. But then as you get a completely logged river...It’s boom, shoots up and you see a raging, raging river and just higher peaks, and it’s for a short amount of time, and then it drops really quickly again. So if you think with the rain, the more extreme weather events caused by climate change, that could actually also be tied into causing more salmon redds to be destroyed and also negatively impacting production.”*

- Anonymous Hupacasath First Nation knowledge holder

Other interactions between risks to salmon were climate based, but unrelated to logging. One knowledge holder described a recent heat dome that kept Nuu-chah-nulth salmon offshore for longer, which amplified their vulnerability to recreational fishing harvesting. Another interviewee described how ocean warming and increased sea water salinity in summer caused by lower rainfall and melting snowpack increases the growth of fish farm sea lice populations. The warmer ocean temperatures cause sub-lethal stress-related harm to salmon, which makes them more vulnerable to effects of the greater number of sea lice.

*“Now I have my sport guide buddies that...really nailed them [salmon] outside Vancouver Island, about four hours out. They nailed Barkley fish all summer. And they were catching silver bright sockeye when they [the salmon] should have been gone. So, you got the sport industry that are fishing on the outside coast above Vancouver Island... this invisible heat dome that’s keeping everything out was there.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

### *Additive combinations of risk*

One example of additive risk combinations was raised during discussions. One interviewee explained that second growth forest, following old growth logging, has a higher water demand than older trees. The greater water demand by second growth trees reduces the amount of water flowing into rivers and streams during the summer months, adding to the harm caused by low flows from receding glaciers and reduced snowpack.

*“So, we have less water from the receding glaciers and less and less rainfall...less water’s entering [the river] and that reduction in flow is also exacerbated by the fact that the young trees are way thirstier, so they actually absorb way more water. So, if you had an old growth forest, they wouldn’t be sucking as much water...thirstier younger trees post-logging just cause rivers to drop even more and dry up even quicker and stay drier longer.”*

- Anonymous Hupacasath First Nation knowledge keeper

## 5.10. Ecological risks to salmon: non-Indigenous experts

### 5.10.1. Climate change

#### *Ocean warming*

Harm to salmon caused by ocean warming from climate variation and climate change was discussed frequently by interviewees. Described pathways of effect included reduced availability and quality of marine food and increased vulnerability to diseases. The recent ocean blob off the coast of British Columbia was also cited by non-Indigenous experts as impacting marine survival. One expert described changes in Pacific Ocean currents resulting in a reduction in rich food sources being delivered to out-migrating salmon. Experts described ocean warming causing salmon mortalities and reduced growth resulting in fewer, and possibly smaller and younger salmon returning to spawn.

*“With [ocean] warming and less of a gradient and temperature between the tropics and the Arctic, there’s not a lot of cold water sinking out of the Bering Sea and pushing the thermohaline and circulation from that end. So that’s slowing down and weakening what we call the Kuroshio Extension in the western drift that delivers northern rich copepods starting in the spring, and that’s when the little Chinook escape.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

#### *Freshwater warming*

The threat of freshwater warming to Nuu-chah-nulth salmon was a recurring theme in discussions with non-Indigenous experts. Several interviewees described increasing freshwater temperatures in the *ha-ha-houlthee*. One expert reported that temperature loggers in Kennedy Lake reached 24 degrees Celsius in 2021. Interviewees described freshwater warming causing lethal and sub-lethal effects on salmon. Some experts explained that delays in returning adult salmon entering rivers cause mortalities. Interviewees also described freshwater warming causing reduced spawning success, with observations of stress-induced reductions in egg counts in females and atrophied gonads. One expert raised the risk that warmer freshwater habitat conditions put out-migrating smolts out of phase with marine food sources by causing juveniles to mature faster and migrate earlier to the marine environment. Two experts explained that freshwater warming impacts salmon fry by changing the incubation portion of the salmon lifecycle during winter. The other expert explained that Nuu-chah-nulth salmon face an increased vulnerability to disease due to stress from warmer water and the resulting decrease in water oxygen levels.

*“So as soon as you get increasing temperature, it holds less oxygen, so there’s less oxygen available for the fish. And yes, I think it was five years ago, in the Nitinat we had an outbreak of disease as well, in the river, we could see it. And basically, some of our chum would come in late, after the Chinook all spawn, and they were all dying in the river.”*

- Rob Brouwer, Hatchery Manager, Nitinat River Hatchery

## *Drought*

Several experts described the impact on salmon from lower levels of precipitation in summer and fall associated with climate change. One expert provided the example that water flows in the Gold River have decreased by 66% over the period 1956-2021 with reduced variability. Interviewees explained that summer drought conditions create low flows in streams and rivers that cause salmon to hold in estuary habitat until flows increase during fall rains. However, one expert reported that fall rains are also decreasing, further increasing the drought risk. One expert described the combination of freshwater warming and low flows causing lower fecundity, and eggs being destroyed in dried out areas.

*“So you get warm water and low flows to fish can't get in in the fall, and they get stressed. And then they have a lower count of eggs, and then they spawn in all these areas that dry out and the eggs die, if they successfully spawn at all.”*

- Anonymous non-Indigenous expert

## *Changing winter storminess and precipitation*

Winters in the *ha-ha-houlthee* are seeing an increase in frequency of high intensity storm rain events, according to several non-Indigenous experts. Experts explained that higher intensity rainfall increases the risk that eggs will be flushed out, depending on time of year. Some experts observed that increased storminess has increased wind throw of trees, which poses a threat to river and stream habitat. One expert observed that the total amount of rain seems stable but that it is falling more intensely in discrete events. Another expert quantified the increase in the most intense rainfall events for the Cheewaht Lake system in Ditidaht territory,

*“For the Cheewaht Lake system, fortunately there is a weather station nearby, so it captures the local rainfall data. And over the previous five-year period, there was maybe one or two events with over 200 millimeters of rainfall over 24 hours. This past season [2021] we had eight events between October and December with over 200 mils over 24 hours.”*

- Yuri Zharikov, Non-Indigenous Expert, Parks Canada

## *Reduced snowpack*

Reductions in snowpack in the *ha-ha-houlthee* emerged from discussions with non-Indigenous experts as a risk to salmon. Several experts explained that during summer, snow melt feeds streams with cold water and is sometimes the only water source for a stream. The interviewees described how the loss of snowmelt contributes to low flows and freshwater warming, which pose a risk to juvenile salmon and eggs during the summer months.

*“Where you have a drier summer, warmer, and you also have an overall lower snowpack, then you're going to have longer periods of time where the flow is less and without that cooler water input you're going to have periods of time when the water temperatures can get to where they may not be lethal, but they're not advantageous.”*

- Anonymous non-Indigenous expert

### 5.10.2. Logging

Logging emerged as a common theme of harm to Nuu-chah-nulth salmon. Experts described logging taking place throughout the *ha-ha-houlthee*, the nature of older and current logging practices, and the pathways by which past and present practices harm salmon and the wider *ha-ha-houlthee*. A picture emerged of cumulative destruction of salmon freshwater habitat over more than a century, in which older practices still pose a threat to salmon in addition to harm from current practices. Interviewees described logging of the lower floodplains up to the higher ridges of watersheds in the *ha-ha-houlthee*. One expert described the extent of logging in Clayoquot Sound,

*“When they initially started logging here, back in the 1940s, it was smaller scale logging operations very close to shore. But then in the 1960s. They really targeted in on the main watersheds, the salmon bearing watersheds, and it's not a coincidence. We know that salmon helped trees grow bigger. So then you fly Clayoquot Sound, it's actually shocking how little logging has occurred in Clayoquot Sound, but where the logging has been focused is in these lower, very rich floodplain habitats that the salmon depend on. So those were the focus of the logging through the 1960s and 70s, and even up to the early 1980s. But by basically 1982, all the lower watersheds in Clayoquot Sound, with the exception of Moyeha and Megin, had been harvested.”*

- Anonymous non-Indigenous expert

Perceptions of risks to salmon from forestry activities differed between non-forestry experts and those working in the forestry sector. Non-forestry sector experts described many ways in which past and current practices continue to harm salmon. Experts working in the forestry sector focused on how harm to salmon has been minimised by improvements in forestry practices in the previous two decades and the expert hydrological and fish assessments that are undertaken to protect waterways when planning logging activities. One forest sector expert emphasized that the extreme nature of the storm climate in the *ha-ha-houlthee* has always caused large scale wind throw events and flashy hydrological events in rivers and streams, particularly in Nootka Sound, but that Nuu-chah-nulth salmon are adapted to these conditions.

*“Depends on who you ask, and what science you look at. We have quite a few hydrological studies...different hydrological aspects or equivalent clear-cut areas is one term they use for these systems, to see how we change hydrology. And I hear a lot of people saying that, ‘Oh, you’re logging, you’ve changed the hydrology. And now you’ve got a second row stand there, that’s going to suck up all the water. And there’ll be nothing left, and you’re just exacerbating regular climate change’. Right. But the information I’ve seen, the science that I’ve seen, doesn’t support that. The hydrological experts that we’ve hired don’t give us that we can’t harvest there, because we’re going to impact the hydrology that significantly. It’s the west coast of Vancouver Island. It’s a flashy wild system out there and natural events do take place out there similar to landslides, wind throw, fire. Things happen.”*

- Anonymous non-Indigenous expert

### *Older logging practices*

Non-Indigenous experts described how several aspects of older logging practices prior to regulation changes in the 1990s impacted, and continue to impact, salmon habitat in the *ha-ha-houlthee*. Practices described included large clear-cut areas, logging to the edge of rivers, taking gravel from creeks to build roads, transporting logs using rivers and lakes, and causing damage to off-stream habitat.

*“They never left buffers. Where are the big trees on the Kennedy that I swim? They all have notches in them because they were hand logged. And they dropped them right in the river and floated them out down through the river going out to the ocean.”*

- Anonymous non-Indigenous expert

### *Current logging practices*

Experts working in the forestry sector explained that logging practices are now based on “retention systems”, in which trees are left standing between cut blocks. Interviewees described the requirement in forestry practice regulations to leave buffers around some rivers and streams. One interviewee explained that as economic logging opportunities have become less available in easy-to-reach areas of the *ha-ha-houlthee* and wood prices have increased, it has become economically viable to log high elevation aspects of some watersheds using helicopters.

*“The areas that are harvested by helicopter are generally too risky from a road construction standpoint. They’re too high up in the mountain. There’s too much rock...So it could be a big rock bluff. Getting there and then above it, it’s nice stable terrain. And again, our geotechnical people assess that for stability. So you identify the area to harvest with a helicopter. Typically, it’s the higher value species. So Western red cedar and Douglas fir. From a value standpoint, helicopters are very, very expensive. It could be \$15-18,000 an hour to run a helicopter.”*

- Anonymous non-Indigenous expert

## *Pathways of effect*

### *Sediment, gravel, and rock transportation*

The harm to Nuu-chah-nulth salmon caused by increased transport of sediment, gravel, and rock into freshwater systems resulting from older and current logging activities was discussed extensively by non-Indigenous experts. Interviewees observed that older logging practices continue to cause sediment issues over 40 years after the logging occurred. They explained that current logging practices (buffers are insufficient where required, or absent upstream of salmon-bearing streams) cause sediment, gravel, and rocks to enter rivers and streams in greater volume than in unlogged watersheds. In the most extreme manifestation of this issue, experts described logging destabilizing the terrain above the floodplain causing landslides, which contribute extreme levels of sediment, gravel, and rock to waterways. Interviewees explained that some areas of the *ha-ha-houlthee* are more prone to landslides because of their geomorphology and the way that logging was historically practiced relative to the landscape (e.g., on steep terrain). Experts described how increased sediment, gravel, and rock load in rivers and stream reduces spawning success by: smothering and scouring eggs; removing juvenile salmon rearing habitat; reducing invertebrate populations that juvenile salmon rely on for prey; filling in pool habitat; creating a barrier to migration (landslides, blocked culverts); cutting access to off-stream habitat; and reducing the carrying capacity and productivity of freshwater salmon habitat. Furthermore, one expert described observing sediment and gravel flowing downstream into estuaries, reducing the depth and stability of the estuary, and therefore decreasing the quality of habitat for the salmon that use estuarine habitat.

*“Logging definitely affects your gravel accumulation and sedimentation in the river. So you're having sedimentation come in, that can lead to scour of your system. So really, when you're thinking about alevins and eggs, you're wanting good gravel habitat, where they can have good oxygen flow through the eggs, you need a particular gravel size and amount for that. And when you're getting scour, you're losing that. And you might even be getting fine sedimentation of gravel, so it's coming fine, could suffocate your eggs, lead to poor oxygenation, and just really not appropriate spawning habitat anymore to create redds and have successful eggs deposited that actually hatch.”*

- Anonymous non-Indigenous expert

Experts working in forestry acknowledged that sediment transport is an issue for Nuu-chah-nulth salmon, particularly as a result of forestry roads. However, they argued that sediment transport and landslides are a natural phenomenon of the *ha-ha-houlthee* and that current forestry practices have reduced the sediment risk to salmon because logging no longer takes place adjacent to fish-bearing streams.

*“I do see some of the aggradation from logging back in the day is still yet to work through...some of these systems. But nowadays, not so much. Nobody logs anywhere near a stream anymore, right, a fish stream anyway. Yeah, they do log some, some non-fish gullies upstream...and there may be some material come down from that, but I don't think it's very significant in the scale of the of these large systems.”*

- Anonymous non-Indigenous expert

### Logging roads

Four non-Indigenous experts spoke of the harm to salmon caused by logging roads. One interviewee described thousands of kilometres of logging roads in the *ha-ha-houlthee*. According to one expert, logging roads used to be cut into the hillside rather than being built out, which destabilized the terrain and increased the frequency of landslides and accompanying consequences for salmon (described previously). One interviewee explained that if a road cut across multiple streams, often ditches were built running alongside the upper edge of the road to divert one or more streams into one culvert, creating a new waterway. One expert explained that culverts often become blocked with sediment, which either prevents fish passage or increases the pressure of the water exiting the culvert, creating greater damage to downstream habitat. Another interviewee explained that in the earliest days of logging in the *ha-ha-houlthee*, egg-laden gravel would be taken from rivers and used to lay forestry roads. Three experts explained that one of the greatest threats that logging roads pose to salmon is how they open up previously inaccessible parts of the *ha-ha-houlthee* to threats from locally novel activities, for instance recreationists, tourists, and non-forestry natural resource extractors (e.g., salmon river poaching).

*“The initial loggers moving into and then cutting the primaeval forest here - that's when they took gravel for forest roads, directly from the streams in those days. So when the excavators removed gravel to put it on the road...those roads stank of fish for days and weeks, because it would be egg-laden substrate that they were excavating.”*

- Yuri Zharikov, Non-Indigenous Expert, Parks Canada

### Rate of water flow during fall and winter

A small number of experts described how logging reduces the ability of a watershed to absorb and modulate the movement of water, increasing the rate of hydrological flow. Interviewees explained how the increased flashiness of Nuu-chah-nulth watersheds causes harm to salmon through scouring, flushing of eggs, depositing salmon in off-stream habitat from which they cannot return, destroying spawning habitat, and causing fry mortality. In contrast, one expert working in forestry argued that the climate in the *ha-ha-houlthee* means that the watersheds have always been hydrologically flashy.



*"[Post-logging] water flow isn't going to slow up, slow down. It's up, down... which is very difficult for fish to adapt to, because what you start to see is simple things like stranding of fish, so natural mortality occurring because fish become stranded, because they get pushed into the off channels during high water event. and then the water dries up and they can't work their way back in. And now they're high and dry."*

- Anonymous non-Indigenous expert

### Changing stream geomorphology

The impact of logging on stream geomorphology and connected harm to salmon was discussed by several experts. Interviewees described how forestry in the *ha-ha-houlthee* has caused changes in the structure and composition of waterways, including streams becoming wider, shallower, braided instead of defined channels, and loss of side channels. Experts explained that changes in stream geomorphology have been caused by logging through riparian logging, increased peak flow, increased sedimentation, logjams, and gravel inundation causing a hump in the middle of rivers, which pushes the energy of the river to the banks, thereby increasing erosion. One interviewee explained that a negative feedback system ensues in which initial braiding causes trees to fall into the water, which causes banks to collapse and creates further instability. Experts explained that the new geomorphology of these streams makes salmon more vulnerable to predation and creates shallower pools, less complex habitat, and faster moving water, all of which reduce the productivity of the habitat for salmon.

*"Logging generates a lot of excess sediment that ends up in a stream in the wrong place at the wrong time. So that sediment will make the stream wider as a rule, not always, but it will make it wider and shallower. So when you have a wide and shallow stream, that exposes fish to predation much more than it would have been exposed historically. And that, in and of itself has, as far as I can tell, two effects. So one: more fish, more adults, when they return get taken out before they can successfully spawn. And two: there must be some sort of a selection process taking place whereby fish have to become smaller, to fit within those shallow waters and be less susceptible or even attractive, to the predators to prey on them because there is just less space and less physical structure to hide from them or to avoid predation on them. And this will be especially true for sockeye."*

- Yuri Zharikov, Non-Indigenous Expert, Parks Canada

### Logjams

Logjams were mentioned briefly by two non-Indigenous experts, who explained that they reduce spawning success by blocking access rivers, and therefore to spawning grounds.

*"[Logging] preventing salmon from spawning just because of allowing logs to block the entrance [to rivers and streams]."*

- Anonymous non-Indigenous expert

### Riparian logging impacts

The threat posed by riparian logging to salmon in the *ha-ha-houlthee* was a recurring theme in discussions with non-Indigenous experts. Experts highlighted that riparian logging is now less common adjacent to salmon-bearing streams since practices were updated in the 1990s. However, interviewees described how older practices are still causing harm to Nuu-chah-nulth salmon. Experts explained that riparian logging increases salmon vulnerability to predation and exposes freshwater to sunlight, which increases water temperatures with lethal and non-lethal implications for salmon. One interviewee cited evidence from their own observational data that warmer water caused by riparian logging leads to fewer but larger fry due to density dependence, which they acknowledged could be a positive or negative outcome. Furthermore, interviewees described a reduction in salmon-supporting nutrient inputs, and woody debris, which creates important habitat for returning adults and juveniles.

*“Water temperatures: if you have the forest canopy removed in and around the riparian zone, the water temperatures in the summer, you think about what happened in British Columbia last summer, it was unbearably hot, right? So, if you have good forest cover, underneath that forest cover the temperatures are significantly lower than if you're in the open. So, you remove that forest cover in and around the riparian zone, it artificially will bring the water temperature up. So that's a human cost. We did that through logging practices.”*

- Anonymous non-Indigenous expert

### Estuaries and logging

Several experts described the impact that logging has had on estuarine habitat and the threat this poses to salmon. Estuary log booms were raised by three interviewees who described a thick layer of bark and mulch material from logs covering sensitive habitat, including eel grass and sedge marsh, that is important for juvenile salmon rearing, particularly Chinook. One expert explained that one estuary still has this layer of material 40-50 years after the log boom was in place. In addition to log booms, one interviewee described the dredging of several estuaries, including the Tranquil and the Cypre, as part of historic logging operations, such as for logging sorts, and to allow access for boats. One expert also described the infill of estuaries for logging camps, and the related activity of pulp mills, for instance in the Gold River and Tahsis estuaries. Three experts described in general terms the changes seen in estuary habitat due to cumulative effects, the harm this can cause to salmon species that rely on estuary habitat, such as coho, chum, and Chinook, and the deficit in scientific knowledge that causes uncertainty in the harm that estuarine declines have on salmon. One of the experts explained that cumulative deterioration of estuarine habitat forces chum and Chinook to leave for the marine environment earlier than in an untouched estuary, increasing the vulnerability of those salmon to marine predation.

*“There's been a lot of alteration of that [estuarine] habitat as well, which is also slow to recover. We've seen that especially in log booming grounds, where there's thick layers of bark and mulch...It's coming off these booming grounds and still resides there, even though it's been 40-50 years. You think with wave action and everything that it would dissipate, and grass and stuff would come back, but it's not the case, it really creates a bed of material that is inhospitable to juvenile salmon.”*

- Anonymous non-Indigenous expert

### *Hishuk'ish tsawak*

Some non-Indigenous experts spoke of connections within the *ha-ha-houlthee* specifically relating to forestry. Two interviewees emphasized that logging higher in watersheds impacts rivers and salmon further down the watershed. One expert explained the connection between riparian trees, and how their roots intertwine to hold river and stream banks together. One interviewee dwelt on the connections through time in which logging actions from decades in the past continue to harm salmon in the present. The connection between salmon and bats, which logging disrupts, was raised by one expert. They explained that a lack of roosting locations near rivers caused by tree felling reduces the presence of bats, which in turn lowers the fertilization of freshwater habitat from bat droppings, which reduces the presence of invertebrates for salmon to feed on.

*“The part where the fish spawn is in Pacific Rim National Park Reserve, so no logging, all old growth. But above it is all been logged off. And so what you end up with is the bottom end of the unlogged area...is just toast. So the stream is all aggraded, or [there are] places that have been blown out or torrented...And it's unlogged. And it's pristine, but it's being impacted by up-slope stuff.”*

- Anonymous non-Indigenous expert

### **5.10.3. Pulp mills**

Two non-Indigenous experts identified pulp mills at Gold River and Tahsis as a risk to Nuu-chah-nulth salmon based on historic infill of estuaries to build mills, and damage to estuary habitat. One interviewee noted the importance of estuary habitat for juvenile Chinook salmon.

*“The amount of infill they did in the estuaries to create the space [for pulp mills]. There's a huge area of [Gold River estuary] that was filled in to provide the land to build on. The same thing happened at Tahsis, massive infill areas. But those [mills are] not operational anymore.”*

- Anonymous non-Indigenous expert

#### 5.10.4. Commercial fish harvesting

##### *Historic overfishing*

Several experts described the direct contribution that historic commercial fishing has made to declines in Nuu-chah-nulth salmon abundance and genetic diversity. Interviewees cited specific examples of Kennedy River sockeye and pink salmon throughout the *ha-ha-houlthee*. One expert described commercial exploitation beginning in the early 1900s and increasing in 1920s, with cannery harvesting featuring prominently. An ex-commercial fisher cited the harm to salmon caused by historic undeclared commercial salmon catch.

*“I think we’ve reduced the gene pool, long ago, before we even cared about gene pools. I think so much of the harvest that occurred in the early 20th century, I’m talking mass amounts of commercial harvest that was going on in the early 1900s and really ramped up into the 1920s.”*

- Anonymous non-Indigenous expert

##### *Current overharvesting*

Current commercial over-harvesting of Nuu-chah-nulth salmon was discussed more extensively than historic overfishing, and focused on the Alaskan commercial troll Chinook salmon fishery. Two interviewees described how Nuu-chah-nulth Chinook salmon migrate north to Alaska and the Bering Strait before returning home via the central coast of British Columbia. Experts explained that the recorded catch of Nuu-chah-nulth Chinook by Alaskan commercial fisheries is between 30-40% of the annual Nuu-chah-nulth Chinook adult population. However, some interviewees, explained that the actual proportion is thought to be higher due to by-catch and unrecorded fisheries, and one interviewee cited DNA data demonstrating that 50% of annual Nuu-chah-nulth Chinook are harvested in Alaska. Several experts explained that the Alaskan troll fishery targets larger, older females, which are critical for spawning. One expert identified current commercial fishing in the *ha-ha-houlthee* as a threat to salmon, arguing that catch had not declined in proportion to salmon population abundance. Three experts expressed concern about the threat that high seas international fishing static net fishers (and their legacy ghost nets) pose to Nuu-chah-nulth salmon, although they acknowledged there is uncertainty about the extent that this continues. A small number of interviewees raised river poaching as a threat to salmon.

*“WCVI Chinook, over 50% we know now from the DNA we collect are captured by Alaska fisheries. Now, some of those Alaskan fisheries north into the Bering Sea are not even recorded.”*

- Anonymous non-Indigenous expert

### 5.10.5. Recreational fish harvesting

Recreational harvesting of Nuu-chah-nulth salmon, predominantly Chinook, around Haida Gwaii and in the *ha-ha-houlthee* was a recurring theme. Some experts involved in the recreational fishing sector provided counter-perspectives, outlined below.

Interviewees raised concerns about the threat to salmon posed by current recreational fishing catch levels. Some experts noted that recreational fishing license numbers peaked in the early 2000s and the annual catch per license has been reduced from 30 to 10 Chinook. However, others argued that advances in fish finding technology, boat size and power, and the professional efficiency in guided recreational fishing means that recreational fishing pressure on salmon populations is currently too high.

*“The size of the fleet hasn't changed. What has changed is the number of guides and charter operators, which have a much higher success rate in catching fish. Now that's not for all fisheries. So, the Somass sockeye fishery, there's guides and stuff out there, but it's predominantly, mom and pop or Joe and son type of fishery, right? It's dominated by individual anglers, not ones that are guided. Part of that I think is the guides can't make as much money on a sockeye trip for whatever reason. But...what's also changed, what you see in every fishery, is the efficiency and the size of the gears has changed. So, the boats are bigger, they're faster, they can exploit more areas. When I was growing up 50 horsepower motor on a 16–17-foot boat was huge. Now it's 200–300 horsepower on the same size of boat.”*

- Anonymous non-Indigenous expert

Recreational fishing around Haida Gwaii and high grading (the practice of discarding a smaller fish in the hope of catching a larger fish) were also raised as risks to Nuu-chah-nulth Chinook. One interviewee explained that DNA of recreational fishing catches around Haida Gwaii shows that up to 60% of the fish caught are Nuu-chah-nulth salmon. Seven interviewees identified high grading of Chinook in recreational fisheries as a threat to Nuu-chah-nulth salmon populations. Two of the experts argued that high grading is reducing the average size of Nuu-chah-nulth salmon. One interviewee described the potentially high mortality rate of released salmon—acknowledging that this depends on environmental conditions and fish handling—and the uncertainty around the impact of high-grading because incidences are not recorded. Another interviewee explained that the threat of high grading to Nuu-chah-nulth salmon is shown in the bias towards larger salmon in the catch records of recreational fishers when compared to commercial fishers targeting the same fish in the same area at the same time. One expert observed that the more conservation-minded recreational fishing guides in the *ha-ha-houlthee* are trying to educate guests against high-grading.

*“Recreational fisheries can discard a lot and you can see the high discard rates in certain areas. A lot of the catch they retain are these larger fish that are so popular...If you look at the composition of the commercial catch and recreational catch in the same area, you'll see a very high skew to older fish and older sizes so they're all catching the same fish but there's a lot of discarding going on.”*

- Anonymous non-Indigenous experts

Non-Indigenous experts involved in the recreational fishing sector provided a different perspective on some of the threats noted by other interviewees. One expert explained that recreational fishing effort has reduced since the 1980s, citing DFO data and reduced license sales. One interviewee emphasized the efforts that have been made to reduce recreational fishing harvest of Chinook in Clayoquot Sound, including the closure of the fishery between August and October when Chinook are known to be present. One interviewee with extensive experience of recreational fishing in the *ha-ha-houlthee* argued that there is no evidence for high grading in the recreational fishery and cited a NOAA study, which found that decreases in salmon size at age are caused solely by marine mammal predation.

*“The facts are based on a NOAA study, that the size at age that we have seen declining...for example, we're seeing less larger fish over 30 pounds...That is true. Absolutely. But the NOAA study went out there to try and find out why that was. And it's the presence of marine mammal predation.”*

- Anonymous non-Indigenous expert

### **5.10.6. Enhancement**

The risk posed to Nuu-chah-nulth salmon by production hatcheries was raised frequently by non-Indigenous experts. The deleterious impact that large-scale hatchery enhancement has on Nuu-chah-nulth salmon genetic diversity was most frequently discussed. Interviewees explained that enhancement harms salmon genetic diversity by breeding from a sub-set of available spawners, breeding domesticated salmon with lower reproduction abilities that then breed with wild salmon and are more likely to stray to other watersheds. Experts described how such introgression leads to genetic homogenization of salmon populations across the *ha-ha-houlthee*. Interviewees explained that the loss of genetic diversity reduces the resilience and local-specific adaptations of wild salmon rendering them less able to survive environmental change. One expert raised the threat of hatchery fish immunization selecting for immune suppressed salmon.

*“Domestication, right? So we're creating fish that are wildly different than wild populations. And when they stray into systems or interbreed with wild populations, you can genetically depress that system. And that can remove genetic diversity from wild populations, which is definitely a negative. Genetic diversity is hugely important, especially under climate change. We don't know what's going to be important for the future. So preserving that is a must for everyone.”*

- Anonymous non-Indigenous expert

Experts described the threat to wild salmon posed by the hatchery practice of releasing smolts larger than their wild counterparts and doing this in a single release. Interviews explained that the larger smolts out-compete the wild equivalents for resources and pinnipeds learn the release timing of the smolts, increasing predation on wild salmon. Experts described how releasing large smolts leads to smaller, younger adults returning to spawn. One expert noted that some production hatcheries in the *ha-ha-houlthee* are changing their practices in an attempt to reduce these risks.

*“Part of the problem with hatcheries is they release all the smolts at one time. They all go down the river in a big pulse. It creates an artificial boom cycle for predators, so you get all seals and sea lions etc. that are just waiting for the dinner bell. They actually know when they're [the smolts] going to be there, if you can believe that. So they time their whole ‘I'm going to be in an estuary waiting for these fish’ for that. So that's one of the downfalls of hatcheries, is their release strategy, is that they just let them go all at once.”*

- Anonymous non-Indigenous expert

Many non-Indigenous experts discussed the broader impact that production hatcheries in the *ha-ha-houlthee* have on salmon conservation. Production hatcheries were described by some experts as a barrier to addressing the root cause of salmon declines by masking the true extent of wild salmon population declines and creating a false sense of abundance. One expert described reliance on hatchery fish for harvesting sectors as an “addiction”. Some interviewees observed that enhanced populations do not self-sustain and therefore hatcheries are not a sustainable conservation solution. Examples were provided of small-scale conservation hatcheries in the Tranquil Creek and Cypre River, where stocks were rebuilt by small conservation-focused hatcheries but returned to depressed states when enhancement ceased. However, some experts argued that enhancing salmon is necessary because there is currently no other option to maintain populations where salmon stocks have crashed and that stopping current enhancement risks the extinction of many Nuu-chah-nulth salmon populations.

*"I guess the one thing that bothers me is enhancement, because I feel if we turned off the tap, people would really see the state of our salmon populations. And then everything else would change. Because you'd see, 'Oh we can't keep fishing this many fish'. And we can't keep managing aquaculture this way, because we have so many fewer fish going out, every single one of them [would be needed] to make it to the next life history phase outside of the sound. So even though I don't think enhancements is the cause, or maybe a cause...it just masks the problem at hand. And I think people would also see that, why aren't these fish surviving? So then they might actually look at the watersheds and the conditions within them. While we have the tap on, people don't care because they can still sport fish, and they can still walk a creek and see salmon return to it. I think it would cause the concern that should exist but doesn't. So, to me, that's the one that really bothers me is that I really value wild salmon. So that's just because that's my values line. If I valued just salmon, and for the activity of fishing or for sustenance, or whatever, then I would probably feel differently, but where my values lie, I think that's the problem. That would spur greater action, to address the other problems."*

- Anonymous non-Indigenous expert



### 5.10.7. Fish farming

Non-Indigenous experts agreed that the density of farmed fish populations held in open-net pens provides the environment for the propagation of parasites and pathogens but disagreed about the risk posed to Nuu-chah-nulth salmon. Six interviewees discussed the threat of parasites transferring from fish farms to juvenile out-migrating salmon and provided personal observations of high levels of lice loading on Nuu-chah-nulth salmon. One expert explained that juvenile sockeye are particularly vulnerable because they are very small when they enter the marine environment. Some experts acknowledged that sea lice exist in the marine environment and that they may transfer from wild salmon to farmed fish. One expert argued that there remains uncertainty in the impact that sea lice have on Nuu-chah-nulth salmon and accordingly it is not yet possible to confidently state the associated level of risk. One interviewee described the release of hydrogen peroxide, which they explained is used in the removal of sea lice from farmed fish, into the marine environment and the uncertainty around the risk this poses to salmon. Two experts raised the risk posed to Nuu-chah-nulth salmon by pathogens transmitted by farmed fish. One interviewee emphasized the economic importance of fish farms to local communities in the *ha-ha-houlthee*.

*“The way I think about it is just you're unnaturally putting an extreme density of fish into an area that never had that density of fish. And so whatever happens is multiplied by that many fish, and then you are putting all those fish in a very small, dense area. So obviously, they're transmitting everything with each other. So yeah, that is just increasing the amount of disease and sea lice that are available in the water column.”*

- Anonymous non-Indigenous expert

### 5.10.8. Predation

A consistent view emerged amongst non-Indigenous experts of risks to Nuu-chah-nulth salmon from predation by pinnipeds in nearshore areas. Interviewees explained that sea lions and seals have been protected since the 1970s, preventing First Nations from practicing traditional harvesting and deterrence. In addition, experts observed that pinniped populations have grown because their predators, primarily killer whales, have reduced in abundance. Interviewees described sea lions and seals preying on salmon in rivers and estuaries, including with the help of human-made structures. Some experts highlighted the contribution of the influx of California sea lions to this risk.

*“There's increased predation, because...we've had this big influx of California sea lions. And, when there's lots of fish out, it's not a big deal, but now there's going to be instances where some of these rookeries are located, the haul ups. Well, if you're Mr. sea lion, where are you going to go? You're going to hang out...where these silvery little fat Chinook swim by right close to shore, right? So you just jump in the water and get your dinner and jump back out again...You don't want to go swimming all over the place, right?...They're not stupid. These marine mammals are very intelligent, they know where to get their food.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### 5.10.9. Residential development

The risk to salmon posed by residential development was raised by five experts, who focused on the accompanying harm they have seen to estuarine and lake habitat. Interviewees discussed pollution from residential sources, for instance storm water releases of household waste chemicals and lawn fertilizer runoff from Sproat Lake residential developments threatening key sockeye spawning and rearing habitat. Interviewees described the permanent harm from residential development encroaching on sensitive habitat. One expert cited the development of single private dwellings in sensitive lake shore habitat at Sproat Lake, whereby some houses are built so that in winter at higher water levels they are in the lake. Concerns were also raised about the potential for pollution from residential septic sewer systems built such that they are in the seasonal extent of Sproat Lake.

*“Really bad planning around urban development, encroaching on sensitive habitats. And that plays out very badly for salmon, when we make really bad decisions around that, because it's forever, you can't change it once it's done.”*

- Anonymous non-Indigenous expert

### 5.10.10. Transportation

Four experts briefly described the risk that road pollution poses to Nuu-chah-nulth salmon. The interviewees explained that salmon are harmed by salt, rubber, petrochemicals, and synthetic materials that runoff roads into freshwater salmon habitat. One expert specifically cited the Kennedy system in Clayoquot Sound as having been affected by road pollution.

*“The Kennedy was once a great salmon run. It's got a highway next to it. In a study just a few months ago, in the Great Lakes, inundation in the interstices of the gravel where the native trout spawn, as the salinity was so high from salting since 1970. Our road [running past the Kennedy] was built around '72. So it's making it inhospitable for the survival of the native salmonids in the Great Lakes.”*

- Anonymous non-Indigenous expert

### 5.10.11. Other risks to salmon

Two risks to salmon that were only discussed by one or two knowledge holders are briefly described in this section. Two interviewees highlighted the risk that agriculture in the *ha-ha-houlthee* poses to freshwater quality and to invertebrates, which salmon rely on for food. Two interviewees described pollution from unmitigated shipwrecks in the *ha-ha-houlthee* as a threat to marine salmon habitat. The case of a recent extensive fuel leak from a shipwreck in Nootka Sound near Bligh Island was provided as an example. One expert highlighted the loss of groundwater to cool freshwater salmon habitat in the Nitinat watershed due to the pumping of groundwater in the neighbouring Cowichan River watershed for municipal, aquaculture, and agriculture use.

*“If somebody pumps a well right beside the river, that groundwater no longer goes to the bottom of the pool. And so, for Cowichan River, for example, the city of Duncan pumps groundwater, there's two other big fish farms that pump groundwater, and there's a whole bunch of farmers that pump groundwater. Now [Nitinat watershed] has no cool groundwater, keeping the river system cool in the summer. So, we're taking that away...It's something that goes under the radar. And that's taking away that cool groundwater in the summer, is it's impacting those cool water species like salmon.”*

- Rob Brouwer, Hatchery Manager, Nitinat River Hatchery

### 5.10.12. Hishuk'ish Tsawak

Risks relating to connections within salmon systems were discussed by a small number of non-Indigenous experts. A small subset of these experts referred to these connections as *hishuk'ish tsawak* (everything is connected, everything is one in Nuuchahnulth). Some experts spoke about connections specifically in relation to logging, and these connections were discussed in the logging (ecological risks) section of this report. In this section of the report, themes are reported of connections that were related to salmon declines, habitat loss, accumulation of harm to salmon over time, and where more than one risk to salmon were described.

#### *General Hishuk'ish Tsawak themes*

Four interviewees spoke about connections between salmon species and how harm to one species can impact other salmon species. Two experts spoke about the key role that chum salmon play in cleaning gravel for other salmon to spawn in. One interviewee explained that although pink salmon are not valued particularly highly by humans, they play a critical role supporting other salmon species by enriching nutrients in rivers. Another interviewee described the relationship between sockeye and coho salmon in a single watershed, explaining that coho predate sockeye fry.

*“And the reason they [rivers in the ha-ha-houlthee] are nutrient deficient is because there's no fish. So if you think about how humans typically look at things, we've had some very bad practices, so we tend to go Chinook salmon [are] good, right? Oh, chum salmon [are] good, we can make money off of chum salmon. Oh, sockeye [are] good. Okay, so we'll go and we'll spend all this money in line with the fish that we like, but we'll forget about pinks. What are they, what are they good for anyway? Well, the pinks play a very big role in a lot of these river systems. But again, we typically go and we enhance our favourite species, instead of taking a very diverse view, which is, we need to replicate the natural system. And we need to make sure that if we're going to go and enhance a system, that we enhance everybody, not just our favourite fish, because everybody plays a role in the ecosystem. So if you look at why are some of these rivers are deficient of nutrients, because those pink salmon carcasses provided a lot of nutrients for coho, for Chinook, for steelhead, and sockeye...So having that level of abundance of all the different species of fish to use that system, they all work together.”*

- Anonymous non-Indigenous expert

One interviewee emphasized the connections between generations of salmon, describing how the consequence of the destruction of a single salmon egg is felt in that salmon population over time and in the wider ecosystem. Three experts observed the harm of salmon declines to terrestrial predators and trees over time. One interviewee described the connections between watersheds in the *ha-ha-houlthee*. They explained that the remaining intact watersheds do not exist in isolation and that their salmon populations are harmed by the impacts of human activities and climate change to the wider ecosystem. One interviewee highlighted the importance of recognising the Nuu-chah-nulth worldview of *hishuk'ish tsawak* and employing it alongside western ways of thinking. Another expert emphasized that the scientific paradigm appears unable to deal with the deeply connected nature of salmon systems and that consequently scientific knowledge lacks the ability to explain these connections.

*“We need to be conscious that the risks to the individual as early as the egg can have impounding effects across the lifecycle and across generations. These are not limited to one individual generation but can be trans-generational. So the impacts that we're doing on one life stage really do impact not only that fish, but future generations, and future ecosystems and stability of those ecosystems. And that is critical, I think, to understanding that our decisions now are going to impact future generations of salmon and ecosystems and humans as well and that's incredible and scary to think about.”*

- Anonymous non-Indigenous expert

### *Cumulative effects over time and place*

A small number of non-Indigenous experts described previous, more abundant states of all the species of salmon in the watersheds of Nootka, Clayoquot, and Barkley Sounds calling on historic DFO data, written documents, and their own personal observations from the previous 30–40 years. The interviewees explained that there have been extensive declines in Nuu-chah-nulth salmon in recent decades, but particularly since the 1990s.

*“In his [John Jewitt, the author of ‘White Slaves of Maquinna’] journal in 1802, they moved from Yuquot, Friendly Cove to Tahsis in the Fall. And they set their traps and in the first 15 minutes they caught over 700 salmon. And when Nuu-chah-nulth say salmon they mean Chinook salmon, the big one. Those 80 pounders, right that used to be here. And yeah, in the first set of traps, 700 of those in the Tahsis River in the first 15 minutes of fishing, so that's the kind of abundance you might talk about back in the day.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

Several experts described cumulative effects of local, regional, and global human activities harming salmon in which climate change (global), intercept fisheries (regional and international), and various activities in the *ha-ha-houlthee* (local) have collectively and persistently reduced salmon abundance and diversity over time.

*“I see it more as something more holistic and cumulative. So as we talk about each piece...when you add all those things up, if you've got a low population size, and then you're swimming past...fish farms, and then climate change is happening and you have lower food availability, and you come back to a stream that's not in great condition, just how all of those things are impacting salmon together.”*

- Anonymous non-Indigenous expert

One expert explained that salmon populations that have been reduced in abundance by cumulative effects are more vulnerable to small incremental harm than they would have been in their healthy baseline state.

*“It's a situation where it's just hard for these fish to recover, because if they're still at historic highs, a lot of these smaller issues probably wouldn't be that big of a deal. Maybe they cause a reduction, but then you'd stop doing that, and you'd see a rebound right away.”*

- Anonymous non-Indigenous expert

### *Connections between two or more risks to salmon*

Direct connections between two or more risks to salmon reported by non-Indigenous experts are described in this section. Such connections have been categorized as either interactive, in which one risk amplifies the impact of another risk, or additive, in which one risk directly adds to another risk to create greater risk to salmon.

### *Interactive combinations of risk*

All risk interactions described by experts featured climate change and either risks from logging, predation, or enhancement. Four experts raised the risk interaction in which logging reduces the ability of the land to hold and slow down the flow of water, which exacerbates the risk of scouring from the increased intensity of rainfall events caused by climate change. Two experts described increased sediment and gravel transportation into rivers and streams increasing the risks posed by seasonal low flows caused by climate change through the infill of cold water refugia (such as pools) and reducing entry accessibility to rivers and streams. Two experts described ways in which logging causes a worsening of the effects of climate-driven freshwater warming. One expert explained that logging causes the land to hold less water, which exacerbates freshwater warming and increases mortality events. Another interviewee described how shallower streams and river geomorphology caused by logging intensifies freshwater warming from climate change. One expert explained that the insufficiency of logging buffers increases the risk of damage to salmon habitat from tree wind throw into rivers and streams caused by more intense wind events brought about by climate change. One interviewee observed that declines in genetic diversity, and therefore resilience, caused by enhancement and overall population declines increase the risks to Nuu-chah-nulth salmon from environmental change. One expert explained that freshwater warming increases stress levels in salmon, which increases their vulnerability to all other stressors.

*“There's been logging, for example, at Turtle Lake right up to the lake. Very badly planned, managed. All of the bogs and wetlands are drying up because...there's no retention from the trees around them. So then when these bogs dry up and then the creeks dry up, they're very warm...Going into the canal is warmer and the fish don't come up. And they die right there by the thousands and thousands.”*

- Penny Cote, Alberni-Clayoquot Regional District (Area D Sproat Lake Electoral Area Director)

Two experts described how the risk of pinniped predation is increased by climate change. The interviewees explained that lower flows in the fall and freshwater warming prevent returning salmon from entering the rivers and streams, which increases their vulnerability to pinniped predators, which are increasing in abundance. One of the experts also described how low flows make salmon more vulnerable to pinniped predation in-stream and another interviewee explained that riparian logging reduces shade which exacerbates predation.

*“They're staying out in the estuary a little longer until the water and the rains come, but then they're more prone to predation, the longer they stay in those marine areas.”*

- Anonymous non-Indigenous expert

### *Additive combinations of risk*

Additive combinations of risks to salmon were described by one expert. They explained that increased drought, warmer conditions, and reduced snowpack from climate change combine to create lower flows and warmer freshwater. The expert also observed that reduced shade from logging accelerates snowmelt, which reduces the snowpack further and contributes to additional freshwater warming.

*“You're a small stream, and your water source is groundwater, snowmelt, that type of thing. If the effect of climate change is to reduce the overall snowpack, on average some years...you're gonna have less snowpack, you're going to have less water throughout the year....Where you have a drier warmer summer and you also have an overall lower snowpack, then you're going to have longer periods of time where the flow is less and without that cooler water inputs you're going to have periods of time when the water temperatures can get to where they may not be lethal, but they're not advantageous. You add logging within a watershed. So what happens with logging is there's no canopy to [provide] shade. So your snowpack will decrease even faster.”*

- Anonymous non-Indigenous expert

## 5.11. Human impacts of salmon declines: Nuuchahnulth knowledge holders

Many knowledge holders discussed impacts of salmon declines to local communities (Fig. 8). The impacts on *Nuuchahnulth-aht* from declines in salmon described were many, varied, and intimately connected. The impacts varied by scale, from individuals to family to community. The most frequently raised themes were loss of traditional way of life, traditional diet and food security, family and community connectedness, individual connection to salmon, livelihoods, and loss of home, peace, and wealth.

The human impacts of salmon declines described by knowledge holders were interwoven with the impacts of colonial policies and outcomes, including residential schools, being denied access to resources in the *ha-ha-houlthee*, and *Nuuchahnulth-aht* having reduced access to the land and having to leave the land for urban centres. One knowledge keeper explained how intimately connected *Nuuchahnulth-aht* are with salmon and the connection between the treatment of Indigenous people and salmon in Canada.

*“I just really, really think that we're so intimately connected with the Salmon, that the way society sees us as First Nations indigenous people is also a reflection of how the salmon are viewed. And in my life experience, First Nations Indigenous people are not valued. You go across into town, and there's hardly any sign of who we are as the first people from Ucluelet. There's one magazine made in Ucluelet. And it starts, you turn the page and at the map of your Ucluelet and it's like they've cut off our community, so it only shows the peninsula. So to me, as a people we are not even recognized. And so I can't help but think about when people come here, the salmon aren't really recognized as a living being, [they] just think about the commodity of it all take, take, take, and what that does to the spirit of our people and the spirit of the salmon.”*

- Anonymous Yuułuᑦiᑦᑭᑦᑭᑦ First Nation knowledge keeper

### 5.11.1. Loss of Nuuchahnulth way of life

Many knowledge holders described how Nuuchahnulth lives were traditionally built around salmon.

*“Everyone would fish. I'm going back to pre-contact and even after contact that's how the society ran, in a sense...from when you were a young kid, five to eight years, there was a part of your everyday life, you just watched. And then as you got older, teenager, you would start to be a part of it, you would get to go out and watch and sometimes start helping. But every day, you would be in it, seeing, not only seeing, being taught how. Every child grew up and you were taught from an early age that this is what you're going to do. This is what we do as a family. So, we take care of everything and everyone.*

*I know there was a story that used to be told about when the first salmon would be caught, when the salmon started running. So, when the first Spring salmon was caught coming in to go up the river, there was a ceremony that would happen. So, they would take the fish, bring it in and it would be celebrated. First fish of the season, everybody would gather...Because everyone lived*

*in a big house, a long house sort of thing, [there would] be a little bit of a ceremony go on. You would thank the fish, like salmon, like gods you would say, the Creator, thank them for bringing the salmon back to us. And that salmon, it wouldn't be eaten, but it would be the guest of honour. It would be treated with the most respect and that they would put Eagle down or goose down around, and down is a really sacred thing in Nuu-chah-nulth. So that would happen. And then after that, they'd bring the fish back to the ocean and give it back. And then that would be the start of the run. That was that big thing... 'Okay, thank you for bringing the fish back' and this is why — it was giving the respect to the fish and praying so they would come back. And that's how fish would come back every year, the ceremony that used to happen for it.*

*[Nuu-chah-nulth-aht ate] predominantly salmon...because it was so abundant...but there was also groundfish, halibut, cod, black cod. After, when there wasn't whaling, it was fishing, right? Fishing was always the big thing. Lot easier, in a sense. And so now there's a situation where almost everyone in the community used to fish and now only a handful of people have boats. And everybody used to eat fish for most, if not all meals. Based on the food fishery, it's [the amount of salmon eaten] not that much. Most people take what they get from the food fishery and process it for winter stock. Have it during the winter, pull a few pieces out here and there so you can say it's definitely not what it used to be. I remember when I was younger that when the dog salmon used to run that's all we would eat all of the month, every single day. Every single meal was fish. And it's not even close to that anymore...Dog salmon is used for smoking, so it was predominantly smoked to preserve it. So, it would be every day after we would get all the fish and my grandmother would be cutting, smoking, hanging and smoking fish. Our smokehouse used to run 24 hours and everyone used to take part in it. Everyone needs to get up take turns keep making sure the fire was on, flipping the fish taking fish out, putting new fish in. And that happened almost the whole month of October for processing dog salmon for the year. And that just doesn't happen like that anymore. The community doesn't participate in those processes, as a community."*

- Byron Charlie, Nuu-chah-nulth knowledge holder

Knowledge holders described how salmon were traditionally the fabric of everyday life for Nuu-chah-nulth individuals, families, and communities, and that salmon represented a way of living, nourishment, and medicine. One interviewee explained the loss of a way of life with salmon at its heart,

*"Because I was in a residential school, I didn't get to eat those things [salmon and other traditional foods], right? And so besides losing my family, and losing my culture, and my language and my community, I lost everything that came with that. And that included spirituality, and included gatherings because when you're gathered together, the conversation always went to good stuff. And there was nothing good about the residential school. My parents went there too. And my grandmother went there. So, there's generations of losing more and more and more and more. And the salmon was such a huge part of the life itself in everything, everything it entailed, you know? Gone, it's almost literally all gone now. Everything that comes with the salmon is gone. And people think of it as, 'Oh, it's just a fish'. It's not just a fish. It's a whole way of life, and it's gone."*

- Gina Laing, Uchucklesaht First Nation knowledge holder





*Figure 8. "Community" was created by Nuu-chah-nulth artist Joshua Watts, who provided the following description: "This piece depicts a Potlatch. A celebration of abundance. The fire is lit, and the wolves are dancing in the house. The door is represented by the face of a man feasting, and the salmon rising from the smoke represents what is sustaining the feast, and the people attending. Through sharing salmon, everyone has been brought together for the many reasons that make Nuu-Chah-Nulth people who we are. Inside the people and the Ha'wiih gather to discuss the business that needs to be done; Stewardship, and the news of the Ha-Houlthee. Nuu-Chah-Nulth governance, and cultural values, take place within the potlatch system. Our people potlatch to celebrate the bounty of the land, and to discuss, plan, and pass down the knowledge to sustain our way of life. All of this is sustained through feasting, and the salmon giving their life allows our potlatch system to live to this day. Mirrored below this image of a potlatch is a modern western house. This is clearly differentiated by the western style door and knob, and bare walls. Inside there is no feast. The values may still exist within the walls, but influence from western civilization has impacted the way of life of those within. The fine connecting line between these two houses is balanced on the core Nuu-Chah-Nulth belief of Hishuk-ish-tsawak, everything is one."*

Two knowledge holders discussed how salmon declines, together with other colonial policies, have eroded traditional Nuu-chah-nulth ways of life in their communities. The interviewees described residential schools harming connections with family, community, culture, language, knowledge, spirituality, the land, and salmon across multiple generations. Combined with the loss of salmon, the traditional Nuu-chah-nulth way of life is being lost. One knowledge holder explained,

*“That's what residential schools did to us. That's what removing us from our lands did to us, removed away from a way of life that had healthy people with healthy outcomes, and looking after the land in a healthy way. So yeah, when the salmon went, so did our people.”*

- Anonymous Huu-ay-aht First Nation knowledge keeper

One knowledge holder described how salmon declines have led to loss of Nuu-chah-nulth identity. The interviewee explained that without salmon and the ocean, it is difficult to see a future for *Nuu-chah-nulth-aht*.

*“The ocean always sustained us, we always had food from [it]. But my grandfather said something to me I'll never forget, and I try to instill it in my kids is we're saltwater people, we come from the ocean. Without the ocean without the salmon we're not, we can't be here. We will cease to exist if we don't take care of the ocean and what it gives to us.”*

- Byron Charlie, Nuu-chah-nulth knowledge holder

### **5.11.2. Loss of traditional diet and food security**

Several Nuu-chah-nulth knowledge holders told stories of salmon and seafood, as a traditional food, many from their own experience, earlier in their lives. Interviewees spoke of harvesting from an abundance of salmon and seafood for individual and family consumption and sharing with community members in need. Another interviewee explained that that different salmon species were prized as food for different attributes and that chum, as the final return salmon migration before winter, were valued for over winter. Knowledge holders spoke of eating the whole salmon. Two knowledge holders explained that mothers would chew up the salmon and feed it to their babies and that babies would be fed the back of the salmon neck because it is the most nutritious part of the fish. Two knowledge holders expressed their love of eating salmon eyeballs. One interviewee explained their love for salmon heads, and another recounted a story of going into another family's house on their reserve as a child and being given a Chinook salmon head to eat.

*“When I was a kid when I was small, mother would chew salmon and feed it to the baby. That was their first taste of salmon. So we've been eating salmon since we were babies. Mum would chew it up and give it to us. That's how far back it goes.”*

- Anonymous Nuchatlaht knowledge holder

Many knowledge holders described reduced personal food security. They explained that they did not have enough food fish supply from their Nation to enable them eat salmon every day, and some explained they only had enough for a few days per year. Interviewees noted that lower abundance of salmon in the *ha-ha-houlthee* has meant some Nations have chosen to harvest less or no food fish due to run size concerns. Charlie Cootes Sr., a Uchucklesaht First Nation knowledge holder, explained that, “We're limited to how much we can take. We can't take our needs anymore. We fall short of that.” and observed that their Nation had made this sacrifice before Federal government conservation action had been taken.

*“Definitely the lack of super nutritious healthy food is the biggest [impact]. So last year, when the forecasted run size was so small, they [the Nation] were like, ‘You can't even take any food fish’, which has never happened before. So that's all of our food that we rely on, just not there anymore. So that was...going to be huge. So, we're not going to have any sockeye over the winter. That would just be devastating. And then that definitely impacts the community in terms of our health because right now, we had to go buy store bought meats.”*

- Anonymous Hupacasath First Nation knowledge holder

Other reasons for reduced food fish availability were discussed by knowledge holders. One knowledge holder explained that their Nation cannot afford to pay a fisher enough to catch the number of salmon they require for their community. DFO setting Nuuchahnulth food and ceremonial fish harvesting numbers without consultation was also raised as a concern by some interviewees. One interviewee described traditional Uchucklesaht harvesting of seafood on beaches at low tide no longer being possible.

*“When the tide went out that was our supermarket a long time ago. Not very long ago we still do that, we gather resources when the tide's out...We say when the tide is out, out tables are set. Nowadays, regulations prevent us from doing that and pollutants in the water such as red tide stuff and those other pollutants. As soon as they come around, the majority of the beaches close and you don't have access to them anymore. So go and buy a hotdog or pop and chips.”*

- Charlie Cootes Sr., Uchucklesaht First Nation knowledge holder

Knowledge holders also described how a lack of access to salmon food fish has resulted in a shift of some Nuuchahnulth diets to western “store bought” foods. Affordability was described as a barrier to sourcing salmon from supermarkets for many. Some contrasted the high price of fish in supermarkets to the free seafood abundance of their youth. One knowledge holder explained that Nuuchahnulth people have been forced into western ways of living through colonialism, which blocks them from traditional ways of harvesting and eating and has pushed them towards poor quality diets. Another interviewee observed the contribution that having to move from the land to urban centres has made to *Nuuchahnulth* diets.

*“To invite a child to eat a salmon meal, whether it be smoked, whether it be dried, whether it be salted, whether it be frozen, was normal, that was an everyday meal. Now we have to pay big bucks...now it's a treat. Before it was a way of life. And that's the big change.”*

- Anonymous Nuchatlaht First Nation knowledge holder

One knowledge holder explained how colonialism has changed Nuu-chah-nulth ways of live, which have in turn reduced access to salmon, and resulted in *Nuu-chah-nulth-aht* needing more money in order to buy foods that are not healthy for them.

*“And when we were fishing communities, we accessed all resources. And we didn't have to go fill a boat up, every time we went out, we just took enough to keep us because we didn't depend so much on white man's way of living. We were at home, we didn't need much. But what we did, it was there. And we went and we accessed it. Until we got integrated into the white man's way of living, going to Safeway to buy meat, going to Safeway to buy what's not our diet, that changed. And so now we need all this extra money to go buy steaks...to go buy hamburger. It's not our diet.”*

- Anonymous Nuu-chah-nulth knowledge holder

Knowledge holders described the impacts of reduced access to a traditional salmon-based diet. The most common theme was the negative health impacts from the switch to a western diet. Interviewees described *Nuu-chah-nulth-aht* eating a poor-quality diet, for instance the consumption of fast food, salt, sugar, and the substitution of nutritious salmon protein for processed meats and meals. Knowledge holders connected the change in diet to increases in diabetes, obesity, cancer, heart disease, and high blood pressure in Nuu-chah-nulth communities. A Yuuʔuʔiʔath First Nation interviewee explained how elders taught that “Our food is our medicine” and that “The impact of not having access to salmon will definitely affect not only our body, but our minds and spirits too, contribute to that disconnection.” Another knowledge holder explained the difference in health between themselves and their children following a change to a more western diet.

*“Every Sunday after church we would go, because we lived across Esperanza and right at a corner ...was a ground fish hole and we would go there every Sunday and we would bring home six and that's all we would capture is six because that would last us till next Sunday, 'til we went out again, because no fridge, no freezer. I can remember having red snappers, lingcod all the time and we were never sick as children we never spent a day in the hospital and never needed to see a doctor. But it was my children that were the ones seeing doctors because they weren't used to the diet, the diet had changed between the time that I was a child, and when I started having children. It was obvious and the ailments started.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

One knowledge holder described how reduced availability of food fish salmon exacerbates financial challenges for some *Nuu-chah-nulth-aht* and leads to cheaper, less nutritious food purchases. Another interviewee explained that for some *Nuu-chah-nulth-aht*, particularly those living in cities, food fish

availability can be the difference between having a meal and not. Some knowledge holders reported receiving other non-salmon supplementary food fish, such as cod, herring roe, and red snapper. One interviewee explained that their Nation began distributing fish heads based on demand from members.

*“A lot of people rely on that community fish to feed them as they don't have the money to go buy chicken and say, pork chops and protein to feed their whole family. But if they load up their freezer with fish they have a free-to-them protein source, healthy protein source...like it's definitely putting financial strain on me because I have to now go buy more protein sources to feed my kids and my family and so there's definitely where I don't get much fish, I got to now budget for more for groceries. I just don't have that free stockpile of food...I definitely think that it causes them to eat for example the cheap like Mr. Noodles for lunch now and buying those like really cheap filler meals.”*

- Anonymous Hupacasath First Nation knowledge holder

One knowledge holder expressed the feeling of injustice from the small amount of food fish they receive from their Nation every year compared to individual fishing allocations in the recreational fishing sector.

*“I would eat fish every day right now if I had it, but I don't. I think we're allowed, what is it, eight fish each a year? And salmon, in the sports fisheries, I think they're allowed to get like, what is it, four or eight a day? Something like that. I don't know how many a day but it's either four or eight, I can't remember. And we're only allowed to have that in a year and, and we're part of the system. We grew up with it...the salmon was a big, big part of our history...without it, there's no life.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

DFO's attempts to stop Nuu-chah-nulth Nations from using traditional protocols to negotiate trades of food and ceremonial fish when one Nation's salmon runs are limited, or fail, was described as exacerbating food insecurity.

*“It's been really tough lately getting food fish for our bands...DFO made a policy called the 'Adjacency Policy', where we can't go to other people's territory now and say, 'we have protocols you guys can get fish'. We used to always get the fish. We used to protocol with [other First Nations], but now no, they stopped it. DFO stopped that...Those kinds of things hurt and it's not good, no food fish. It's really hard to come by now. DFO is always trying to stop us. I guess that DFO, that's what they are for. I always say, I read a story that that's what they were put there for, DFO, was to stop First Nations from being in the river...I still depend on salmon. I really do.”*

- Anonymous Hesquiaht First Nation knowledge holder

The mixed emotions relating to salmon food fish availability were described by three knowledge holders. One interviewee explained the sense of excitement and happiness in their community on the

day in a year when food fish is distributed. Another knowledge holder described a time when a group of friends got together to eat a sockeye salmon, and the joy of eating the precious resource together. One interviewee explained how the community suffers emotionally when sockeye populations fall, and food fish is limited or not available. They told a story of a recent year when there were negative emotions in the community when pre-forecasts for sockeye and therefore food fish were low, but also the immense gratitude when food fish became available because the run turned out healthier than expected. The same knowledge holder expressed their personal anger about years in which the pre-forecast has been overly optimistic, leading to overharvesting, and imperiling the future of the salmon population.

*“For me the connection to the health of salmon is on the days in our community when we get food fish, it's like, to me it represents I guess a reflection of where salmon are at. On the days when we get our food fish, it's one of the most exciting days of the year really...So the trucks would come in and that parking lot would be full of community members excited, just happy.”*

- Anonymous Nuuchahnulth knowledge holder

### 5.11.3. Loss of fishing livelihoods

Many knowledge holders spoke at length about how Nuuchahnulth fishing livelihoods have been decimated over the last half century. Discussions painted a picture of a healthy and prosperous Nuuchahnulth commercial fishing fleet up until the 1980s, when salmon and other commercial species declines triggered a shift in DFO policies. Knowledge holders explained that outside of Nuuchahnulth five-Nation T'aaqwiihak rights-based fisheries established through several successful court cases, very few Nuuchahnulth commercial fishing boats remain in operation. One interviewee described their Nation having no commercial fishers. Some knowledge holders explained that they are still active fishers in their Nation's food fishery.

*“Well, I think about the disconnections that have happened over the years and how the waves of oppression have impacted the livelihoods of our people. I think here in our community, there's only a handful of fishermen...So, there's been a disconnection and I think it's connected to not only oppression but policies that have been implemented by DFO. Policies that have been implemented making it harder for people to have the livelihood...and for such a rich territory, there's a lot of poverty here. It's all connected. When you have families and communities being held down with policy, not being able to practice culture or not being able to speak the language, pretty soon that thumb comes off. And it's been happening for generations. And...you learn that state. And so, I think, the wellness of our people is also connected to the livelihoods...it's like many of our people are in states of grief. Yeah, and when you're in grief, it becomes hard to connect with life energy, including the livelihood.”*

- Anonymous Yuułuṭiṭṭath First Nation knowledge holder

The loss of Nuuchahnulth fishing livelihoods was attributed by knowledge holders to a combination of salmon population declines and Federal policy. Interviewees described being driven from the industry through Federal fisheries management policies of license proliferation and individual quotas.

Descriptions of the inequity of these policies featured heavily in conversations. Knowledge holders explained that the privatization of fish stocks created a market for licenses and quota, which could be bought and sold by fishers. Policy, interviewees highlighted, shifted licenses from multi-species to single species, which created the need to own multiple licenses to continue operating. Some knowledge holders explained that as the allocation of allowable catch to commercial fisheries decreased, it became increasingly less economic to continue fishing. Some interviewees described DFO redistributing the allocation of catch in and around the west coast Vancouver Island from commercial to recreational fishing.

*“We were hunters and gatherers, let’s put it that way..., my family. It’s been really terrible being a fisherman in this last 10, 15 years... We went fishing at the Fraser and fished half a day and got 68,000 pounds of pinks. Real happy, yahooing. Made a few bucks. Another announcement next day: to go fishing we need seven licenses to participate. And I only have one. Seven! So, what do we do? Just up and leave, because you know damn well you’re not fishing anymore.”*

- Anonymous Hesquiaht First Nation knowledge holder

Two knowledge holders described how after changes to fishing licenses, the Jim Pattison Group provided a line of credit to Nuuchahnulth fishers, and then took their licenses and boats when they couldn’t repay. One knowledge holder estimated that the Jim Pattison Group accumulated 30% of commercial salmon licenses.

*“Jimmy Pattison...he’s a shrewd businessman, got to give him that, because he gave our fishermen a line of credit. And when they couldn’t pay, he took their license, he took their boat...So, it’s been a stacked deal that we’re working against. A lot of the other non-native fishermen are trying to understand why we’re so frustrated. But they don’t take the time to educate themselves to see what the policies actually do.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

Knowledge holders explained that barriers to entering the fishing profession mean that many Nuuchahnulth cannot see a path to becoming fishers, although some interviewees explained that the T’aaq-wiihak fishery is creating opportunities for prospective fishers from the five Nations that have secured rights-based commercial fisheries. Some knowledge holders described their frustration and pain at the unjustifiable and unexplained delays in DFO implementing the rights-based fisheries court decisions in favour of the five Nations and the inequitable allocation of allowable catch to T’aaq-wiihak fisheries relative to the commercial and recreational fleets in the *ha-ha-houlthee*. Knowledge holders explained that interest in skipping commercial fishing boats and younger community members entering the livelihood has fallen for their Nation.

*“It was good to see the younger ones wanting to fish but with the restrictions and limitations, a lot of the interest waned. It’s discouraging.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

#### **5.11.4. Loss of individual connection to salmon**

The causes of *Nuu-chah-nulth-aht* losing individual personal connection with salmon was described as a complex combination of salmon declines, disconnection from *ha-houlthee*, and colonialism. Knowledge holders observed the loss of *Nuu-chah-nulth-aht* personal connection with salmon through loss of knowledge, experience, ways of life, and livelihoods. One knowledge holder explained that the disconnect from salmon inhibits *Nuu-chah-nulth-aht* from valuing salmon.

*“That process of processing the salmon, there’s a disconnection, and with that disconnection, it separates us from really valuing the salmon.”*

- Anonymous Yuuʔuʔiʔath First Nation knowledge holder

#### *Loss of knowledge connection to salmon*

Knowledge holders described how traditional knowledge about salmon has eroded as salmon populations have declined. One knowledge holder explained that traditional fish harvesting and preparation, and preservation knowledge has diminished. However, one knowledge holder described a resurgence in salmon preservation knowledge, with classes in their Nation to learn smoking techniques. Other knowledge holders explained that some traditional smoking and jarring of salmon still takes place. Several knowledge holders expressed concern that *Nuu-chah-nulth* youth will lose knowledge of historic levels of abundance. The same knowledge holder described the role of other colonial processes in destroying knowledge relating to salmon and ceremony.



*“I’m yapping off as an elder right now and trying to talk a little bit, what little I know about it, because their [previous generations of elders] knowledge was extensive, and mine isn’t. They were taught not to talk about it, because of residential schools. They were taught to be quiet. It was heathen, what they’re talking about, it was backwards. And so what my grandmas taught me was very secretive...They even took me into the smokehouse and told me be really quiet. And my grandmother looked out the door and she’s looking, and my other grandmother was saying, is there anybody there? And they said, ‘No, there’s nobody there and close the door and turn on a light’ and [they] started removing pieces of wood that were stacked in there for smokehouse and exposing these masks. And they were telling me these stories of masks and how they celebrated with these masks the return of the fish, about how you hunt for deer, and they tell stories with these masks about all these things. And they’re talking in the smokehouse in the dark very quietly, and hiding all this stuff, because the Indian agent might come and take it. So that was lost. Eventually it was gone...I don’t know what happened to it after. I guess they [the Indian agent] got it. So I never ever saw it again after that. And so that was another part that’s taken away. And the whole thing, sitting in the smokehouse and they’re smoking, fish is up in the racks being smoked, and they talk about that as they’d be doing it. Their way of teaching was to do it to show you how to do it and they didn’t instruct you and hit you if you made a mistake, like they did at the residential schools. And yeah, that’s all gone. And I don’t think very many people are taught that anymore.”*

- Anonymous Nuu-chah-nulth knowledge holder

Several knowledge holders described the contribution to salmon knowledge loss from receiving food fish packaged and prepared. They explained that receiving ready-prepared food fish removes the opportunity to hold it, learn about it, and participate in salmon preparation processes. One interviewee observed that as a result some people are losing the knowledge of how to clean the salmon, cut it, and how to use all parts of the fish. One knowledge holder described how knowledge was lost with smokehouses. One example given was of a traditional preparation of salmon eggs, which the knowledge holder explained was called ‘cheese’.

*“We used to always fill our smokehouses, make smoked fish, everything else we need to make. They used to call it cheese, the salmon eggs. But you have to really look after it, turn it all the time, they got to get all the gases out of it...Get sick from it if you don’t make it right. I always remember that. I always remember them making it. Put it inside a cod fish stomach, the eggs, and then stored upstairs. Let it sit and work on it and turns solid and I used to call it cheese! Yeah, I used to really like it when I was a kid, really sticks to the teeth!”*

- Anonymous Hesquiaht First Nation knowledge holder

One interviewee explained that changes in salmon behaviour, such as migration timing, risk related traditional knowledge becoming obsolete.

*“An elder would be able to go out in their yard and say, ‘Oh, there’s a whole bunch of salmon there’. They know when they’re going to come every year by the moon phase and environmental factors. But now, when we start to be dependent on hatcheries, which [is] a lot of what we are involved in now, then you start messing with that runtime...you start losing the runtime because then those fish ultimately aren’t genetically born in that river. They were enhanced from somewhere else.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge keeper

### *Youth*

Many interviewees explained that the lack of salmon and lack of commercial and food fishing access to salmon has created a profound loss of connection to salmon among Nuu-chah-nulth youth. Knowledge holders described Nuu-chah-nulth children not recognising traditional seafoods. Interviewees explained that many youth are no longer looking to fishing as a livelihood (see ‘Loss of Livelihoods’ section) and no longer spending time in nature in their *ha-houlthee*, and so they do not get to watch and touch the salmon.

*“It’s sad that most of our younger generation don’t know how to prepare foods, store food, or some of them won’t even touch it.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

### *Spiritual connection*

Two knowledge holders described experiencing a reduction in *Nuu-chah-nulth-aht*’s spiritual connection with salmon. One interviewee explained that at one point in their life, elders stopped daily spiritual aspects of life and salmon.

*“Because that whole cycle is something you thank the Creator for. And the people always did. Before they ate meat, they talked to the Creator. They woke up in the morning, all day long with everything they did, they talked to him about it first, and sitting down to eat a meal, they would thank the Creator for it. And after a while, it just got to the point where they weren’t doing it anymore and I thought it was really sad because there’s always something really special when the elders were talking like that.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Another knowledge holder told a story of how ceremonial events around salmon stopped when they were younger, and that this disconnection was the result of the loss of elders, colonialism, and cultural genocide.

*"I used to do dance practice and cultural practice all the time as a kid. My grandpa dragged me and so that was a big part of my childhood. And then as I hit probably about Middle School, we just stopped, [it] just stopped happening. And we just stopped practicing our culture. And then I remember every year we used to do back in the day, we did one thing was probably one of the last culture events we did, it was called the Mii-aht, the name for sockeye in Nuuchahnulth, the Mii-aht Festival, and go down the river and do our culture things and practice and he had sockeye head dresses, and then we blocked traffic for a little bit. And then we'd [have] the salmon coming from the river and we would go across over the road into the band hall, we'd have a cultural, 'Oh, the sockeye have arrived, I thank the Creator', spiritual aspects and celebrate everything...but that hasn't happened in a long time. And cultural loss is a pretty big thing right now. Elders keep passing away...the culture dies with them. But I do know salmon play a big role in our culture. You hear about stories and stuff. I remember being told ancient stories, they talk about the salmon jacks carry the canoes upriver... I feel like maybe it's just me speaking. There's not much spiritual connection to it...People don't really see it through that lens anymore, they don't see like the elders' way. They [elders] see spiritually and the creator and Naas. People see it as that's just our fish. That's just our sockeye. It's just the fish. They don't have the cultural and spiritual stuff tied to it like they used to."*

- Anonymous Nuuchahnulth knowledge holder

### 5.11.5. Loss of family and community connectedness

A recurring theme among knowledge holders was salmon declines causing loss of family and community connectedness resulting from the loss of family and community processes.

#### *Loss of family processes*

Several knowledge holders described how declines in Nuu-chah-nulth salmon have impacted family time together, including teaching and nurturing. One knowledge holder explained that salmon declines have reduced time spent together as a family.

*“It affects us socially...when I was young, and my children were young, we would go down to the canal, and we would stay with my mom and dad, and my aunties and everyone else. The elders were down there and we could socialize and get together and help each other and get fish and work on it, and work together, and now that there’s no salmon, we can’t do it anymore.”*

- Gina Laing, Uchucklesaht First Nation knowledge holder

Two interviewees explained that the loss of opportunities to prepare food fish salmon has removed the process of family knowledge sharing. One knowledge holder explained that during family and community efforts to smoke fish, older generations would pass on teachings to younger community members. Interviewees described how salmon meals were a time of intergenerational knowledge sharing and connection, to teach children about salmon, Nuu-chah-nulth connections to salmon, and community connections. One interviewee explained how using salmon mealtimes as a time of learning also benefitted the community, because children would often eat at other families’ tables. Although many knowledge holders described how these processes have been lost to salmon declines and the effects of colonialism, one interviewee observed that some families have managed to continue intergenerational teachings.

*“Now there’s so many other impacts, because salmon meal is not on a table anymore. The kids are gone. Now, the kids don’t want to sit at the table. So, it’s huge. We sat at the table, because we knew we were going to be taught something, we were going to hear something, we were going to learn, and our parents talked all the time, especially our grandparents. So, to me, the one salmon meal is a huge loss in teaching in history and sharing in the community. We were always at somebody’s place. And if it was lunchtime, you were fed. You weren’t told to go home and eat, you were told to sit down and eat because there was lots. And we knew how to share it. Now, you have to buy everything. We’ve given up that sharing and then access it to buy it. And that’s costly. And it doesn’t mean anything. I’m going to eat this because it’s expensive, I’m not going to share it with my friends. So there’s a big change now. We as First Nations, we need to get back to that, where salmon plays as a teaching tool. It’s a tool to spread knowledge, share knowledge.”*

- Anonymous Nuchatlaht First Nation knowledge holder

### *Loss of community processes*

Some knowledge holders described how harvesting, preparing, and distributive sharing of salmon is core to Nuu-chah-nulth communities, but are now being lost as a social process in the wake of salmon declines. Interviewees who spoke about a loss of community sharing explained that the shift to the western model of buying salmon in stores for food at high cost has created an affordability barrier to sharing. One knowledge holder explained that the change in Federal commercial fishing policies to individual quota-based systems of management accelerated values of individualism, which reduced community harvesting and the sharing of salmon that went with it.

*“The quotas and the licensing, it really divided the community. There was no more community effort, it became individualistic opportunity. It’s tough trying to reverse that and bring back the community consciousness.”*

- Georgina and Harold Amos, Ehattesaht First Nation knowledge holders

One knowledge holder provided more details on how smoking processes were a community endeavour, which has been lost.

*“When we help each other, where the ladies got together, they started cutting fish, the men went out to access the resources and the ladies got prepared for the smokehouse. The men got the wood for the smokehouse and watched the smokehouse. It was a community thing.”*

- Anonymous Yuuʔuʔiʔath First Nation knowledge holder

One interviewee spoke of the loss of community chum salmon harvest, smoking, and distribution.

*“[During the dog salmon run] the whole community would go out because the band owned a big seine boat, or they would go out in little herring skiffs with a seine net. The school used to take the day off, everybody would, all our community would go out there and everybody would take part in seining dog salmon, and then bringing it back. And then every household would get their share and their winter stock of dog salmon. All on that one day. That’s how abundant the runs were from one river and sad to say that it’s just not like that anymore.”*

- Byron Charlie, Nuu-chah-nulth knowledge holder

### **5.11.6. Loss of home**

One of the most prominent ways that knowledge holders described declines in salmon connecting with other outcomes of colonialism was the movement of *Nuu-chah-nulth-aht* away from their lands to towns and cities. Two interviewees explained that the first declines in salmon coincided with the loss of cannery employment when the canneries closed. With depleted salmon resources, no economic

opportunities within the imposed colonial way of living, and the impacts of residential schools, community members moved away. Two interviewees explained that they moved to cities so that their children could go to school. One knowledge holder described how when people left the land, they lost their traditional way of life.

*“When our people left home, so did that way of life. A very small amount of us know how to live off the land. What we ate, because if you look at a calendar, I can describe it to you in January, February, we're getting ready for herring. Now February, March things are starting to change, herring is almost over and then we start getting ready for halibut, lingcod, and things like that. And after those months are over, we're moving into spring and into the salmon seasons. Not to say that we can't catch salmon in the winter, because you can but we really followed the food, we followed that chain. That was our calendar, was a harvest calendar. And so, after the sockeye came the Chinook, coho. And the chum would be the final ones. And chum being the fattest ones, you can imagine why they were the ones that were prized at the end, it was the last salmon you harvested and dried and preserved for the winter, which only lasted so long... We liked eating deer and liked eating clams and so, as the calendar moves. And so, when you remove people from the land base, you remove them from that way of life. When the salmon were gone, residential schools started taking the kids away. Those villages, the remaining people that were there, during the end of those real overharvesting years, when there were still canneries and things like that, when those canneries shut down the jobs shut down, people moved. They had to, there was nothing to sustain them.”*

- Anonymous Huu-ay-aht First Nation knowledge holder

### 5.11.7. Loss of peace

Knowledge holders described how salmon declines are fuelling conflict in the *ha-ha-houlthee*. Increases in human-bear conflict were raised by two interviewees. They explained that without access to sufficient returning salmon, black bears are entering residential areas in search of food, primarily garbage.

*“If you start losing out on all that salmon habitat...they [salmon] will continue to come back but with populations declining. And your bears start to go hungry and they're no longer feeding themselves. They're going to the next town where they know there's garbage. Yeah so, the bear knows how to feed itself, get ready to pack on those calories for the winter's sleep. But...bears in towns and cities, they don't hibernate, because they have no need to hibernate, they know where there's food year round and it's garbage unfortunately, right?...The black bears are really harmless or more suspicious. [People] don't really have much education on how to handle bears, they just get really scared and they call conservation saying, ‘Come on, come shoot this bear, get it out of town’, when really they are just trying to feed themselves. But also, the issue is, when it comes to cubs as well because then your mother teaches you to come here, this is where the garbage is, just keeps them coming here. Fortunately, we are all dependent on wild salmon, not only for the growth of populations but also as a great food source for all to sustainably live on, for all living things.”*

- Jamie James, Mowachaht-Muchalaht First Nation knowledge holder

One knowledge holder observed the way that salmon declines elevate tensions between groups harvesting salmon. The interviewee explained that instead of salmon harvesters working together to ensure salmon populations recover so that there is more salmon to share, stakeholder groups fight harder over the few salmon do that.

*“The less there is, the more we fight, instead of everybody being part of the process and benefiting from the work that you do to ensure that there's lots for next year, lots for the year after, that we have good healthy stocks.”*

- Anonymous Nuuchahnulth knowledge holder

### **5.11.8. Loss of wealth from the *ha-ha-houlthee***

One interviewee described the harm to Nuuchahnulth Nations caused by a history of colonial resource extraction from the *ha-ha-houlthee* without accountability or benefit to sustainability or Nuuchahnulth communities. They explained that extraction of salmon and other resources has eroded Nuuchahnulth Nations' wealth from a position of having all the resources they needed for everyone in their society to the current impoverished state of the *ha-ha-houlthee*.

*“I think that at the rate we're going, where it's all access, where we invite the world to come and access our Chinook. Where we invite the Americans to come, people from out of province, people from out of country, to come and fish our fish. We can't afford that they do that. And so that's why I say we have to make these tough decisions where local people benefit first. One of our top politicians was bragging about how much money that the fish lodges make. I said, 'You come home with me, you come to Oclucje after they close, the next day, we'll count the money that they left behind, to benefit the communities, because you guys took out a lot of fish without helping to ensure that we have a good run through the next year'. He sees my point. I said, 'We won't be there a minute, because there's nothing left behind'. It's just like a clear cut. It's all gone. They aren't going to come back and say, 'Here, Nuchatlaht, here's a million dollars, go fix the streams'. They're not going to say that, and so how do we change that thinking? How do we ensure that we're all, 'You benefit, you help'... the biggest impact was taking away the access to those resources, and making us dependent on somebody else, where we didn't, for thousands of years, we didn't have to go ask anybody for help, we were happy, our *ha-houlthee* was wealthy, it had everything, and our wealth with having lots of everything, that was our wealth, lots of salmon, lots of halibut, lots of ducks, lots of trees, lots of clean rivers, free flowing, nothing interfering with the flow.”*

- Anonymous Nuchatlaht First Nation knowledge holder

## 5.12. Human impacts of salmon declines: non-Indigenous experts

### 5.12.1. Harm to Nuu-chah-nulth communities

Non-Indigenous experts, some of whom work with Nuu-chah-nulth communities to some degree, provided their perspectives on harm to Nuu-chah-nulth communities from salmon declines.

#### *Loss of food security*

Five non-Indigenous experts observed how declines in salmon have restricted Nuu-chah-nulth Nations' access to food fish, rendering the supply inadequate for some of the Nations' needs. The interviewees who discussed the lack of food fish emphasized salmon's importance to *Nuu-chah-nulth-aht* since time-immemorial.

*"That's [salmon] a really important part of their [Nuu-chah-nulth] culture. Huge, huge, huge, huge part. That was their reliable food source for millennia. But they don't have that anymore. There's no smokehouses smoking chum...I don't think there's much of a harvest left...So it's shrunk, shrunk really drastically. It's not over, but some of these rivers are on life support now waiting and waiting. But there doesn't seem to be any movement in the department [DFO] in order to move things forward."*

- Anonymous non-Indigenous expert

#### *Inequity in DFO management*

Several interviewees described how salmon declines have driven DFO management decisions that have been inequitable for Nuu-chah-nulth Nations. Two experts recounted the inequity of how Nuu-chah-nulth commercial fishing livelihoods were taken away by DFO in the 1990s and early 2000s as parts of attempts to deal with commercial harvesting pressure in the face of dwindling salmon populations. The experts went on to explain that DFO has started to recognise the fishing rights won by five of the Nuu-chah-nulth Nations through several court decisions, but only now that the department has allowed salmon populations to be over-harvested, leaving limited sustainable fishing opportunities for the Nations. Consequently, the experts observed that having overseen the depletion of salmon stocks, DFO has left little economic opportunity for the Nations to benefit from salmon harvesting. However, one of the interviewees emphasized that the importance of the recognition of their right to commercially harvest their own resources goes far deeper than economic opportunities for the Nuu-chah-nulth Nations.

*"We knew [Nuu-chah-nulth] people who were making a lot of money, some people before the commercial fishery broke down [in the 1990s] were making great money. We hear stories of there being upwards of 20 to 30 trollers in the harbour. And then when the court case started, there were one or two. And a lot of people used to depend on fisheries commercially...Now they won the court case and are ready to get back out there but the fish aren't there...This older guy would go out every day on his boat. He'd get skunked [catch none], get one, come in and sell his one. But it just didn't matter. He was out fishing salmon and asserting his right."*

- Anonymous non-Indigenous expert



### *Loss of cultural knowledge, values, and knowledge*

Acknowledging that they could not comprehend the impact of salmon declines on Nuu-chah-nulth Nations, one expert described their awareness of the deep importance of salmon to the Nations and recognized that salmon declines must impact Nuu-chah-nulth communities in terms of harm to culture, values, and traditional knowledge.

*“I'm not First Nation, I can't speak to it, but I can only imagine...cultural knowledge and passing on of values and traditional ecological knowledge is drastically impacted by the loss of salmon, which is a cornerstone in many of their cultures and the cornerstone of their life and their economy and family structure. To then be lost, really severs a whole part of their culture that I can't understand, and most western white folk can't understand. So really, they're fully invested in salmon and a whole other way than western white folk would be.”*

- Anonymous non-Indigenous expert

### **5.12.2. Harm to non-Indigenous communities**

#### *Loss of fishing livelihoods*

Many commercial fishers active at the beginning of the 1990s lost their livelihood to fleet reduction policies. Some interviewees spoke of the impact to fishing towns after the commercial fishing sector was lost. They described the loss of land-side fishing industry jobs, loss of identity, and the erosion of standards of living as towns such as Tofino and Ucluelet became tourist hotspots with less high skilled jobs, shortages in housing, and increases in living costs.

*“I look at the west coast of Vancouver Island, we went from 360,000 Chinook, two million coho, with a fleet of up to 1,800 boats. That fleet of active fishermen last year was under 30.”*

- Anonymous non-Indigenous expert

Two experts described the inequity of DFO management decisions connected to declines in salmon and fishing livelihoods. One interviewee explained that compensation funds were not distributed to those whose livelihoods were affected by fleet reduction strategies. Another expert described the harm to non-Indigenous commercial fishers caused by DFO's failure to award compensation after reallocating fishing rights to Nuu-chah-nulth communities. One interviewee described the on-going DFO policy of fleet reduction, with (as of early 2022) license buy-backs planned for commercial fishers. They explained that the policy is inequitable in that those who submit to the policy are fishers that are most financially precarious, shifting the industry further towards larger scale company-owned fishing.

*“There's a proposed buy-back for this year and it is based on who's the most desperate, not a forward-looking approach of what do we want fisheries to look like in British Columbia in the future. How many boats can be sustained in this area? That should be the goal. So we don't set the goalposts, we basically go, here's some money, you're desperate enough, we'll buy you out. Obviously, the company boats can afford to stay. And so they'll probably be the last man standing. And that will determine what fisheries look in British Columbia more than anything else.”*

- Anonymous non-Indigenous expert

### *Loss of peace*

Two experts described increases in conflict between bears and people because of salmon declines in the *ha-ha-houlthee*.

*“In years when fish returns are low or fail, often combined with some other things like low berry crop, you get a big problem with bears, you get emaciated animals and then you get a sharp spike in a number of, we call it human wildlife conflict, that is bears getting into settlements, getting accustomed to human food, and so forth and so forth. And they all end up being shot, right? And so it's tragic.”*

- Yuri Zharikov, Non-Indigenous Expert, Parks Canada

### *Loss of recreational fishing access*

Using the example of an area in Nootka Sound, one expert highlighted the inequitable impact of recreational fishing area closures as a result of salmon declines, in which those without sufficient resources cannot access offshore fishing areas when nearshore areas are closed.

*“Access to salmon fishing was a pretty low barrier because the Tahsis Inlet was open for salmon fishing. Right from the village...over to Esperanza. Well, now it's closed for most of the year. And so you're travelling half hour, 45 minutes to get to the fishing grounds, and that requires typically bigger boats, and more money for gas, and so on, so forth. So it's meant that persons who are on limited incomes can't afford to buy a bigger boat and with a bigger motor and pay for gas and pay for mortgage and all those kinds of things. Recreational fishing has become sort of beyond the means of a lot of people in the community. So it tends to create those who can afford to fish and those who can't.”*

- Anonymous non-Indigenous expert

### *Sense of loss and responsibility*

Two interviewees expressed feelings of fear, shame, sadness, and responsibility at the state of salmon in the *ha-ha-houlthee* and concern for what accepting the current state of salmon systems means for their future.

*“As we lose salmon populations, and as we lose opportunities to fish salmon, it impacts our connectivity with the world around us and really impacts how we can understand and do better and, frankly, our passion to do better. So, it’s quite sad. We’re losing salmon, and our generations aren’t seeing these ecosystems anymore and they’re seeing them in depressed states. And really accepting that that’s how they’re supposed to be and not understanding that this isn’t how it has always been.”*

- Anonymous non-Indigenous expert

### **5.13. Solutions: Nuu-chah-nulth knowledge holders**

Although solutions were not the focus of this research, many knowledge holders offered ideas for a sustainable path towards equitable and positive outcomes for salmon, people, and the environment. The idea themes that emerged were conservation actions, governance, mitigating specific risks, and advancing Nuu-chah-nulth economic income to support stewardship of the *ha-ha-houlthee*. It is important to note that the ideas described here are incomplete in scope and detail, because the research was not designed to explore solutions to salmon declines.

#### **5.13.1. Conservation actions**

Knowledge holders argued for several conservation actions. Two interviewees raised the importance of protected areas for the future of Nuu-chah-nulth salmon and pointed to the Salmon Parks work being carried out in some of the Nuu-chah-nulth Nations, in which the land, freshwater and marine environments that salmon call home will be protected from harm. Three knowledge holders emphasized the need for restoration of salmon watersheds and taking care of rivers in the *ha-ha-houlthee*, not only for salmon but for clean healthy drinking water. One of these interviewees suggested that restoration efforts should prioritise the streams and rivers that were historically most abundant in salmon. One knowledge holder argued that fishing camps should be established in their Nation’s uninhabited reserves, to create a presence that could observe and reduce logging practices. One interviewee explained that the re-introduction of beavers to their *ha-houlthee* would provide more habitat for salmon. One knowledge holder was so concerned about the state of Chinook salmon in their *ha-houlthee* that they urged the need for gene banking.

*“Gene banking, is probably all that’s going to save our salmon, unfortunately.”*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

#### **5.13.2. Governance**

Governance-related ideas to reverse salmon declines in the *ha-ha-houlthee* included increasing Nuu-chah-nulth participation in management of the *ha-ha-houlthee*, a shift to local management, greater management collaboration between Indigenous groups, and advances in data and knowledge for salmon.

Many knowledge holders made the case of Nuuchahnulth leading management of salmon and the *ha-ha-houlthee* in place of current Provincial and Federal governments. Knowledge holders explained that they never relinquished ownership of their territory and so they have the right to steward it as they always have. They explained that they have the answers, they just need money and time to execute them. Some interviewees identified the *Ha'wiih* as the people that should own taking care of salmon and strategically managing the *ha-ha-houlthee* for seven generations. Knowledge holders advocated for getting all decision makers at one table to make decisions locally, not in Victoria or Ottawa. One knowledge holder explained,

*"We should have more say on what happens with those resources at the local level, feeding up to the regional level, and teaching the global level how to do business."*

- Anonymous Huu-ay-aht First Nation knowledge holder

Interviewees argued that Nuuchahnulth Nations should work with other Nations in BC and the USA to understand and learn from broader salmon issues and agree on harvesting access. The idea was raised to allow Nuuchahnulth guardians to play a role in enforcement, because they are present and DFO do not have adequate resources. One knowledge holder argued that Nuuchahnulth Nations should take more direct action to reduce risks to salmon, as they did successfully with herring harvesting.

*"To me...big part of the solution is that First Nations need to do that work. First Nations need to have scientific, traditional, and firsthand knowledge, because we live there. And we need to do that. We need to be a force, we need to take the ball and run with it, run that show. Show DFO, that we can do a better job of management, and that everybody enjoys the benefits of what we do together. I'm beyond fighting with people, I'd rather sit and talk, and talk about solutions and how can we work together to reach a solution. So, we all say nice words, but I prefer action."*

- Andrew Jackson, Tla-o-qui-aht First Nation knowledge holder

Several knowledge holders described the need for Nuuchahnulth knowledge and data to be respected and employed in local management of salmon alongside colonial data and knowledge. One knowledge holder suggested that a Nuuchahnulth data centre, through which Nuuchahnulth scientific data and any data collected within the *ha-ha-houlthee* by other actors would be managed collectively, could act as a powerful tool in resurgence of Nuuchahnulth involvement in the governance and management of the *ha-ha-houlthee*. One interviewee argued that funding should be sourced to increase Nuuchahnulth monitoring and data collection. Two knowledge holders advocated for reporting food and ceremonial fish catches to ensure that other sectors are not overharvesting and to ensure access to food fish in the future. One interviewee explained the need, as the prevailing global system breaks down, for Nuuchahnulth Nations to consistently articulate Nuuchahnulth data and ancestral teachings through a Nuuchahnulth values philosophy to show a route to protecting the *ha-ha-houlthee*.

*“I hope that we see and we understand that we have to change, that we have to listen to science, that we have to listen to traditional knowledge, and we have to listen to people that live in the communities. Whether they’re Aboriginal or not, they live in the area, they have knowledge, they’ve seen the wealth of our ha-houlthee, they have accessed the wealth of our ha-houlthee and now we need to get that wealth back, that health back.”*

-Anonymous Nuchatlaht First Nation knowledge holder

Other governance-related ideas raised by knowledge holders included having a Nuu-chah-nulth management plan containing risks and solutions and updated annually. Another interviewee would like to see COSEWIC (Committee of the Status of Endangered Wildlife in Canada) listing of their salmon. One knowledge holder argued that the court action used to stop herring fishing in the *ha-ha-houlthee* should be used as a strategy to protect Nuu-chah-nulth salmon. Another interviewee argued that tough trade-off decisions need to be made to stop fish harvesting in the *ha-ha-houlthee* when runs are not strong enough.

*“This should be like a living document, something we revisit every year, something that we tune up and tweak and check in, how did we do with fish farms, how we do with forestry, how did we do with BC Hydro, and sort of start monitoring it ourselves rather than relying on others to give us the data.”*

- Anonymous Nuu-chah-nulth knowledge holder

### 5.13.3. Mitigating specific risks

#### *Forestry*

Several solutions relating to forestry were raised by interviewees. One knowledge holder proposed that ecologically incorrect plantations (those planted post-old growth logging) should be logged and replanted with the original mix of ecologically correct tree species. One interviewee suggested Nuu-chah-nulth Nation logging guardians should monitor and enforce forestry practices and build relationships with forestry companies in the *ha-houlthee*, an approach that is currently working for Kyuquot/Checlesheht First Nation. Another interviewee proposed a cessation of forestry to allow the *ha-ha-houlthee* to recover before logging recommences. One knowledge holder argued that wider riparian logging buffers would help protect salmon from climate change.

*“I think they’re [forestry companies] getting a little better in our territories only because now we’re treaty, we actually have people out there looking and, examining their permits and their area, making sure that it’s not encroaching, and yeah it’s taken a while that they’re starting to work with our nations and develop some kind of real relationship.”*

- Tyee Ha’wilt with wee-win-ta-eek (Christina Cox) and Ha’wilt with n’yasim (Samantha Christiansen), Ka:’yu:’k’t’h First Nation

## Enhancement

Three knowledge holders proposed increasing conservation hatchery activities until a better solution to salmon declines is found. One of the interviewees suggested funding the increase in conservation hatchery activities through levies on resource extractors in the *ha-ha-houlthee*. One knowledge holder expressed support for mark-recapture of hatchery fish to reduce harvesting of wild salmon. One interviewee argued that wild Nuu-chah-nulth salmon are essentially lost and so a strategy of enhancement and farming should be pursued to build Nuu-chah-nulth Nations' economies.

*"Hatcheries, I hear some of the concerns brought up about strays and competitiveness, but I have to say this because we have a hatchery and without our hatchery we would have no fish. I can tell you that for a fact. Our hatchery started up because we had less than 50 adults coming back to our river. We had that up to 2000. And due to global warming, we went from 2000 back down to where we started. Less than 50 adults. Well actually, it's not that bad. It's less than 100. But when you...check out the dynamics of the 100 fish, probably 80% to 85% of that was males. It's always that way. So without hatcheries, I can tell you for a fact that that we would not have any salmon in our territory. And as I said about the hatchery differences, well guess what, our hatchery is for stopping extirpation until we can find out a better solution."*

- Anonymous Nuu-chah-nulth knowledge holder

## Fish harvesting

One interviewee suggested a circuit breaker on commercial salmon harvesting, whereby the fishers would be paid not to fish for four years to allow salmon populations to recover. Another knowledge holder drew a parallel to the gradual recovery of herring populations since the cessation of herring fishing. Another knowledge holder proposed an end to the leasing of licenses and quota, with quota only held by people actively fishing and using the quota. One knowledge holder argued that salmon harvesting, particularly Nuu-chah-nulth sockeye fisheries, should be timed to reflect the impacts of climate change. They explained that harvesting should be tempered during the spring, despite prices being higher, to allow returning adults to enter rivers during cooler freshwater conditions. Harvesting could then start once river conditions warm up and salmon are either waiting outside the river until freshwater conditions cool again, or entering the rivers in warmer, less optimal conditions.

*"My more idealistic idea of how it should be [is] if we let the [early] fish in [to the river without harvesting] and then the [later returning] fish that now got trapped [by high temperatures] we can start fishing...they're already going to be dying more and we'll get more [total] fish in the river...rather than we fished all the [early returning] ones that were going to go up the river and the ones [later returning] that we want to go up the river can't and then they're going to be dying now more in the inlets. So that's just the kind of things that we can do that we know is going to have a positive impact."*

Some ideas were shared by knowledge holders seeking to reduce the impact of recreational fishing on Nuu-chah-nulth salmon. Three interviewees argued that recreational license fees should be increased,

and all license fees should be spent only on salmon habitat restoration. One interview suggested that catch limits should be reduced by making them on a per boat basis, while another knowledge holder proposed that a proportion of recreational fish catch should be contributed to Nuu-chah-nulth Nations for food fish. One interviewee argued that high grading in recreational fisheries should be prohibited to prevent it from happening.

*“The bottom line is we all get together...instead of the funds going to the government they need the license fees for the sports fishing to go to a restoration fund...and start getting along instead of pointing fingers at each other. It’s all, ‘The Indians are getting fish, how come we don’t get fish?’. We just got to all get along. Save the fish together.”*

- Paul Sieber, Ditidaht First Nation knowledge holder

The most common solution proposed to combat over-harvesting of Nuu-chah-nulth salmon in the ocean was a move to terminal-only fish harvesting. Knowledge holders explained that this would mean no harvesting of salmon in marine areas of the *ha-ha-houlthee* and no fishing targeting salmon outside the *ha-ha-houlthee* along Nuu-chah-nulth salmon migration routes. Interviewees explained that this would be the only way to overcome the failed management of mixed stock fisheries. One knowledge holder described the traditional use of weirs to control harvesting of returning salmon, which allowed *Nuu-chah-nulth-aht* to target only males.

*“I think we have to really start to manage our harvest into terminal fisheries, not intercepting fisheries. I’m against harvesting from Alaska to Ucluelet unless you’re Nuu-chah-nulth but there are not enough resources today to feed everyone that is hitting the table. I cannot afford to turn around and let 800...licenses fish the West Coast. Unless they come to the terminal area of area 23. And then we could have a proper management plan.”*

- Tom Tatoosh, Hupacasath First Nation knowledge holder

### *Predator control*

Three knowledge holders argued that respectful non-cull approaches to pinniped control are necessary to protect Nuu-chah-nulth salmon populations. They suggested traditional methods of minimal killing of pinnipeds in problems areas, which they explained deters other pinnipeds from predated in that area.

*“I go back to our principles and the responsibilities we have as people. And it’s to maintain a balance, not to over exploit in any one area. So, when we see that, then it’s our responsibility to deal with it but to deal with it in a fashion that’s respectful to the mammal, our ways of life, and our principles.”*

- Anonymous Huu-ay-aht First Nation knowledge holder

## Fish farms

Three knowledge holders proposed different solutions to the threat that open-pen marine fish farms pose to Nuuchahnulth salmon. Proposals included the closure of fish farms, moving production from the marine environment onto land, and dialogue between Nations and fish farm businesses based on respect for Nations' rights aiming for a commitment to zero impact to salmon.

*"We've tried to be part of the process of trying to fix it [fish farming]. But right away, there's a fight. No, you got to go to court. No, we don't. We can sit down, you want to be in our waters, you have to prove that you're not going to be an impact, that you're not going to be a detriment to our resources because they're there because it's pristine. That's why they're there. They can't just go anywhere."*

- Anonymous Nuchatlaht First Nation knowledge holder

### 5.13.4. Economic solutions

Many knowledge holders identified that sustainable income streams would be necessary for Nuuchahnulth Nations to manage their salmon. Ideas to achieve this related to short- and long-term time horizons.

For the short term, three knowledge holders suggested that a fiscal transfer is required from resource extractors to local Nuuchahnulth Nations to support stewardship. Examples were provided for logging and recreational fishing. One interviewee made the case for greater freedom in DFO funding for Nations, whereby the outcome of the funding is not controlled by DFO. One knowledge holder offered several ideas for Nations to create sustainable revenue streams into the future. The interviewee advocated for a long-term plan with a shift towards Nuuchahnulth-owned businesses in existing resource extraction industries with lower harvesting and greater value-added activities in the *ha-ha-houlthee* to create more jobs and income for Nuuchahnulth communities whilst reducing environmental harm. The knowledge holder also suggested potential for new industries, such as kelp farming, which would create habitat for salmon, sequester carbon, and develop Nuuchahnulth economies.

*"It's time now that the forest industry starts becoming good corporate citizens, and creating a stewardship fund...because, we all we all know that forestry is absolutely one of the main impacts [to salmon], besides over harvesting and other things. There's a cumulative effect that happened to our salmon, it's not any one thing. But I think if we can take forestry as a model, not so much a model as good forest management, but a model that we could say, 'Hey, you're going to be operating in our territory, we need some recognition of salmon values, as they're the heart of our people, and all stages of life'. And we need to do the next right thing in terms of repairing what we can from all past logging damages. But more importantly, going forward doing some things that will ensure that the habitat is not facing any more destruction than it already has. While we're doing that, those funds can go towards not only salmon enhancement, but habitat restoration. Because there's a lot of areas that could use a lot of habitat restoration, to fix the homes of our relatives, the salmon."*

- Anonymous Nuuchahnulth knowledge holder



## 5.14. Solutions: non-Indigenous experts

Although solutions were not the focus of this research, many non-Indigenous offered ideas for a sustainable path towards equitable and positive outcomes for salmon, people, and the environment. The themes that emerged were conservation actions, governance, and mitigating specific risks. It is important to note that the ideas described here are incomplete in scope and detail, because the research was not designed to explore solutions to salmon declines.

### 5.14.1. Conservation actions

One expert emphasized the importance of protecting marine and terrestrial salmon habitat as a strategy to prevent Nuu-chah-nulth salmon extinction and to provide cold water refugia that resists the warming effects of climate change. The interviewee provided the example of the Salmon Parks initiative, which is based on the principle of protecting salmon systems to give them the opportunity to heal over a thousand-year timescale. Two experts spoke about restoration, specifically the opportunity to restore salmon systems through collective stewardship by interested groups. One interviewee argued for stewardship of salmon systems involving the role of empowered stewards who would represent salmon's interests in decision making and another emphasized the need for stewardship education for young people in the *ha-ha-houlthee*.

*"90% of the [salmon] productivity...came from 20% of the landscape, right? Try and protect those key places. Maybe on the Gold River where the lakes are here...this is a long term genetic refugium and I'm thinking with waters drying up we need those. So where are those cold places in the future? ...Got to find out the answer."*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### 5.14.2. Governance

#### *Role of Council of Ha'wiih and Nuu-chah-nulth Nations*

Four non-Indigenous experts made the case for Nuu-chah-nulth to resume their role leading the stewardship of the *ha-ha-houlthee*. One interviewee argued that the Council of *Ha'wiih* should set the long-term vision for the *ha-ha-houlthee*, and salmon systems in particular, and oversee new co-governance institutions. Another expert emphasized the leadership role that the Council of *Ha'wiih* has to play in maintaining good neighbourly relationships, and the importance of this for long-term peace and harmony. One expert emphasized the importance of the Council of *Ha'wiih* communicating their vision for salmon systems to local stakeholders.

*“I guess my hopes at the beginning were the Aquatic Management Board. At this point, if I was to be honest with myself and say, ‘Is there anybody out there that has the long vision to do this?’ I would have to say the Council of Ha'wiih, because it's embedded in their principles...that they take a longer view...So to me, the role of the Council of Ha'wiih as leaders, as visionaries for the future cannot be undermined and should actually be encouraged...They should be encouraged to speak out not just on what gets brought to them at the Council meetings...so that they get too caught up in the day to day management crises that take place, but that the Council of Ha'wiih have to maintain the long term vision and the recognition that unless all stakeholders buy in, there will not be success, that you cannot do it alone at this point...The guiding principles that they have that everything is interconnected and respect, that without those being the guiding principles in the process, you will not get the stakeholder buy-in and then you will not get the success that you want...The actual spirit embedded in the community, sense of responsibility and the longevity of ...that level of commitment to the future has to come, I think, at this point from the Council of Ha'wiih.”*

- Anonymous non-Indigenous expert

One expert argued that local management of salmon systems is critical to their future, and that the management and the benefits from salmon should belong to Nuu-chah-nulth Nations.

*“And that's why I firmly believe that we need to stop doing things the way we're doing them. We need to stop and regroup and do things differently and put the benefit back to the [Nuu-chah-nulth] Nations. Whether they are the ones raising the fish through enhancement, they are the ones doing the monitoring, the research, the protection, they're the ones doing the fishing. They are on site, we need to regroup here and put that value back in their hands. And that should be the priority from a humanistic perspective, but also I think anything managed at the local level will be in better hands than something managed from someone in Vancouver or Ottawa.”*

- Anonymous non-Indigenous expert

### *Local co-management*

Many experts argued that a shift in salmon governance to local co-management, in place of national and regional management by Federal and Provincial agencies, is critical to saving Nuu-chah-nulth salmon. Experts reflected on the strengths of the current salmon roundtables and explained that they create accountability and generate good ideas. However, experts also noted that the roundtables are undermined by attendees lacking empowerment to make decisions, a focus on harvesting decisions at the cost of an integrated system perspective, and fundamentally, DFO retaining control over the decisions that are made.

*“Where we need to go in the future is to not repeat what we've been doing. And having had some participation in the, for example, the Area 23 Roundtable, it's not perfect, nothing like that is ever perfect, but it's a vast improvement in terms of how we try to achieve collaboration, we try to build relationships that are celebrated, and that people work together. I think that there's the biggest hindrance there is that it's focused too narrowly on just harvest, is not focused on the entire system, right? Because ecosystems, as I've said earlier, are very complicated, integrated animals, if you like, and I think it takes all of us pulling together to figure out what are the right set of solutions, and we probably won't get it right. But at least if we're doing it together, collaboratively, we have a better chance. And we have a better chance of respecting the knowledge that comes from a variety of different areas. So, I think that is a path forward. I think that getting people together and co-managing the solutions is the future. And if we don't get there, well, I don't think there's a future for salmon, to be honest. Because I've seen what the last 100 years of managing in silos has achieved. It's not good. So, we need to change things.”*

- Anonymous non-Indigenous expert

Two interviewees described the need to take advantage of the policy environment becoming more conducive to new local management institutions. One expert explained that the updated Fisheries Act provides for power and decision making at the local level, and another that the Provincial government is pursuing a policy of local planning processes. One interviewee argued that TFLs (Tree Farm Licenses) should be replaced with local management.

*“So I'd be very curious to hear what the Tribal Council's thoughts are on this [land use planning]. But just from experience in forestry, there's been a major shift in forestry right now. Our mandate that they just rolled out in April is that we have long-term...co-management with First Nations... So my recommendation to this Tribal Council would be to...merge the marine spatial planning that we've all worked so hard on, with the current land use terrestrial planning that we have, and take that maybe within their territory, or maybe within a larger region and use that as the base for your planning tool...I remember one of the Huu-ay-aht Chiefs saying that within their territory, they would like to see forestry done differently, where the AC [allowable cut] would be cut in half, and then they would be growing trees bigger before harvest. So they'd be managing for value and log size, rather than volume and harvesting things smaller, and having trees on the land base longer than what they have right now. Things like that, at the local level. I think if they go down that route, and I would take advantage of the new change in forestry direction now.”*

- Anonymous non-Indigenous expert

Experts set out several facets that local co-management of salmon systems in the *ha-ha-houlthee* should have. One interviewee argued that local co-management should reflect Nuu-chah-nulth values and principles. Many interviewees suggested that the future of salmon governance in the *ha-ha-houlthee* needs to be holistic, full-system in scope, with power ceded from government to local actors. Experts highlighted the need for equal power amongst stake and rights holders, consideration and definition of equity and equitable outcomes, individuals investing in relationships across groups, agreements and

targets, and accountability, local oversight and enforcement, different solutions for different areas of the *ha-ha-houlthee*, and local planning. One interviewee suggested that this research could act as a catalyst for co-management conservations.

*“If you don't have fairness in the system, if one group isn't treated fairly and respectfully, it still starts to fall apart...I think it has to be done right. I think defining fair, and that's where it comes into that perspective about what is fair, would likely be the most difficult part.”*

- Anonymous non-Indigenous expert

### *Data and monitoring*

Interviewees raised potential solutions relating to data and monitoring. One expert focused on the role that commercial fishers have played in the past and can play in the future collecting data on salmon. Another interviewee emphasized the importance of recognizing when decision makers have insufficient data and using agile monitoring of salmon returns to make adaptive co-management decisions.

*“The fish have to come first. We have to establish ways of knowing...how robust the return is, and then having systems in place to manage or mitigate against not having the right amount of information...Because you don't always have all the information that you think you need to make good decisions.”*

- Anonymous non-Indigenous expert

### **5.14.3. Mitigating specific risks**

#### *Forestry*

One expert suggested that after an area has been logged all logging roads that can be replanted should be replanted.

*“Here's something you could do on the coast...make it mandatory that wherever you can rehab a road and replant, do that. And then you'll have more carbon captured because you won't have these roads lying around with nothing on them until 10-15 years down the road, it grows alder. But the alder is younger and a different species than the forest growing beside it, right? So you have a uniform forest growing...Don't worry about your permanent access structure limits, throw that out the window. If you can do it, you should do it. If you can rehab a site afterwards, you don't need it to go ahead for hunting or for whatever, for continual development, if it's a dead-end road de-build and plant it if you can. So that's a gap in the system right now...just tell the foresters who are prescribing if you don't need that road, and you can save the soil, put it back.”*

- Anonymous non-Indigenous expert

## Enhancement

One expert emphasized the risk that climate change poses to salmon in the future, and the need to adapt. They suggested that enhancement can act as a climate adaptation, because breeding takes place in temperature-controlled conditions.

*“Hatcheries are actually a tool to offset the effects of climate and temperature [change]... You can control the water temperature in a variety of different ways using a variety of different technologies where you can actually produce those fish in an ideal situation temperature-wise that mitigates against that [freshwater warming]... People don't like hatcheries, but that's one of the things that hatcheries can do for you... It's scary stuff, because people that love salmon and depend on salmon have to be thinking about things that are going to happen 50 years from now, long after I'm dead. Because if you want salmon to be around, and we keep doing what we're doing to pollute the planet, salmon can't live in that kind of environment. So we're gonna have to think long-term and start having some honest conversations around, what are some of the technological tools, if you want to mitigate, that you can bring to the table.”*

- Anonymous non-Indigenous expert

## Fish harvesting

Several non-Indigenous experts suggested solutions to commercial and recreational fish harvesting risks to salmon. Two interviewees suggested ideas to change the management of recreational fishing. One expert argued that guided recreational fishing should be licensed differently to non-guided fishing, and one mentioned increasing the recreational fishing license fee. Three experts called for a moratorium on all fish harvesting, arguing that it is the easiest way to directly and quickly reduce pressure on Nuu-chah-nulth salmon. However, an expert from the recreational fishing sector argued that a moratorium would not affect the number of salmon returning. Four experts made the call for a move from intercept to terminal-only salmon fisheries to remove the issues associated with mixed sock fisheries. Two non-Indigenous experts emphasized the terminal fishing solution by describing how terminal fish weir harvesting was successfully used by Nuu-chah-nulth Nations to selectively and sustainably harvest salmon for millennia. One expert suggested that for a period when each salmon return run commences, a fishing closure would allow a proportion of the returning spawners to reach their spawning grounds in optimum conditions, although the expert acknowledged that the beginning of the run is when the salmon are in the best condition and therefore command the highest prices. Some interviewees advocated for mark-selective fisheries, whereby hatchery fish have a fin clipped so that harvesters only retain enhanced salmon and release wild salmon. However, other experts highlighted challenges of the mark-selective approach, including wild salmon release mortalities, the non-applicability to net gears, and the cost and practicalities of fin clipping all hatchery fish.

*“Historical First Nations river fishing, like weir fish fences to count fish...So the fish come to your fence, into your trap, and you can count them and say, ‘Okay, I’m gonna have a 10% harvest rate. So we’ll keep this one male, we’ll put nine including all the females over the fence’....And you’ve still got your fish and you can precisely control it.”*

- Roger Dunlop, non-Indigenous expert, Resource Manager - Nuchatlaht First Nation

### *Predator control, fish farms, and freshwater management*

Single experts advocated for pinniped predator controls, fish farms as an alternative to fish harvesting to protect wild salmon and working with BC Hydro to manage freshwater for salmon.

*“So in the Alberni Valley, BC Hydro isn’t managing necessarily the water and control of water for salmon’s sole benefit...That’s number one priority that needs to change.”*

- Anonymous non-Indigenous expert



# IMPLICATIONS & RECOMMENDATIONS

## 6. Implications and recommendations

Nuu-chah-nulth knowledge holders described an accumulation of degradation to Nuu-chah-nulth salmon over time and space to the point where once abundant individual river and stream populations are heavily diminished, and in some cases extinct. Furthermore, knowledge holders explained that salmon, notably Chinook, are returning smaller (less heavy), with proportionally fewer females that carry fewer eggs. Nuu-chah-nulth knowledge holders and non-Indigenous experts described a wide variety of threats to Nuu-chah-nulth salmon and connected harm to people.

Knowledge holders emphasized that colonial greed, individualism, and governance have driven and facilitated human activities for over a century that have eroded the status of Nuu-chah-nulth salmon. Threats described varied by Nuu-chah-nulth Nation and the pathway by which they cause harm to salmon. Participants explained that many threats remain active. For example, interviewees noted that long established threats, such as logging, continue under insufficient policies designed to reduce their impact to salmon. As established threats have been somewhat moderated through policy, newer threats, notably climate change, have emerged. Examples of climate change amplifying the harm of other established threats were also highlighted. The decline in Nuu-chah-nulth salmon populations has caused harm to Nuu-chah-nulth communities in a myriad of ways fundamental to Nuu-chah-nulth society. Nuu-chah-nulth communities have been impacted by salmon declines through their way of life, food security, health, livelihoods, individual connections to salmon, family and community connections, and loss of home, peace, and wealth.

Using a decolonized approach to understanding risks to salmon has de-colonized the problem space and opened a wider solution space. If a healthy, prosperous, and sustainable *ha-ha-houlthee* for salmon, and people is to be realized, solutions cannot be limited to incremental changes to the colonial status quo. The role of colonial greed and governance at the core of harm to Nuu-chah-nulth salmon and people means that changes must be more ambitious, must focus on how decisions are made, and who makes them, and centre Nuu-chah-nulth values and laws.

### ***Differences in perspectives***

Differences emerged in perspectives on risks from knowledge holders and non-Indigenous experts, and within the sample of non-Indigenous experts. Many knowledge holders identified aspects of colonial greed and individualism as the root cause of salmon declines, but this was echoed by only three non-Indigenous experts. Knowledge holders identified several ways in which colonial governance threatens salmon and some of these were also highlighted by non-Indigenous experts. The human activities identified as risks to salmon were similar between Nuu-chah-nulth knowledge holders and non-Indigenous experts, possibly because many non-Indigenous experts who participated actively collaborate with Nuu-chah-nulth Nations to some degree. However, non-Indigenous expert respondents who were closely connected to the logging and recreational fishing industries perceived the risk from these activities as lower compared to other non-Indigenous experts and Nuu-chah-nulth knowledge holders. Nonetheless, the research also revealed that there may be potential for Nuu-chah-nulth and industry sectors to collaborate to address common concerns about governance risks to salmon that can only be revealed through greater dialogue. For example, the research suggested that the recreational fishing sector and Nuu-chah-nulth knowledge holders recognise the need to change governance of



recreational catch reporting, highlighting the opportunity for collaboration in the pursuit of policy change.

### ***Mitigating western colonial greed and governance risks to salmon***

The view expressed by many Nuu-chah-nulth knowledge holders was that although harm to salmon is caused proximately by local activities and climate change, these threats flow from colonial greed and governance. There is an imperative to mitigate the role played by colonial greed and governance in the decline of Nuu-chah-nulth salmon populations by elevating and including Nuu-chah-nulth values and laws in salmon governance. This research suggests that achieving Nuu-chah-nulth leadership in the governance of marine and territorial salmon ecosystems would require a transformation to post-colonial governance.

The need to transform to post-colonial local co-governance in which settler and Indigenous peoples share power in decision making is increasingly recognised. The National Advisory Panel on Marine Protected Area Standards stated in a 2018 report that “The government recognizes the importance of Indigenous peoples’ roles as full partners in all aspects of design, management, and decision-making around marine protected areas.” (Bujold et al., 2018). Incremental progress is being made towards joint decision making through co-governance in BC. For example, the application of a provincial statutory decision-making framework, as set out in Section 7 of DRIPA, was used for the first time between BC and the Tahltan Central Government in 2022. Nuu-chah-nulth leadership in local co-governance goes beyond co-management (for example, the West Coast Vancouver Island Salmon Roundtables) and offers potential for Nuu-chah-nulth Nations’ values, laws, and worldview to inform approaches to research, data collection and use, land and development planning, and decision-making processes, legislation, regulations, and policies.

Transforming governance of the *ha-ha-houlthee* from a centralized regional and national power-centred model to a system based on Nuu-chah-nulth leadership could help mitigate the risk of colonial greed and seven governance risks to salmon identified through this research:

- 1. Colonialism in governance and exclusion of Nuu-chah-nulth knowledge:** This research found that colonialism in salmon governance threatens salmon by excluding Nuu-chah-nulth voices and knowledge. Nuu-chah-nulth Nations’ meaningful participation in local salmon system governance would reduce risk to salmon by ensuring the equal treatment and use of western and Nuu-chah-nulth knowledge and worldviews in decisions affecting salmon ecosystems. Furthermore, co-governance would advance Nuu-chah-nulth influence over the salmon research agenda.
- 2. Centralized decision making:** Knowledge holders highlighted that salmon outcomes are poorer because power is centralized in regional and national centres where civil servants and politicians pursue broadscale socio-economic-political agendas. Local co-governance would partially mitigate this centralization risk by sharing decision-making power with *Nuu-chah-nulth-aht*, who live in, steward, and depend on local salmon systems. Co-governance could see individual Nuu-chah-nulth Nations, or groups of Nations, working alongside the provincial and federal governments to set policy and management plans and make decisions relating to human activities and development at a local scale. However, because Nuu-chah-nulth salmon lifecycles cover a broader spatial scale, decentralized local governance systems would need to interface with each other and with governance institutions at provincial and international scales to be effective (see point 5 below).

3. **Insufficient and inaccurate knowledge, data, and monitoring:** Local governance systems could be grounded in place-based knowledge and expertise held by Nuu-chah-nulth and local non-Indigenous experts. Using local expertise to allocate resources and employing people with local knowledge in data collection and monitoring (e.g., through guardian programs), local governance could mitigate the risk that ill-informed decisions are made based on inaccurate and insufficient knowledge, data, and monitoring.
4. **Failure of adaptive management:** Participants revealed the risk posed to salmon by the failure of colonial governance to adapt fisheries management decisions to new data and past lessons learned. Local co-governance would not inherently address this risk but could partially mitigate it by increasing the proximity of decision makers to salmon systems. However, to realize these benefits, new fisheries co-governance systems would need to be designed to be adaptive and agile, both in terms of short-term decision making and long-term policy making.
5. **Jurisdictional silos:** Nuu-chah-nulth salmon exist within many jurisdictions throughout their lifecycle, including Nuu-chah-nulth Nations, DFO, the Province of BC, and the USA. The threat to salmon from colonial siloed jurisdictional governance, whereby different governments or government agencies are responsible for salmon in different spaces (e.g., marine vs freshwater, Canada vs USA), could in part be addressed by local co-governance systems. Local co-governance would need to be designed based on the worldview of *hishuk-ish tsawak*, whereby the inter-connections between institutions are recognized and managed effectively. Holistic local co-governance could mitigate the risk of governance silos between DFO and the Province of BC for watersheds. However, addressing jurisdictional silos in the marine environment would necessitate new governance structures that connect all Nuu-chah-nulth Nation local co-governance structures with governance institutions for the high seas, BC's central coast, and the USA.
6. **Lack of transparency and accountability:** Nuu-chah-nulth Nations' participation in salmon co-governance would implicitly diminish transparency and accountability risks to salmon from a Nuu-chah-nulth perspective. Through an equal role in salmon governance, Nuu-chah-nulth Nations would be at the table making management decisions, including those affecting research, monitoring, and resource use.
7. **Insufficient enforcement:** This research identified insufficient enforcement of resource extraction activities as a risk to Nuu-chah-nulth salmon. Local co-governance, backed by sustainable funding for Nations, could mitigate the enforcement risk by giving Nuu-chah-nulth power to expand guardian programs, which are already active in monitoring, educating, observing, collecting data, performing research, protecting, and enforcing in some Nations.

### ***Recognizing connections between threats to salmon***

We found that Nuu-chah-nulth salmon face many threats from human activities and climate change at different scales. The threats exist at each stage of the salmon lifecycle, which crosses local, regional, and international jurisdictions. At a local level, where salmon spawn, rear, and spend portions of their early and late adult life, human activities in the *ha-ha-houlthee* influence salmon mortalities directly (e.g., fish harvesting and through legal protection of pinnipeds) and by degrading salmon habitat in freshwater, estuarine, and marine environments.

Cumulative harm to salmon varies throughout the *ha-ha-houlthee*. Areas of the *ha-ha-houlthee* that have seen higher levels of development face a greater number and accululation of threats. For example, salmon populations in the Alberni Valley have been depleted over time by logging, dams, residential

development, municipal pollution, industrial pollution, and commercial and recreational fish harvesting. Conversely, in the areas of the *ha-ha-houlthee* around Nootka Sound, comparatively less urban development has occurred, but salmon populations have been harmed by logging, road building, and commercial and recreational fish harvesting. Although a small number of watersheds were described as pristine in terms of an absence of logging, salmon that call those watersheds home are exposed to threats at regional and global scales, for example fish harvesting (regional and international) and climate change (global).

The level of control that Nuu-chah-nulth Nations and local stakeholders have to mitigate risks to salmon varies by scale. *Nuu-chah-nulth-aht* have little control over the mitigation of climate change. Even after global net zero emissions are achieved, salmon will feel the effects of elevated atmospheric carbon dioxide concentrations long into the future. Further risks to salmon from climate change are therefore inevitable. At the international level, reductions in Alaskan commercial harvest of salmon would require favourable renegotiation of the Pacific Salmon Treaty, which is due for renewal in 2028. A negotiated reduction in US catch of salmon may require a reduction in Canadian catch of US salmon, which Nuu-chah-nulth Nations may be able to influence through political channels. Given that Nations have little control over climate change and international fishing pressure, their efforts to influence salmon recovery may have to focus on minimizing threats that are under local control in the *ha-ha-houlthee*. Decisions made to allow activities that threaten salmon must factor in the harm to salmon from other risks outside local control.

Harm to Nuu-chah-nulth salmon has accumulated over time from a wide range of human activities since colonial contact. Salmon systems have been altered in many ways, and salmon no longer have the healthy home they once did. For salmon, harm from the past does not remain in the past, it ripples through time and lives in present depleted populations. Cumulative effects on salmon over time therefore mean that decisions in the present must reflect the current state of salmon systems relative to pre-colonial baselines. Nuu-chah-nulth salmon are more vulnerable due to lower abundance and reduced genetic diversity. Minor perturbations are likely to cause greater harm than they would have done were the *ha-ha-houlthee* in a healthier state. If salmon are to recover, a vision of the desired future states of salmon ecosystems is necessary to inform decisions about managing the risk from ongoing and new activities, for example the extent and type of activities and the degree of protection afforded to ecosystems. Reflecting *hishuk-ish tsawak* (everything is connected), decisions about activities that pose a threat to salmon in the *ha-ha-houlthee* should be connected and made together, because there is a limit to the total sum of harm that remaining Nuu-chah-nulth salmon populations can absorb and survive.

### ***Harm to salmon is harm to people***

Nuu-chah-nulth knowledge holders highlighted several ways in which Nuu-chah-nulth people have been harmed by salmon declines. Nuu-chah-nulth communities have suffered losses fundamental to their wellbeing, including to food security, health, livelihoods, identity, social processes, and family and community connectedness. Non-Indigenous experts identified lost commercial fishing livelihoods as the main impact of salmon declines to non-Indigenous people. This research demonstrates that harm to salmon is harm to people and that salmon recovery cannot un-do the historic inequitable impacts to *Nuu-chah-nulth-aht*. If salmon populations recover to healthy states of abundance, decisions will be

required that advance socio-economic and cultural recovery, including ensuring that the multi-faceted benefits of abundant salmon flow to *Nuu-chah-nulth-aht*.

A sustainable future for the *ha-ha-houlthee* must be built on a foundation of equitable outcomes for Nuu-chah-nulth Nations. Many non-Indigenous groups have profited from extractive activities in the *ha-ha-houlthee* over centuries, often without benefit to Nuu-chah-nulth Nations and with direct harm to Nuu-chah-nulth communities. Equitable outcomes require equitable governance in terms of recognition and procedure. The breadth and depth of impacts on local communities from salmon declines highlighted in this report emphasize the importance of including Nuu-chah-nulth values and worldview to look beyond short-term colonial economic and political interests to long-term sustainability involving recovery for salmon and people. Equitable outcomes for Nuu-chah-nulth Nations are only possible through the meaningful inclusion of Nuu-chah-nulth Nations in co-governance policy making, planning, and decision-making.

### ***Concluding thoughts: a thriving future for communities and salmon***

Identifying risks to salmon and harm to communities from salmon declines is but one small contribution to supporting Nuu-chah-nulth Nations in taking care of salmon. Stewardship of the *ha-ha-houlthee* is a complex process, which includes wider considerations of community wellbeing in a complex social context of competing and changing social interests made more challenging by extensive cumulative harm to salmon systems and Nuu-chah-nulth communities from colonial policies and management. This research has demonstrated the strength and clarity of Nuu-chah-nulth voices and knowledge in identifying the complexity and interconnections of threats to salmon and people.

In conclusion, this research suggests that the colonial mandate of resource exploitation that persists in the *ha-ha-houlthee* today is running out of road for salmon, ecosystems, and people. We do not provide an answer to the thorny question of how positive socio-economic outcomes for Nuu-chah-nulth communities can be built alongside Nuu-chah-nulth salmon recovery, but we do highlight that the challenge facing Nuu-chah-nulth Nations is how to build a thriving future when the health of the *ha-ha-houlthee* has been diminished by extraction and degradation for the benefit of others. Our hope is that this research uplifts the diverse knowledge and wisdom of this place and points to the cross-cutting challenges but also opportunities for holistic positive change.



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