The Beauty Underneath:

Revitalizing Indigenous Shellfish Harvest in Semiahmoo Bay

By

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DipT., British Columbia Institute of Technology, 2002

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Abstract

North American coastal Indigenous communities have feasted from the tidelands since time immemorial. Abundant clams, oysters, mussels, seaweed and other marine resources provided seasonal sustenance, opportunity for communities to gather, to share intergenerational knowledge, ceremony, language and cultural values. Since settler contact, land development, pollution and overharvest have diminished native oyster populations and contaminated clams and other marine resources. Current colonial coastal governance has responded with blanket shellfish harvest closures along much of the British Columbia coastline, walking away from the problem, and focusing attention on areas important for commercial harvest.

This participatory action research focuses on the transboundary waters of Boundary Bay (Steloqwen in SENĆOŦEN), home of the Semiahmoo First Nation people. This place-based study reveals pathways towards revitalizing Indigenous shellfish harvest on the Canadian side of Steloqwen, through complex social-ecological system analysis and Indigenous resurgence and storytelling. While there are potential future economic benefits to Semiahmoo First Nation through the re-opening of shellfish harvesting beds, Semiahmoo are primarily interested in revitalizing their traditional practices of being out on the land, digging for clams, having opportunity for elders to share with young people about culture and language and connection to the bay. They want to restore reciprocal relationships that have been lost through contaminated waters and unjust governance.

Through a literature review, jurisdictional interviews and Indigenous storytelling workshops, key barriers and opportunities were identified and discussed to reveal a pathway towards revitalizing shellfish harvest in Steloqwen. Firstly, jurisdictional roles and responsibilities related to coastal ecosystem management need to be clarified and re-defined to close existing governance gaps and to be aligned with Indigenous values. Secondly, pollution sources must be identified and controlled, which requires both a consistent, coordinated, and well-communicated monitoring plan as well as a collaborative approach to addressing the variety of potential pollution sources. And thirdly, Semiahmoo First Nation capacity must be bolstered to provide a leadership role in collaborative efforts.

All three of these key barriers can be addressed by taking a two-eyed seeing approach, weaving systems analysis and Semiahmoo Indigenous teachings to reveal innovative solutions. In conclusion, this will involve: 1) ȻEN,TOEL, jurisdictional alignment to allow for Indigenous led collaborative watershed remediation, 2) ĆEĆINES, Indigenous led watershed governance with teeth to hold jurisdictions accountable, and 3) XĆETSW̱, Indigenous led collaborative process of looking over, measuring, figuring out and deciding where the pollution sources are and how best to address them. All of these solutions rely on Indigenous capacity to provide leadership and uphold their rights of sovereignty and self-determination.

To operationalize this research, Semiahmoo First Nation must be acknowledged and supported as leaders with the capacity and authority to carry out governance in their territory, influencing land and water management on a watershed scale. Short, medium and long-term steps are recommended to achieve the vision of revitalized shellfish harvest and a healthy bay ecosystem.

Keywords: critical coastal governance; Indigenous resurgence; shellfish; social-ecological systems; participatory action; arts-based engagement

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Lastly, I am grateful to the Creator who sustains all things in love and faithfulness and patience. May you be glorified in this work of restoration and Reconciliation.

Dedication

For my children and grandchildren, the next generation of clam harvesters.

Chapter 1: Introduction

"Everyone who looks over at the bay sees beauty,
but does not see that the beauty underneath is marred and imperfect,"

Late Semiahmoo Nation Grand Chief Bernard Charles (quoted in Norman, 2009, p.1)

North American coastal Indigenous communities have feasted from the tidelands since time immemorial. Abundant clams, oysters, mussels, seaweed and other marine resources provided seasonal sustenance, opportunity for communities to gather, to share intergenerational knowledge, ceremony, language and cultural values. Since settler contact, land development, pollution and overharvest have diminished native oyster populations and contaminated clams and other marine resources. Due to concerns about risks to human health, the Canadian government has prohibited the harvest of clams along much of the British Columbia coastline. This thesis explores pathways towards revitalizing Indigenous shellfish harvest, addressing the overlapping problems of food insecurity, watershed degradation and Indigenous disempowerment, as a place-based study within the context of Steloqwen/Boundary Bay, British Columbia.

Joanne Charles, Semiahmoo First Nation Councillor and granddaughter of the late Grand Chief Bernard Charles quoted above, told me the story about a day in 1996. Some of their community members were out on the beach harvesting clams when federal fisheries officers approached, confiscated their clams and arrested two men, charging them for harvesting in a closed area. On the same day, their Lummi relatives south of the Canada/United States border were harvesting clams legally on the other side of the bay, connected by shared waters, but under different governance frameworks. Over the past thirty years, the American side of the Salish Sea has upgraded or re-opened over 6400 acres of shellfish harvest areas and conditions continue to improve, whereas on the Canadian side, conditions are deteriorating, with more and more tidelands becoming closed to shellfish harvest. Closed areas have increased by 44% over the past 35 years on the Canadian side of the Salish Sea (USEPA, 2022). Canadian governments have largely walked away from the problem of contaminated clam beds, while Indigenous communities continue to be disconnected from this important source of food, and the coastal waters clams are found in, central to their culture, community, and spirituality.

This participatory action research focuses on the transboundary waters of Boundary Bay (Steloqwen in SENĆOŦEN), home of the Semiahmoo First Nation people. This place-based study reveals pathways towards revitalizing Indigenous shellfish harvest on the Canadian side of Steloqwen, through complex social-ecological system analysis and Indigenous resurgence and storytelling. While there are potential economic benefits to Semiahmoo First Nation through the re-opening of shellfish harvesting beds in Steloqwen, that is not what is driving the activities of those engaged. Semiahmoo are primarily interested in revitalizing their traditional practices of being out on the land, digging for clams, having opportunity for elders to share with young

people about culture and language and connection to the bay. They want to restore reciprocal relationships that have been lost through contaminated waters and unjust governance.

Problem

Coastal Indigenous communities, including Semiahmoo First Nation, are disconnected from their traditional food source of bivalve shellfish. The socio-ecological system surrounding shellfish management is complex, involving a large number of interacting variables and jurisdictional responsibilities. From Semiahmoo First Nation's perspective, as their community members move through this complex system, they encounter a river and bay with degraded water quality, and they are constrained by federal legislation that prohibits harvest of one of their main traditional food sources: shellfish. This situation is intolerable for Semiahmoo; not only is it a food security issue, but it also disconnects them from their cultural and spiritual practices of receiving sustenance from the bay. For Semiahmoo First Nation, this is about who they are, not just what they can or can't eat.

> *"When the tide goes out, the table is set is a core teaching. For Semiahmoo, the tide goes out two times a day and we're still starving. (From the ability) to practice, to participate, to be part of that beautiful system that we are unable to be part of. We talk of the four aspects of our being: mental, emotional, spiritual and physical. And without acknowledging and exercising each aspect of our being, we're crippled in a way. We only have half of the spiritual part of our being. We're intergenerationally disconnected from practice, which in turn develops an unknown emptiness."*
>
> Harley Chappell, Semiahmoo First Nation elected Chief

Shellfish harvest is prohibited due to contaminated waters resulting from colonial land use practices and a lack of priority placed on coastal remediation. This disconnection to shellfish has resulted in a loss of cultural and spiritual practice, a loss of intergenerational teaching, a loss of connection between community members because they aren't gathering food together and feasting together, and a loss of healthy food. This collective loss threatens Semiahmoo as a people.

Purpose

This study aims to amplify Semiahmah community voices and reveal actionable outcomes that move towards transformative governance and restoration of a healthy bay ecosystem, offering pathways towards revitalization of shellfish harvest in tsepoleq/Semiahmoo Bay. This process includes the deconstruction of colonial mindsets, starting with my own and expanding to decision-makers at all levels of government, so that there would be a collective pursuit of flourishing for waterways, winged ones, shelled ones: all of creation, including humans. The research takes a collaborative and community-engaged approach (Etmanski et al., 2014; Hall and Tandon, 2017; Levac et al., 2020), building from my relationships with Semiahmah community members, to seek clarity and innovative solutions. The complexity of the problem is examined, and the application of Indigenous stories and traditional practices is

explored, to address the overlapping problems of food insecurity, watershed degradation and Indigenous disempowerment among Semiahmoo First Nation community members in the Steloqwen watershed.

Complex problems such as this require creative and collaborative approaches (Etmanski et al, 2022; Bradbury et al., 2019; Levac et al., 2020). Participatory action research promotes relational, co-learning, creating shared knowledge gained through experience that leads to real change. Following a participatory, community-engaged research approach, research questions were developed in collaboration with Semiahmoo First Nation leadership. The goal is to centre relationships and benefits to Semiahmah community members, following Indigenous research methodologies (Gaudry, 2011; Kovach, 2009; Wilson, 2014). Western science and Indigenous traditional knowledge will be interwoven like a braid, using a "two-eyed seeing approach" (Reid et al., 2021). Care must be taken to critically reflect on power dynamics and guiding principles, to maintain open communication, to build trust, and to be honest about the challenges (Bartels and Friedman, 2022).

Research questions

1. How is shellfish harvest governed in Steloqwen/Boundary Bay? What are the jurisdictional and interjurisdictional responsibilities within this governance framework? Why is the United Nations Declaration on the Rights for Indigenous Peoples (UNDRIP) important in this context?
2. In what ways do traditional stories and practices of Semiahmoo First Nation presently inform shellfish management practices and policy in Steloqwen and how could this process be improved?
3. How can the existing shellfish management system be changed to support pathways towards revitalizing Semiahmoo First Nation shellfish harvest?

Background

Semiahmoo People and Place

Boundary Bay/Steloqwen has been home to Semiahmah people since the last great flood, approximately 10,000 years ago (H. Chappell in Henry, 2021). They are Lhaq'temish, survivors of the great flood. Semiahmoo means "lowering to feed" indicating Semiahmoo First Nation's dependence on the wide stretching tidal flats for food resources (H. Chappell, personal communication, April 6, 2018). Semiahmoo is the name of the place and Semiahmah is the name of the people, such is their deep connection to place. Semiahmah know the Coast Salish teaching well:

> *"When the tide is out, the table is set."*
>
> H. Chappell, personal communication, March 15, 2021

This indicates their reliance on marine resources, particularly shellfish, for sustenance. Steloqwen has always been rich in resources, providing an abundance of salmon (SĆÁNEW̱), bivalves (DEL,*T*ELO), urchins and eelgrass.

Steloqwen, along with the Fraser River estuary is recognized provincially as a Wildlife Management Area, nationally as a Key Biodiversity Area and Internationally as a Ramsar Wetland of International Importance due to its rich habitats and biodiversity. Steloqwen is located within the Salish Sea ecoregion, a transboundary watershed that encompasses both British Columbia and Washington waterways (**Figure 1**).

Figure 1. Map of the Salish Sea ecoregion and Steloqwen/Boundary Bay.
Source: Thompson, S. (2010, July 14). Salish Sea to be inaugurated in ceremony on Vancouver Island. The Georgia Straight. https://www.straight.com/article-334282/vancouver/salish-sea-be-inaugurated-ceremony-vancouver-island.

Semiahmoo First Nation is a small Indigenous community with a population of 100 on reserve, located near the mouth of the TA'TALU/Little Campbell River (personal communication, Elected Chief Harley Chappell, 2021). They were separated from their relatives, the Lummi and Nooksack Tribes when the Canada/US border was established, and the federal reserve system was put in place (Norman, 2009). All of these and other Coast Salish communities have relied on the waters of Steloqwen for thousands of years as a primary source of food (Norman, 2009).

Shellfish and Shellfish Management in Steloqwen/Boundary Bay

Bivalve shellfish in Steloqwen include the following species: butter clam (*Saxidomus gigantea*), horse clam (*Tresus capax*), geoduck clam (*Panopea genoerosa*), littleneck clam (*Protothaca stamineais*), Manila clam (*Venerupis philippinarum*), varnish clam (*Nuttallia obscurata*), blue mussel (*Mytilus edulis*), Olympia oyster (*Ostrea conchaphila*) and Pacific oyster (*Crassostrea gigas*). Coast Salish communities, including Semiahmoo, have relied on these waters for centuries for their food security.

Figure 2. Image showing Coast Salish traditional clam harvest methods.
Source: Stewart, H. (1984). *Cedar: Tree of Life to the Northwest Coast Indians*. Douglas & McIntyre Ltd. https://canadacommons-ca.ezproxy.library.uvic.ca/artifacts/1873817/cedar/2622884/view/

Historically, the native Olympia Oyster thrived in Steloqwen, an important source of food for Semiahmoo First Nation; however, with the arrival of settlers these small, slow-growing oysters were overharvested to near extinction (Kay, 1976). In the early 1900s, Atlantic and then Pacific Oysters imported from Japan were introduced to Steloqwen for commercial harvesting purposes and were very productive, contributing to over 60% of British Columbia's commercial oyster harvest (Kay, 1976).

The Canadian side of Steloqwen: tsepoleq/Semiahmoo Bay and Mud Bay, have been closed to bivalve harvest since 1962 due to contaminated waters (Kay, 1976). This prohibition has disconnected coastal Indigenous communities from their traditional food sources and cultural practices for two generations (Norman, 2015). Contaminants include heavy metals, pesticides, pharmaceuticals and elevated fecal coliform bacteria resulting from government authorized sources: agricultural runoff, failing septic systems, urban stormwater, sanitary sewer cross-connections, sanitary pump station overflows, in addition to pet waste and wildlife (CSSP, 2019; Zevit et al., 2008; Sandborn et al., 2023a; Bull, 2010).

The American side of Steloqwen is known as Drayton Harbor and also has a long history of tribal, recreational and commercial shellfish production. After a complete prohibition in 1999 due to contaminated waters, Whatcom County established a Shellfish Protection District according to Washington State legislation (Water Rights—Environment, 90.72 Shellfish Protection Districts, 2008) and the community galvanized through leadership of the Drayton Harbor Community Oyster Farm to collaboratively address pollution sources and engage the community in oyster farming (Peabody, 2018). Through collaborative efforts within a State-funded and legislated framework, remediation and monitoring work is ongoing has resulted in

over 800 acres of shellfish harvest growing area to be re-classified as fully approved for year-round recreational, commercial and Indigenous harvest of clams, mussels and oysters.

On the Canadian side of Steloqwen, the Canadian Shellfish Sanitation Program (CSSP) holds responsibility to manage and oversee shellfish harvest. The CSSP is created by a Memorandum of Understanding between three federal agencies: Fisheries and Oceans Canada, Environment and Climate Change Canada and the Canadian Food Inspection Agency with the goal to "provide reasonable assurance that molluscan shellfish are safe for consumption as food by controlling the harvesting of all molluscs within the tidal waters of Canada" (CFIA et al., 2000, p.135). Within the context of multiple, co-existing, inter-related crises including biodiversity loss, climate change, salmon fishery declines and urban development pressures, there are multiple competing priorities facing federal agencies (DFO, 2021; ECCC, 2021; CFIA, 2021a). Under current colonial governance frameworks, the CSSP does not have a mandate to restore shellfish harvest areas once they have been closed due to contamination.

The BC Ministry of Environment and Climate Change Strategy is responsible for the effective protection, management and conservation of freshwater in BC (MECCS, n.d.). Provincial water quality objectives for Steloqwen and streams flowing into the bay, were set to achieve guidelines for aquatic life and recreational use, but do not include the more stringent guidelines for harvesting shellfish (Swain, 1988). Shellfish have not been a provincial consideration because shellfish are located within coastal waters, outside of provincial jurisdiction.

Land Use in the Steloqwen Watershed

Current land use surrounding Steloqwen is largely rural/agricultural, with rapidly expanding and densifying urban development closer to the bay: Municipalities of White Rock, Surrey, Delta and Langley on the Canadian side and Whatcom County and City of Blaine on the American side (**Figure 3**). As population increases in these areas, hardscape or imperviousness continues to increase in the form of paved roads, roofs, and greenhouses. Natural streams are converted to stormwater drainage pipes and ditches, riparian forests and upland forests are diminished to make space for development and the natural function of streams and watershed are compromised. With any rain event, contaminants from vehicle tires, fuel, livestock, pet, and human waste, etc. all sheets off of the hard surfaces and rapidly enters waterways. For tsepoleq/Semiahmoo Bay, the TA'TALU/Little Campbell River was found to be the most significant contributor of fecal coliform bacteria contamination to shellfish growing waters (Hay & Company, 2003).

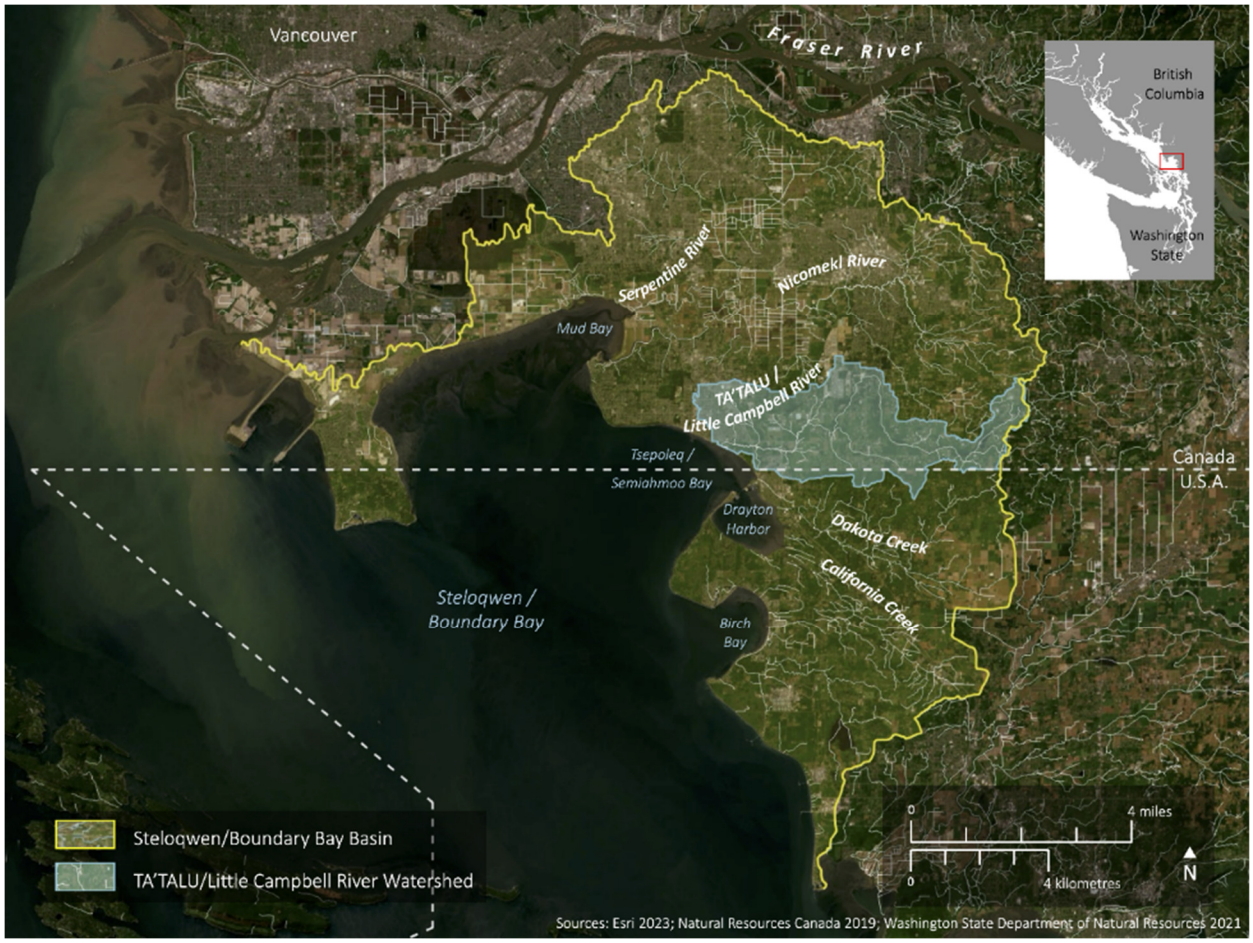

Figure 3. Map of the transboundary Boundary Bay basin study area
(Created by: A. Baylis; Source data: Esri, 2023; Natural Resources Canada, 2019; Washington State Department of Natural Resources, 2021).

Collaborative Efforts to Date

Shared Waters Alliance is a transboundary working group established in the late 1990s in response to the problem of closed shellfish harvest. Its origins were birthed out of conflict, when two Semiahmah community members were charged for harvesting clams in their traditional territory (Norman, 2015). As an outcome of the legal proceedings, Environment Canada initiated the Shared Waters Alliance working group (initially called the Semiahmoo/Drayton Harbor Roundtable, then the Transboundary Watershed Alliance), bringing representatives from both sides of the border to the table from all jurisdictions: municipal, provincial, federal, and Indigenous, as well as non-profit stewardship groups and American shellfish growers, with the goal of working towards improving water quality in Steloqwen so that shellfish harvest might be restored (Shared Waters, n.d.). Leadership has shifted over the years from federal (Environment Canada), to provincial (BC Ministry of Environment), to regional (Metro Vancouver Regional District) until the group dissolved in 2011 when the then chair retired and the initiative was not picked up by their replacement. In 2018, the group was revitalized with leadership from the non-profit stewardship groups: A Rocha Canada and Friends of Semiahmoo Bay Society, in partnership with Semiahmoo First Nation elected chief: Harley Chappell.

While much time and effort has been applied to meetings, studies, monitoring and restoration, shellfish harvest remains prohibited. Working group representatives are keen to participate in roundtable discussions, and there is a strong shared vision of a healthy bay with clean water and open shellfish harvest; however, there remains a lack of commitment from Canadian provincial and federal governments to invest capacity or shift priorities to achieve the vision. Under the colonial CSSP legal framework of the Fisheries Act, Fish Inspection Act and Regulations, there is no mandate for the Canadian government to restore shellfish harvest, and CSSP federal agencies continue to manage shellfish within this structure, claiming no authority or capacity to take effective steps towards addressing pollution sources. However, recent legislation has been established that holds Canadian governments responsible to uphold Indigenous Rights, including the right to practice and revitalize cultural activities, the right to traditional resources such as shellfish, and the right to redress for "lands, territories and resources traditionally owned" (UNDRIPA, 2021; DRIPA, 2019). Until Canada fully recognizes obligations to Indigenous communities, Shared Waters Alliance will have well-meaning individuals participating at a roundtable with no real authority to make change.

Indigenous Rights

The Canadian government has committed to recognize and affirm existing Aboriginal and Treaty Rights through the Constitution (Canadian Charter of Rights and Freedoms, 1982). Canada is also a signatory of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), under which numerous articles apply to Indigenous shellfish harvest as a traditional resource (Appendix 5). Article 29 states that:

> *"Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of Indigenous peoples for such conservation and protection, without discrimination… and States shall also take effective measures to ensure, as needed, that programmes for monitoring, maintaining and restoring the health of Indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented"* (UN, 2007, p.11).

The environment of Steloqwen has not been conserved or protected from contamination, which has damaged the productive capacity of Semiahmoo First Nation lands to supply healthy shellfish. Reparations have not taken place to address these concerns (Article 28). Monitoring and maintenance of the environment have not been undertaken to restore the health of Indigenous peoples. Colonial extractionist paradigms have resulted in jurisdictional and land use practices that do not consider Indigenous values, even actively undermining their wellbeing (Harris, 2001; Harris, 2004; Norman, 2019; Phare, 2017; Simms et al., 2016).

Positionality

I am a third-generation white settler with Dutch roots, a grateful guest on the beautiful traditional and unceded territory of Coast Salish peoples including Stó:lō, Kwantlen, Katzie,

Semiahmoo and W̱SÁNEĆ First Nations. Before I could walk, my parents took me camping and backpacking into the local mountains and along coastlines to explore and enjoy creation. These explorations as a child have deepened my curiosity and love for creation and have led me into studies and a career in environmental science. As a biologist, I have been trained within a western science framework and have conducted many studies to better understand fish, wildlife and habitat within Coast Salish territory over the past fifteen years. Over the past five years, I have been working closely with Semiahmah community members on shared projects to improve the health of the TA'TALU (Little Campbell River) watershed, and I am learning more about their values, priorities and practices. Our relationships are growing in understanding and trust.

Research design, conduct and analysis were undertaken acknowledging my positionality and upholding the protocols necessary for research with Indigenous peoples in a respectful axiology: "respect for persons, concern for welfare, and justice" (Article 1.1, p. 6; CIHR et al., 2018). Part of ethical research design considers the power dynamics between myself as researcher and the Indigenous community members I am working with (Moodie, 2010; Cochran et al, 2008). Poole (1972) describes the "ethical space" where engagement is open, with mutual learning benefits for all involved (Ball, n.d.). My academic background in "western" science and experience with hypothesis-driven research needs to be adjusted to embrace and respect Indigenous ways of knowing and experiencing the world within this "ethical space" mindset. Recognizing that colonization and the subjugation of all Indigenous communities have deep roots that affect layers of inequity and grief, care must be taken to respectfully acknowledge these histories and their effects on present day communities (Reid, Cormack and Pain, 2019). Importantly, the research follows principles of ownership, control, access, and possession (OCAP principles), ensuring that Semiahmoo First Nation has control over the data collection process, and that they have ultimate say in how the information is used and communicated (First Nations Information Governance Centre, 2014).

Structure of Thesis

Following the Introduction in Chapter 1, the report is structured as follows: Chapter 2 provides a review of the literature including the conceptual framework on which the study is based; Chapter 3 describes the methodology and methods used to answer the research questions; Chapter 4 summarizes the findings from the key components of the study: social-ecological systems analysis, jurisdictional interviews and Semiahmoo First Nation workshops; Chapter 5 discusses and analyzes these findings as they compare with the literature review and conceptual framework; and finally Chapter 6 draws conclusions and recommendations based on the findings and analysis, offering pathways forward towards revitalization of Indigenous shellfish harvest in Steloqwen/Boundary Bay.

Chapter 2: Literature Review

This literature review compiles and critiques 45 papers, examining key themes related to the problem of coastal Indigenous communities' disconnection from traditional food sources, specifically shellfish. Themes include: governance approaches and jurisdictional responsibilities for shellfish and watersheds; social-ecological system change; water quality conditions and pollution sources and how they are managed; and Indigenous leadership and empowerment within their traditional territories.

Literature Review Methods

Relevant literature sources were gathered from the Uvic library and databases (Web of Science, ScienceDirect and EBSCOhost) as well as government documents and websites. Keyword searches used combinations of: Indigenous, conservation, governance, food, fish, watershed, municipal, shellfish and clams. Exclusion criteria included: publish dates within the last fifteen years (since Canada's adoption of the United Nations Declaration on the Rights of Indigenous Peoples in 2007). Final literature selection was completed based on relevance to the research questions, proximity to the local North American context, and the number of times works were cited. I tried to apply greater emphasis on Indigenous scholars and voices in the literature, acknowledging that these voices have often been stifled within the colonial system of academia and acknowledging my own positionality, familiarity and tendency to focus on more "mainstream" literature. Review of relevant literature was largely completed at the beginning of the project, but additional findings were incorporated when new literature was uncovered throughout the research journey.

Literature Review Findings

Literature review findings were summarized into emergent themes that help to bring clarity to the research questions: 1) Coastal governance and jurisdictional responsibilities, 2) socio-ecological systems change as a method to examine complex adaptive systems and innovate solutions, 3) Indigenous resurgence, and 4) coastal ecosystem revitalization. Persisting knowledge gaps were summarized to inform further research.

Coastal governance and jurisdictional responsibilities

Governance and jurisdiction underlie the conservation of coastal ecosystems because they define the power and responsibility that government holds to create and uphold land and water laws. Coastal law jurisdiction within the Salish Sea is complex and overlapping (Hewson et al., 2023; **Figure 4**). The scope of jurisdictional responsibilities explored were related to the environmental conditions necessary to sustain safe shellfish harvest, not to aspects related to economic benefit or aquaculture production, since Semiahmoo First Nation's primary interest in revitalizing shellfish harvest is for food, social and ceremonial purposes.

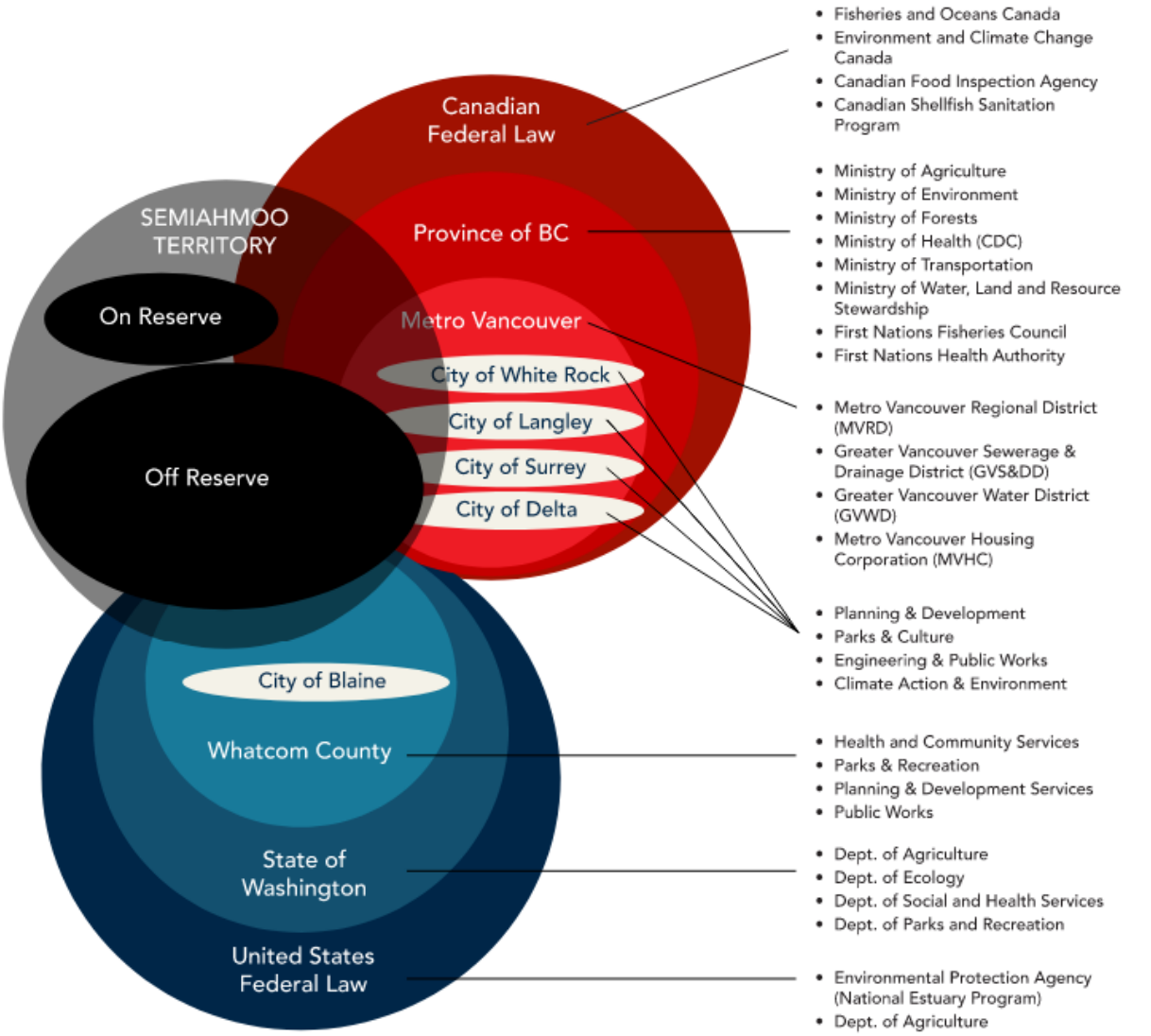

Figure 4. Jurisdictional complexity surrounding shellfish management in Steloqwen/Boundary Bay
(Source: Henney, 2023)

Indigenous nations have been governing their territories since time immemorial and continue to have inherent jurisdiction to govern these lands and waters, including coastal ecosystems (United Nations, 2017; United Nations Declaration on the Rights of Indigenous Peoples Act, 2021; OAS, 2016). Indigenous laws are often rooted in natural law, drawn from learnings of natural ecological systems (Ballantyne et al., 2022; Redvers et al., 2020) and inform practices of reciprocity and conservation, valuing the flourishing of all created things. Coastal First Nations are living within the reality of their inherent laws and ways of being, held in tension with the restrictions and confusion of Canadian laws, funding models and bureaucracies (Ballantyne et al., 2022; Flynn and Daum, 2021). There is a need to bring harmony, understanding and clarity to coastal governance to address the overlapping crises of biodiversity loss, climate change, and food insecurity, and Indigenous-led governance could provide a way forward (Artelle et al., 2019). Murray Ned, Executive Director of the Lower Fraser Fisheries Alliance and Semá:th First Nation Councillor, calls us to quick action in "collaboration and in

unity of lets'emó:t / nə̓c aʔmat: one heart and one mind" to address the fisheries crisis together, acknowledging that revitalizing Indigenous laws can be a key to bring effective nation to nation relationship (Ballantyne et al, 2022, p. 1). While legal resistance tools are effective in some cases to address issues of Aboriginal rights and title, collaborative approaches have been found to be more effective (Lee et al. 2019; Simms et al. 2016; Phare et al., 2017).

Steloqwen is a transboundary watershed, receiving rivers and streams from both sides of the Canada/United States border. Semiahmoo First Nation was divided from their SENĆOŦEN relatives: Lummi and Nooksack Tribes when the borderline was drawn. Shellfish harvest is managed differently on either side of the border line. International laws and agreements can be important tools for advancement of the political goals of Indigenous peoples, particularly in the case of transboundary watersheds (Elienus et al., 2016; Norman, 2015). Current shellfish management in Canada is largely influenced by the 1948 US-Canada bi-lateral agreement on Shellfish Sanitation, committing them to uphold bivalve shellfish harvesting standards to facilitate international trade (ECCC, 2017). Additional, more holistic agreements include the Boundary Waters Treaty, established in 1909, which holds both Canada and the United States responsible to prevent pollution that might harm people or property within shared transboundary waters (ECCC, 2022). The International Joint Commission investigates any disputes and holds both countries accountable to their commitments under the treaty. The United Nations Convention on the Law of the Sea and United Nations Declaration on the Rights of Indigenous Peoples are examples of international law that can provide a framework for ocean governance and influence federal marine laws in Canada and the United States (Hewson et al., 2023).

Shellfish harvest is influenced by multiple levels of government on both sides of the Canadian/American border within the Salish Sea (**Table 5** and **Table 6** in Chapter 4 provide a description of all jurisdictions involved). Pauquachin First Nation with reserve lands on Vancouver Island, Canada, have highlighted the important roles that regional, provincial and federal governments play in the shared governance of coastal ecosystems. Pauquachin have called both Regional and Provincial governments to action to address the governance gaps that have led to ongoing coastal pollution and resulted in prohibited shellfish harvest within their traditional territory of Coles Bay (Sandborn et al., 2023a; Sandborn et al., 2023b). Legal harvest under colonial law is dependent upon clean growing waters because bivalve shellfish are filter-feeders and can accumulate pathogens and toxins within their tissue; water quality regulations are established by the federal government (Government of Canada, 2019; U.S. Food & Drug Administration, 2019). Degraded water quality across the Pacific Coast has resulted in prohibited shellfish harvest due to unsafe conditions (Government of Canada, 2021; Washington State Department of Health [DOH], 2023). On the Canadian side, federal governments currently regulate shellfish harvest through prohibiting harvest; however, they do not work to restore closed areas and they do not monitor areas once they have been closed.

There is a mechanism for Indigenous communities to request a re-classification of shellfish growing waters within their traditional territories (CSSP, 2018). Communities can submit an application to the Pacific Regional Interdepartmental Shellfish Committee (PRISC) outlining the proposed shellfish harvest area, intended use, target species diversity and abundance (resource availability), and any other information needed for PRISC assessment. PRISC then assesses the proposed shellfish growing area including: land use, known and potential pollution sources, water quality data, and any remediation efforts conducted.

Following this review, a decision will be made to accept or reject the proposal based on perceived risks to human health.

Elevated fecal bacteria is the main contaminant of concern for shellfish growing waters with sources from livestock, wildlife, human and pet waste: manure runoff, failing septic systems, pet waste, sanitary sewer overflows and wildlife all contribute to elevated levels of bacteria, making shellfish unsafe to consume (Government of Canada, 2019; PSP, 2021). Water quality impacts can be attributed to exploitive management practices such as manure over-application or improper storage, septic system failures, sanitary sewer and pump station overflows, piped stormwater systems and excessive impervious surfaces (Sandborn et al., 2023; Ban et al., 2019; Groesbeck et al., 2014; Lee et al. 2019; Norman, 2019). Urban stormwater has been found to be the greatest pollution source influencing shellfish closures across North America and specifically in tselopeq/Semiahmoo Bay (McGuire 2010; USEPA 1994; Juteau, 2008). Stormwater drainage systems and urban impervious surfaces have disrupted the natural water cycle, rapidly transporting pollution sources through pipes directly into the ocean, rather than allowing filtration of contaminants through vegetation and soil, slowly percolating before reaching watercourses (McGuire et al., 2010; Nadji et al, 2019).

Urban stormwater is managed by municipalities, with guidance from regional or county level government. On the Canadian side of the Salish Sea, Metro Vancouver's Integrated Liquid Waste and Resource Management Plan includes guidance for municipal stormwater management and is overseen by the BC Ministry of Environment (Metro Vancouver Regional District, 2010). Municipalities are required to develop Integrated Stormwater Management Plans and monitor their13ffectiveeness through Adaptive Management Frameworks. The current Liquid Waste Management Plan is under review, though at the time of writing water quality objectives under the plan did not include shellfish guidelines nor any other Indigenous priorities. On the American side of the Salish Sea, Counties are responsible under Washington State legislation to establish Shellfish Protection Districts whenever shellfish growing areas become contaminated. Protection of shellfish growing areas requires that local programs monitor water quality, so that sources can be identified and corrected quickly (Puget Sound National Estuary Program, 2015).

Current colonial water governance has fragmented jurisdictional authority, does not account for Indigenous laws and knowledge, and lacks capacity and funding for Indigenous participation (Simms et al., 2016; Phare et al., 2018; Kobzik, 2021; Ballantyne et al., 2022). The literature indicates that there is a need to do things more equitably and effectively, shifting away from colonial water governance to alternatives that recognize ecosystem and social interactions, Indigenous rights and leadership and collaborative decision-making (Curran, 2019; Groesbeck et al., 2014; Phare et al., 2017; Sandborn et al., 2023; Simms et al., 2016; Wilson et al., 2018).

UNDRIP Implementation at the local level

Both Canada and the United States did not initially endorse the 2007 United Nations Declaration on the Rights for Indigenous Peoples; however, both countries have since agreed to support the UN Declaration. Canada has gone one step further by passing UNDRIP legislation, calling all levels of government to action to uphold the Declaration (DRIPA, 2019; TRCC, 2015; OAS, 2016; UNDRIPA, 2021). However, Canadian municipal leaders often defer this responsibility to provincial and federal levels of government (Anderson and Flynn, 2020;

Bouvier and Walker, 2018). Municipal leaders often have concerns about the impact that Indigenous law and land title rights might have on existing municipal land use, bylaws, tax revenue and economic development (Dust, 1997 in Alcantara and Nelles, 2009). Municipal-Indigenous relations are critical considering the overlap in shared land and resources and the influence of municipal land use decisions on Indigenous communities, and yet these relationships have often been ignored and eroded (Anderson and Flynn, 2020; Hoehn and Stevens, 2018; Alcantara and Nelles, 2009). As 'agents of the Crown', municipalities are subject to consult and accommodate the interests of Indigenous People when the proposed decisions may adversely affect an existing or potential Aboriginal right, in order for the Crown to uphold its responsibility of protecting Aboriginal rights and promoting reconciliation (Hoehn and Stevens, 2018). More than consultation, the call to reconciliation requires a broader relational approach to decision-making that looks to the best interest of Indigenous communities (Anderson and Flynn, 2020; Flynn, 2021; Levac et al. 2022).

The Supreme Court of Canada has stated that in the context of Canadian history and in the interpretation and implementation of treaty and aboriginal rights, the "honour of the Crown should be understood generously" (*Haida Nation v British Columbia (Minister of Forests)*, 2004 in Hoehn and Stevens, 2018). As neighbours whose decisions deeply affect nearby Indigenous communities, municipalities should take a generous posture, honouring relationships, finding the best way to consult each other, regardless of the legal obligations (Chief Percy Guichon, in Hoehn and Stevens, 2018).

More recently, the rate at which Indigenous-local agreements are developing has been increasing, and there are a number of examples arising across Canada, especially in British Columbia (Alcantara and Nelles, 2016). Examples of existing agreements between Indigenous governments and municipalities in BC are listed in

Table *1*; while additional more recent examples are actively unfolding. Upon examining the Kwanlin Dün First Nation and City of Yellowknife agreement to transfer waterfront lands, Alcantara and Nelles (2009) note that the most significant factor in developing a successful agreement was found to be local leadership (Alcantara and Nelles, 2009). Ultimately, municipal and First Nation governments have similar goals and challenges in terms of economic development and enhancing the quality of life for community members (Alcantara and Nelles, 2009).

Table 1. Examples of Agreements between First Nations and Local Governments in Canada

Year	Type	First Nation	Municipalities/ Local Governments	Agreement
2008	Service Agreement	Kamloops Indian Band	City of Kamloops	Fire protection agreement, three-year renewable for the Nation to pay the City for fire protection services.
2011	Joint Agreement	First Nations Algonquin of Pikwakanagan	Pembroke, Petawawa, Laurentian Valley, Bonnechere Valley, North Algona Wilberforce, the Whitewater Region	Upper Ottawa Valley Medical Recruitment Committee joint management – contributing volunteers and funding to recruit medical professionals to the region
2005	Relationship Agreement	Ktunaxa Nation Council, Akisq'nuk First Nation, Lower Kootenay Indian Band, St Mary's Indian Band, and Tobacco Plains Indian Band.	Regional District of East Kootenay, Regional District of Central Kootenay, City of Cranbrook, City of Kimberley, City of Fernie, District of Sparwood, District of Elkford, District of Invermere, Town of Creston, Village of Radium Hot Springs, and Village of Canal Flats.	MOU commits the parties to "develop strong, committed and fair working relationships between their respective governments by ensuring respectful and open communication" on all issues of mutual interest. Areas of mutual interest may include, "but are not limited to, planning for services, providing economic development opportunities, land use planning and developing infrastructure."
1999	Decolonization Agreement	Westbank First Nation	Regional District of Central Okanagan	Agreement recognizes that "the Okanagan people of Westbank have lived in the Okanagan territory since time immemorial" and that the first non-Native people came to the area "now some 150 years" ago. As well, "the descendants of the first settlers and newcomers now insist that their governments, in keeping with the judgements of the courts, deal justly, honourably and fairly with the Okanagan and other native peoples, on the basis of equality." Finally, the parties declared that they intend "to pursue a lasting relationship based upon mutual respect and honour, in respect and recognition." Includes biannual meetings between leadership to discuss issues of mutual concern.
1999	Capacity Building	Ditidaht First Nation	Town of Ladysmith	Agreement to help the Ditidaht First Nations to "develop their own system of government," including governance structures, policies, and procedures.

Source: Alcantara, C., & Nelles, J. (2016). Indigenous–Local Agreements in Canada: An Analysis of Regional and Historical Trends. In *A Quiet Evolution—The Emergence of Indigenous-Local Intergovernmental Partnerships in Canada* (pp. 15–32). University of Toronto Press. https://www.jstor.org/stable/10.3138/j.ctv2fjwx1p.7

Semiahmoo First Nation has recently developed a service agreement with the City of Surrey in 2021 to enable fire protection, sewer and water servicing and lift a long-standing boil water advisory experienced by the Nation (Ryan, 2021). Recent gatherings hosted by Semiahmoo First Nation Chief and supported by Shared Waters Alliance have invited elected officials from all Canadian municipalities surrounding Steloqwen to raise awareness about water quality concerns in the bay and to discuss a shared vision and goals for the health of the bay and to restore shellfish harvesting (Browne, 2021). Municipal leaders have shown interest and support in advancing shared values of improved water quality in Steloqwen. It will be interesting to see how these relationships develop and whether verbal support translates into local leadership taking action to address pollution sources within their jurisdiction. Local governance is one critical piece within the complex system of shellfish management.

Social-ecological Systems Change

In the context of the emerging Anthropocene, where humans are influencing all aspects of the biosphere, there is growing recognition of the impact societal influences are having on ecological health and the need to pay attention to these relationships, as well as the influence of ecological health on society (Brousselle & McDavid, 2021; Folke et al., 2016; Sula-Raxhimi et al., 2019). To overcome growing coastal and marine ecosystem concerns, it is necessary to better understand the complex and dynamic relationships between human society and ecological systems, recognizing that they are interwoven and adapting. Complexity theorists use systems thinking to visualize and describe the interactions, interdependencies and trade-offs between elements to reveal innovation opportunities and emergent properties that could result in transformative change (Damper, 2000; Meadows, 1999; Waterloo Institute for Social Innovation and Resilience [WISIR], 2017; Westley et al., 2007). Similarly, social-ecological models have been used in many different fields of study to better understand the inter-relationships and to support decision making (Kilanowski, 2017; Salomon et al., 2019). Social-ecological system scholars take an interdisciplinary approach, paying attention to drivers and feedback loops inherent in both social and ecological systems to identify emergent interventions that are adaptive and flexible towards continued increase in the sustainability of people and places (Fischer et al., 2015; Folke et al., 2016; Pullanikkatil & Hughes, 2022; Zurlini et al., 2008).

Theories of social-ecological systems acknowledge the interdependencies of the human social systems of economy, policy, technology and culture with the elements of ecological systems (Biggs et al., 2015; Fischer et al., 2015; Folke et al., 2016). The complex system of shellfish management in Steloqwen/Boundary Bay involves numerous dynamic and evolving relationships between decision makers, pollution sources, the watershed ecosystem, landscape development (i.e. urban or agricultural), climate change and shellfish harvesters, including Semiahmoo First Nation. There is a wide diversity of perspectives on what should be done to resolve this problem and there is a low degree of certainty or predictability about what outcomes will result when potential solutions are applied: zone of complexity (Westley et. Al., 2007).

Key learnings from the literature that have resulted in effective action research include: reflexivity, sense of mutual responsibility, humility, rigorous analysis, and deep respect for one another (emphasis added). (Lam et al., 2021; Meadows, 1999). Frequent (i.e.. weekly), critical self-reflections on assumptions, expectations, values, and process, and allowing opportunity to share these reflections, enables collaborative teams to remain aligned with guiding principles and

to make adjustments or improvements during the process (Lam et al., 2021). Other key learnings include the importance of identifying leverage points within complex system analysis, points where interventions will be most likely to result in transformative change. Meadows (1999) describes the most effective system interventions as related to worldviews or paradigms, acknowledging that these values-based components of the system are foundational and will need to be addressed in order to see real and lasting change. Social-ecological system thinking and leverage point analysis can provide helpful tools to get to the root of the problem.

Indigenous systems thinking scholars like Melanie Goodchild and others weave both Indigenous epistemologies and western systems thinking together to find "pathways for peaceful co-existence," described as "Relational Systems Thinking" (Goodchild, 2021). Both Indigenous and non-Indigenous scholars hold sacred space for shared learning, both centring on the importance of connection to the (Mother) Earth and to each other as fundamental to shifting global-scale system problems like ocean pollution, greenhouse gas emissions or food insecurity (Goodchild, 2021). Unfortunately, the most common activities administered by current North American governments typically address symptoms of the problem, such as applying standards, providing subsidies or charging taxes to effect change, rather than dealing with the roots (Meadows, 1999). Otto Scharmer in (Goodchild, 2021, p.92) talks about the western scientific approach of stepping back to see the system as all of its individual abstract parts and the need to "step in to sense the particulars" in order to truly see the "authentic whole". This methodology blends "systems thinking with systems sensing" (Goodchild, 2021, p.93) and aligns with other literature that highlights the importance of embedding our sensory experience with community engaged problem solving and ethnography (Martin, 2022; Pink, 2015; Wiebe, 2020).

Indigenous Resurgence

Indigenous resurgence is the intentional thoughts and actions of Indigenous communities to revitalize their traditions, languages and practices as a form of resistance to the ongoing threats of colonialism (Zakrison, 2018; Alfred and Corntassel, 2005). Indigenous resurgence scholars describe it as more of an inward approach, focusing on Indigenous identity and traditional ways of knowing and being, rather than focusing outward on what needs to change within Western systems (Zakrison, 2018; Alfred and Corntassel, 2005; Corntassel, 2021). Approaches to Indigenous resurgence bring forward a conversation beyond rights, and highlight the importance of rekindling responsibilities of inter-relationships with land, community and culture. Anishinaabe scholar and activist Leanne Betasamosake Simpson says it like this: "…resurgence must be concerned with the reattachment of our minds, bodies and spirits to the network of relationships and ethical practices and generates grounded normativity. It means the reattachment of our bodies to our lands, regardless of whether those lands are rural, reserves, or urban" (in Corntassel, 2021, p. 73).

Pathways towards sustainable coastal ecosystem management involve embracing Indigenous governance and traditional practices (Groesbeck et al., 2014; Lee et al., 2019; Norman, 2019; Wilson et al., 2018; Artelle et al., 2019). Curran (2019) describes how Indigenous leadership in watershed governance actively asserts Indigenous rights and water laws, resulting in frameworks that are grounded in relationship and responsibility to watershed health. "Indigenous communities are repoliticizing decisions that affect watershed health and are

establishing their own processes of consent as appropriate expressions of the UN Declaration in practice" (Curran, 2019). Numerous examples cite leading practices including:

- Ancient clam gardening practices and traditional abalone fisheries management result in greater abundance and diversity of bivalves (Groesbeck et al. 2014; Lee et al., 2019);

- Portage Bay Partnership (agreement between Lummi First Nation and upstream agricultural landowners) resulted in re-opening of previously closed shellfish harvest areas because of improvements in water quality (Norman, 2019);

- Indigenous-led water governance for the Nadleh Whuten and Stellat'en First Nations held government and industry to account upholding watershed health objectives (Simms et al., 2016);

- Community-based monitoring used with a governance lens empowers Indigenous communities to make data-informed decisions, uphold water rights and pursue shared goals of improved water quality and overall watershed health (Wilson et al., 2018);

- Indigenous Protected and Conserved Areas (IPCA) across Canada including the Unama'ki Mi'kmaw IPCA Project in Nova Scotia (Nash, 2021; ICE, 2018);

- Syilx Nation Siwłkw (water) Declaration and resulting collaborative process to define environmental flow needs and critical flows for 19 streams (AEC, 2016 in Curran, 2019);

- Tsleil-Waututh developing collaborative water quality objectives for Burrard Inlet (Kerr Wood Leidal and Tsleil-Waututh First Nation, 2017);

- Cowichan Watershed Board collaborative governance framework (Cowichan Watershed Board, 2018);

- Semiahmoo First Nation's collaboration with Tsawwassen and Kwantlen First Nations to establish the Salish Sea Indigenous Guardians Association (SSIGA). They are working to monitor and protect their traditional food sources: crab, salmon and shellfish. Initiatives include the implementation of an Indigenous-led Regional Assessment of the Salish Sea to understand past, current and future cumulative effects in Steloqwen and beyond (Chappell et al., 2022).

Indigenous resurgence can play a key role in defining research methodologies and approaches (Brown & Strega, 2015; Kovach, 2009; Wilson et al., 2019). Themes consistent across the literature include deep values embedded in transparency, relationality and accountability, holding respect for all our relations, meaning complete ecological systems: past, present and into the future. "Two-eyed seeing" or "walking on two legs" embraces both the strengths of Indigenous knowledge and western science knowledge to address complexities of nature conservation (Buxton et al. 2021; Dickson-Hoyle, 2022). Reid et al. (2020) describes the possibilities of transforming fisheries and coastal ecosystem management through this process by holding space for co-decision-making, placing equal weight of evidence on Indigenous

knowledge as well as western science. This requires a humble and curious approach for all participants, acknowledging multiple perspectives and research methods.

Addressing challenges facing Indigenous-led water governance

There are many barriers to establishing Indigenous water governance or collaborative governance including: the legacy of colonial dispossession, lack of national/regional policy support, jurisdictional confusion, capacity and funding, lack of trust, and diversity of BC's 203 First Nations (Lee et al., 2019; Norman, 2019; Simms et al., 2016). Often Indigenous communities are seen as stakeholders rather than government, limiting their inherent rights (Norman, 2019; Simms et al., 2016; Phare et al, 2017).

Keys to addressing these barriers are rooted in relationships. Characteristics of successful initiatives include: small scale, well-defined fisheries management systems with appropriate training and resources to build capacity for both provincial and Indigenous governments (Lee et al, 2019;), plurality of knowledge systems and sources (Lee et al, 2019; Norman, 2019; Wilson et al, 2018), established trust between parties with a focus on shared priorities and shared learning (Lee et al., 2019; Norman, 2019; Simms et al., 2016; Wilson et al., 2018), well-defined authority structures (Simms et al., 2016), and willing champions to provide leadership (Lee et al., 2019; Norman, 2019; Wilson et al., 2018). Restoring trust will take time and relationship building from personal to institutional levels (Simms et al., 2016). The Coast Salish Gathering is an example of Indigenous leadership, holding responsibility to preserve, restore and protect the sustainability of the Salish Sea. The connection between social and ecological systems blends together in their Sacred Trust to protect Mother Earth (Coast Salish Gathering, 2017).

Coastal Ecosystem Revitalization

There is a tension between western paradigms of ecosystem restoration, where humans are meant to "manage" nature and are considered separate, as compared to many Indigenous paradigms where caring for the land is grounded in relationship and co-creation (Corntassel and Bryce, 2012; Dickson-Hoyle et al., 2022; Robin et al, 2022). How can western ecosystem restoration practitioners learn from local Indigenous communities to address the global deterioration of coastal ecosystems? Compounding concerns of plastic and other pollution, acidification, overfishing, eutrophication and a warming climate urgently need to be addressed (UN 2022; Ban et al, 2019; Groesbeck et al, 2014; Lee et al., 2019; Norman, 2019). The Salish Sea, of which Steloqwen is a small part, is no exception, and many indicators are showing declining trends including: chinook salmon populations, Fraser River water quality, marine species at risk, marine water quality, stream flow, and Canadian shellfish beds (US EPA, 2022). One contrast has been an improving trend observed in allowable shellfish harvest on the American side of the Salish Sea, including in Drayton Harbour, Washington, the south side of Steloqwen (Dunagan, 2017). Coastal ecosystem restoration activities under the Washington model include: monitoring and mapping pollution sources, implementing actions to address these sources such as agricultural waste runoff, failing on-site sewage systems, boater waste, stormwater and sanitary storm sewer outfalls, generate knowledge, support innovation and develop solutions through research and pilot programs to restore coastal ecosystems under

changing conditions (UN, 2021; NEP, 2022; NOAA, 2011). What would coastal ecosystem revitalization look like under Indigenous leadership?

Native shellfish populations such as Pacific littleneck (*Protothaca staminea*) and Olympia oyster (*Ostrea lurida*) are important traditional food sources for local Indigenous communities; however, they have experienced significant declines due to competition with non-native bivalves such as the Manila clam (*Venerupis philippinarum*) and Pacific Oyster (*Crassostrea gigas*), overharvesting and coastal habitat degradation (Bendell, 2014; Dinnel et al., 2009). Olympia oyster is the only native oyster to the west coast of North America and has declined to less than five percent of historic coverage in Puget Sound (Blake and Bradbury, 2012 in Dohrn, 2020); Olympia oysters have been designated as special concern federally (COSEWIC, 2011). Recruitment of Olympia oyster seed on crushed shell stock has been found to be a successful restoration technique (White et al., 2009; Dinnel et al., 2009). Ancient clam gardening practices and traditional abalone fisheries management have been found to result in greater abundance and diversity of bivalves (Groesbeck et al. 2014; Lee et al., 2019). Native shellfish such as butter clam (*Saxidomus gigantea*) and littleneck (*Protothaca staminea*) can be 2-4 times more productive in constructed clam gardens than in non-walled beaches (Smith et al., 2019; Groesbeck et al., 2014; Jackley et al. 2016).

Knowledge gaps

Many questions remain unaddressed in this literature search, such as: How can Indigenous resurgence leading practices apply to Semiahmoo First Nation and the revitalization of shellfish harvest? How can Indigenous capacity be enhanced to provide leadership in coastal ecosystem governance? How can the assertion of Indigenous sovereignty clarify or further complicate understanding of jurisdiction? And how do we deal with unresolved tensions: jurisdictional fragmentation and divergent worldviews? What role does urban stormwater treatment play in the restoration of shellfish harvest? How can nature-based solutions be applied to result in multi-layered benefits to addressing climate change, biodiversity loss and water quality challenges? There appears to be a lack of literature on how these questions intersect and there is an opportunity to apply literature findings to the unique context of Steloqwen.

Conceptual Framework

This thesis applies a critical coastal governance lens to the problem of restricted Indigenous shellfish harvest in Steloqwen, connecting Indigenous resurgence scholarship (Corntassel and Bryce, 2012; Curran, 2019; Simms et al., 2016) with social-ecological systems analysis (Westley et al., 2007; Biggs et al., 2015; Meadows, 1999; Berkes et al., 2000; Fischer et al., 2015; Folke et al., 2016). Drawing from Indigenous resurgence leading practices and ancient coastal management techniques such as clam gardens (Groesbeck et al., 2014; Jackley et al., 2016), this research takes a participatory action approach (Hall and Tandon, 2017; Wiebe, 2020; Bradbury et al., 2019), attending to power and Indigenous methodologies (Kovach, 2009; Kimmerer, 2015; Wilson et al., 2019) to enable co-research with Semiahmoo First Nation, amplifying their voice and applying it to relational social-ecological systems change (Goodchild, 2021; Westley et al., 2007; Biggs et al., 2015; Meadows, 1999). In particular, the conceptual framework takes a critical approach to existing coastal governance systems and highlights

innovative pathways towards ecological revitalization. The framework is rooted in evidence that Indigenous resurgence, revitalizing traditional knowledge and practice, is central to restoring relationships with water systems and awakening a sense of responsibility to coastal ecosystem stewardship.

Research methods, such as collaborative workshops, interviews and getting out on the beach to develop film and story map products, are centered on catalyzing resurgence, grounded in Semiahmoo traditional knowledge and practice. This is an opportunity to shine a light on the ways in which Semiahmah are revitalizing their traditional ways of clam harvesting and through this, build knowledge and capacity within this next generation who have been disconnected from shellfish harvest to provide leadership in watershed governance, influencing the many other jurisdictions involved.

In the midst of this complex problem involving numerous variables, jurisdictions and relationships, it is beneficial to lay out and critically examine all of the components of the social-ecological system, including jurisdictional and governance roles, responsibilities and gaps, outlining key drivers and revealing leverage points to influence systems change (Westley, 2007; Salomon et al., 2019; Bodin, 2017). Concurrent with resurgence pathways, the conceptual framework within this research explores the use of social-ecological system mapping tools and jurisdictional interviews, with guidance from complexity theory, and leverage point scholarship (Westley et al., 2007; Meadows, 1999; WISIR, 2017; Biggs et al., 2015) to identify pathways towards transformative systems change.

There is a sense of urgency to address the problem of Indigenous disconnection from traditional shellfish harvest. Ongoing colonial patterns of watershed degradation and lack of remediation efforts are holding the bay in a contaminated state, making clams unsafe and illegal to eat and restricting Semiahmoo First Nation's connection to land and water. The risks to human health are high in that consumption of contaminated shellfish can result in death or severe illness. Participatory action research can provide a transformative process to address urgent and complex problems (Hall and Tandon, 2017; Castleden et al., 2009; Levac and Wiebe, 2020; Bradbury-Huang, 2010; Bradbury et al., 2019).

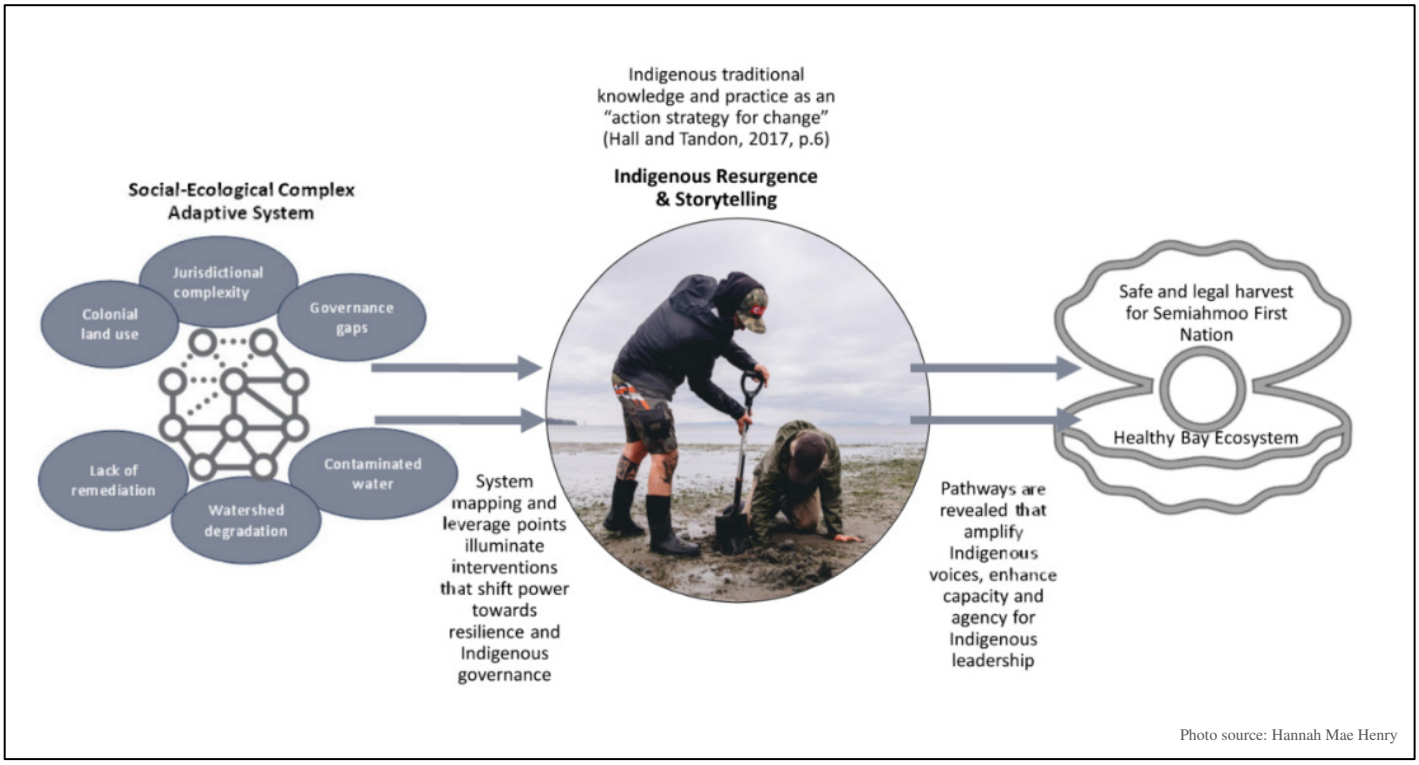

Figure 5. Conceptual framework.

This research presents a conceptual framework that highlights the importance of Indigenous resurgence through the revitalization of traditional clam harvesting practice in Steloqwen and sharing Indigenous stories within the context of complex social-ecological systems analysis and participatory action to pursue transformative change **Figure 5**. Transformative change emerges when Semiahmoo teachings are interwoven with systems analysis to illuminate interventions most effective to address the existing complex problems surrounding shellfish harvest management in Steloqwen/Boundary Bay. Potential interventions include governance shifts towards reconciliation and a healthier bay ecosystem, ultimately resulting in safe and legal shellfish harvest for Semiahmoo First Nation.

Chapter 3: Methodology and Methods

This chapter describes the methodological approach and methods used to complete the research. Methods were approved by the Human Research Ethics Board on January 26, 2023, Approval #: 22-0659. The research is an exploratory and place-based study, focusing on the Semiahmoo First Nation's experience of disconnection from their traditional food sources and exploring potential pathways towards addressing the problem. Following a qualitative community-engaged research approach (Hall and Tandon, 2017; Castleden et al., 2009; Levac and Wiebe, 2020; Bradbury et al., 2019), my goal in this research is for Semiahmah community voices to be amplified, for justice to be pursued, and for actionable outcomes that result in transformative governance and restoration of a healthy bay ecosystem. The research design used participatory action techniques including interviews and arts-based storytelling through collaborative film to answer the questions, allowing for an expansive and creative approach to address the complexity of the problem (Levac et al., 2020; MacDonald et al., 2015; Tremblay & Jayme, 2015). Qualitative methods were used to explore the complexity of the system, jurisdictional responsibilities and Indigenous resurgence pathways.

This research was completed within the larger context of the work of Shared Waters Alliance, a transboundary working group with a vision to improve water quality in Steloqwen/Boundary Bay such that Semiahmoo First Nation might be able to return to safe and legal shellfish harvest. Beyond the timeline of this thesis, participatory work will continue with jurisdictional leaders and stakeholders to advance this vision, applying the recommendations revealed through this research.

Methodology

The research questions were answered through the following methodological components as shown in **Table 2**. Data collection was gathered through: 1) jurisdictional interviews, and 2) Semiahmoo First Nation workshop gathering and film interviews, and these data were analyzed using 3) systems mapping tools, and 4) thematic analysis. Data collection and analysis components are described below.

Data Collection:

1. Jurisdictional interviews were conducted virtually via Zoom, from February to June 2023, with 40 representatives from all levels of government, including Indigenous, federal, provincial/state, regional and local, as well as industry, academia and non-profit sectors, who were connected with the management of shellfish harvest in Steloqwen, on both sides of the Canadian and American borders.
2. Indigenous resurgence workshops and interviews to develop participatory film and story mapping products. Two workshops were hosted on Semiahmoo First Nation reserve lands on February 17 and March 10, 2023, and facilitated by myself and Chief Harley, for community members to share knowledge and stories about their connection to shellfish harvest (past, present and future) and to develop a film and story map to communicate these learnings with decision makers.

Data Analysis:

3. Social-ecological system mapping, using causal loop diagram tools (Rushing, 2010; Waterloo Institute for Social Innovation and Resilience, 2017) to understand key drivers and relationships between variables within the system of shellfish management in Steloqwen, ultimately pointing to leverage points (Meadows, 1999) that could result in transformative action;
4. Thematic analysis of jurisdictional interviews to observe dominant themes that emerged from the data.

Table 2. Methods used to answer each of the research questions.

Research Question	**Methodologies**
How is shellfish harvest governed in Steloqwen/Boundary Bay? What are the jurisdictional and interjurisdictional responsibilities within this governance framework? And why is the UNDRIP important in this context?	Jurisdictional interviews, systems mapping, and literature review.
In what ways do traditional stories and practices of Semiahmoo First Nation presently inform shellfish management practices and policy in Steloqwen and how could this process be improved?	Story telling workshops with Semiahmoo First Nation, participatory film and story map products, jurisdictional interviews, and literature review.
How can the existing coastal governance system be changed to support pathways towards revitalizing Semiahmoo First Nation shellfish harvest?	Application of a critical coastal governance lens to the shellfish management system in Steloqwen/Boundary Bay, using system mapping and leverage point analysis to provide recommendations for systems change.

Relational Research

I used an overarching framework drawing from Indigenous research methodologies (Kovach, 2009; Wilson et al., 2019), and within this context take a community-based participatory action research (PAR) approach (Tandon et al., 2016; Taylor and Ochoka, 2017): drawing on relationships I have with community members and the land, and paying attention to my senses (Wiebe, 2020), I have held value in listening to people and the earth (Kimmerer, 2013), seeking reciprocity and trust.

Since 2011, I have had the privilege of working with Semiahmoo First Nation leadership on water quality monitoring, habitat enhancement, and engagement with decision makers to better understand and improve the health of the TA'TALU/Little Campbell River watershed and Steloqwen/Boundary Bay. Building on these many years of collaborative project work and relationship through Shared Waters Alliance, we agreed that it would be beneficial to engage all of the jurisdications related to shellfish harvest management in the research process by interviewing them. Data collection methods were determined in relationship with Semiahmoo

First Nation elected Chief. At each step in the research process, I have conferred with the Chief and deferred to his direction; in the development of research questions, and general research approach, including Indigenous community workshops and film interviews. He provided feedback and approval on the film and story mapping process as well as the products prior to release and shared insights and reflections throughout the research journey.

Semiahmah community members participated in data collection and communication of results by contributing to workshop gatherings and sharing their knowledge about connections to shellfish harvest in Steloqwen through film and storymapping products. At each of the two workshops, audio was recorded to capture stories and reflections on the history of shellfish harvesting for Semiahmoo First Nation. From these recordings, information was summarized in a story map, describing past and present shellfish harvesting conditions as well as future hopes for revitalization. For the film, five Semiahmah community members agreed to be interviewed on camera and were asked to share stories and reflections about their past connection to shellfish, their current experience of disconnection from shellfish harvest, and their hopes for the future. These five interviews were interwoven by film-maker Hannah Mae Henry and reviewed by film interviewees to ensure comfort with the final product. Western science and Indigenous traditional knowledge were interwoven like a braid, using a "two-eyed seeing approach" that draws from the strengths of both ways of knowing (Reid et al., 2021; Dickson-Hoyle et al., 2022). The research questions were viewed through an interpretivist lens (Schwartz-Shea and Yanow, 2011), acknowledging the complexity and subjectivity of the study. As a researcher, I bring my own perspectives and observations and the knowledge generated through this research is relative to the time, context and culture that it emerged from (Rogers, 2020).

Methods

Data Collection

Data collection involved a qualitative participatory action research approach. This research was participatory and sensitized to create space for stories and quotes of those directly impacted by the prohibition of shellfish harvest. Fifty-three individuals participated in this research through jurisdictional interviews and Semiahmoo First Nation workshops.

Jurisdictional Interviews

In order to characterize the role and responsibilities of the multiple jurisdictions involved within the system, I reviewed relevant literature and conducted interviews. Literature included legislation and governance documents, including government websites and corporate reports from jurisdictions surrounding the Salish Sea. Interview participants covered a diversity of perspectives including: municipal, regional, provincial and federal government, non-profit groups and Indigenous community members who have been or are currently involved in the work of revitalizing shellfish harvest in the Salish Sea: specifically Steloqwen/Boundary Bay, including tsepoleq/Semiahmoo Bay and Drayton Harbor, US (**Table 3**). Literature review and interview results underwent critical discourse analysis using Nvivo Software; I searched for key terms, themes and any limitations or gaps within the information gathered.

Table 3. List of jurisdictions represented in the interviews

Governance category	Number of interviewees	Jurisdictions related to shellfish harvest in Semiahmoo Bay
Indigenous communities	8	Semiahmoo First Nation
		Tsleil-Waututh First Nation
		Swinomish Tribe
Federal government	6	Canadian Food Inspection Agency
		Fisheries and Oceans Canada
		Environment and Climate Change Canada
Provincial/State government	5	BC Ministry of Environment and Climate Change Strategy
		BC Ministry of Water, Land and Resource Stewardship
		BC Ministry of Agriculture and Food
		BC Centre for Disease Control
		Washington Department of Health
Regional government	4	Metro Vancouver Regional District
		Fraser Health Authority
		Whatcom County Public Works
Municipal government	3	City of Surrey
		City of Delta
		City of White Rock
Shellfish growers/private industry	3	Drayton Harbor Oyster Company
		BC Shellfish Growers Association
		Confluence Environmental Company
Non-profit	7	Puget Sound Restoration Fund
		Salish Sea Indigenous Guardians Association
		Little Campbell Watershed Society
		Raincoast Conservation Foundation
		Friends of Semiahmoo Bay Society
		Coastal First Nations – Great Bear Initiative
		West Coast Environmental Law
Academic institutions	5	Uvic Environmental Law Centre
		Northwest Indian College

		Simon Fraser University
		Vancouver Island University
Total	41	

Semi-structured interviews were conducted over zoom, except for Semiahmoo First Nation interviews which were conducted in person. All interviews were recorded, transcribed and emailed to the interviewees to ensure transcriptions were accurate. Interviews followed Indigenous research methodologies (Kovach, 2009; Wilson et al., 2019); questions were open-ended and responsive, so that initial questions led to additional un-planned questions and interviewees had the opportunity to ask questions as well. This sensitized design allowed the storytellers to hold the power during these sessions (Brown and Strega, 2015), allowing space for them to share whatever they felt was important, with an active listening response. Interview questions were developed in collaboration with Semiahmoo First Nation leadership (Appendix 2).

Indigenous Resurgence

To explore Indigenous knowledge and traditional practice as a resurgence pathway towards revitalizing shellfish harvest, I worked with Semiahmah community members to share their stories through participatory video and story mapping. The aim was to amplify Indigenous voices and ensure that these voices were responded to, to answer questions about what matters to Semiahmah within their community related to revitalizing shellfish harvest.

Chief Harley and I hosted two gatherings on Semiahmoo First Nation reserve lands with the purpose of sharing stories and knowledge about connections to shellfish within the community. Seventeen Semiahmah community members participated as well as nine individuals from supporting organizations: the Salish Sea Indigenous Guardians Association (SSIGA), A Rocha Canada (A Rocha) and the University of Victoria. SSIGA and A Rocha are non-profit organizations with mandates to support Indigenous communities and improve the health of the Salish Sea (SSIGA, 2021; A Rocha Canada, n.d.). An invitation poster was sent out ahead of time by Chief Harley Chappell, explaining the purpose and scope of the project. Key components of both workshops included: eating lunch together, introducing ourselves around the table to get to know each other and build trust, and conversational learning – sharing stories and asking questions related to shellfish harvest.

Workshop 1 took place indoors on February 17, 2023, with large windows facing Semiahmoo Bay. Chief Chappell and I described the purpose of the research, provided a bit of background on the collaborative work that has been happening to better understand pollution sources and address them so that clams might be safe and legal to harvest. Then together, we discussed past experiences with shellfish, the present situation of disconnection, and future hopes related to clam harvest within the community. Community members shared stories about their experiences and their connection to shellfish, the challenges associated with disconnection from the clams, and also what they hope to see in the future. Sessions were recorded with prior and informed consent of participants.

Workshop 2 took place on March 10, 2023. It started indoors with lunch, a round of introductions to connect together, and an opportunity to reflect on visioning the future of clam harvesting in Semiahmoo Bay. Then we headed down to the beach together to "turn the beds" and experience the practice of digging clams. Stories were shared along the way about how community members used to harvest and eat different shellfish species and how important this local healthy food source was for survival and how the act of harvesting on the beach and cooking and eating clams can bring communities together.

Film and story map products were created out of these workshop gatherings to amplify the voice of Semiahmah community members. For the film, five workshop participants were invited to be asked three open-ended questions that prompted them to share about their connections to shellfish harvest. In discussion with Chief Harley, we agreed that it would be valuable to share the Semiahmoo shellfish story in the context of their experiences past, present and future, so the questions were crafted along those lines:

1) Please will you share a story about your connection to shellfish from the past?

2) What is the significance of shellfish for you and your community in the present? And

3) What are your hopes related to shellfish harvest for the future?

Film interviews were conducted on Semiahmoo First Nation reserve lands on March 10, 11, and April 14, 2023. Videographers Hannah Mae Henry and Ellie Auton-Strolz collected footage and Hannah Mae Henry compiled the film for community member review. I compiled the story map with information gathered during the workshops and Semiahmoo First Nation interviews. GIS mapping support for the Story map was provided by the Salish Sea Indigenous Guardians Association.

Data Analysis

Social-Ecological Systems Analysis

To evaluate existing and past efforts to revitalize shellfish harvest, I completed a system analysis by developing a causal loop diagram (Rushing, 2010) of key variables involved in the system surrounding Steloqwen shellfish management. Causal loop diagram methods are outlined within the Waterloo Institute for Social Innovation and Resilience learning modules for social innovation, as a tool to explore complex relationships, feedback loops and leverage points at which change might be effective (WISIR, 2017a). Systems maps identify all of the key social and ecological variables or elements within a system, as well as their interconnections or the ways in which each of the variables relate to or influence one another (WISIR, 2017a). Laying out these variables and their interactions helps to clarify how complex socio-ecological systems function and to reveal reinforcing relationship loops where interventions might be most effective to change system outcomes.

A social-ecological system map was developed using information gathered through jurisdictional interviews and a review of relevant literature. Interview response data also revealed feedback loops and key variables/drivers within the system. I placed a geographic

boundary around the Steloqwen/Boundary Bay watershed, focusing attention on Semiahmoo First Nation as the group most affected by the problem. Since Semiahmoo First Nation reserve lands are located within the Canadian context, the social-ecological system focused on a Canadian governance context, even though it is acknowledged that the shellfish harvest system is influenced by American jurisdictions and transboundary waters.

When conducting systems analysis, it is important to acknowledge ourselves within the system, and consider how our actions might affect or influence overall system function (Westley et al., 2007). Within the system, I am a middle-aged white professional, mother of four. I am concerned about ecosystem health and Indigenous justice and am actively pursuing both, but I am also living out of a place of privilege. I am also one of the many polluters on the urban landscape, contributing contamination to the Fraser River and Salish Sea receiving waters. For the past eleven years, I have lived within the Steloqwen watershed, and the TA'TALU River flowed through my property. As a biologist for a non-profit conservation organization, I have spent over ten years studying fish and wildlife species and their habitats within this watershed. My job and my mission was to learn about the river, its estuary, and the creatures who depend on it and to work in collaboration with many partners to improve ecological conditions through habitat restoration and community engagement. As I reflect on my place within the complexity of this problem, I acknowledge that I cannot control it. I have taken time to "stand still" and carefully observe the interrelationships, laying out the interconnectedness in order to identify possible solutions (Westley et. Al., 2007).

In addition to causal loop system mapping, I also used leverage point analysis to evaluate opportunities for innovation and transformation. Meadows (1999) describes the most effective ways to influence change and I have selected the top eight for application to my data analysis process (**Table 4**; Meadows, 1999, p.5).

Table 4. Places to intervene in a system (from greatest to least effectiveness)

Effectiveness Ranking	Intervention Opportunities
1	The power to transcend paradigms
2	The mindset or paradigm out of which the system – its goals, structure, rules, delays, parameters – arises
3	The goals of the system
4	The power to add, change, evolve, or self-organize system structure
5	The rules of the system (such as incentives, punishments, constraints)
6	The structure of information flows (who does and does not have access to what kinds of information)
7	The gain around driving positive feedback loops
8	The strength of negative feedback loops, relative to the impacts they are trying to correct against

The social-ecological system map was analyzed to identify the most applicable leverage points and these were described in Chapter 4. Pathways to revitalizing shellfish harvest were revealed through the process.

Thematic Analysis

Data analysis involved both interpretive meaning-making and thematic analysis, ensuring that results were summarized within a highly contextualized framework to align with Indigenous research methods and avoid fragmenting stories (Kovach, 2009). "Truths of the stories are held within the life context of the storyteller…. Truth cannot be abstracted from the life." (Kovach, 2009, p. 131).

Jurisdictional interview transcripts were uploaded into Nvivo software and manually coded to identify emerging themes under three categories: 1) jurisdictional responsibilities to clarify roles within the system mapping process, 2) barriers, and 3) opportunities to reveal pathways towards revitalizing shellfish harvest. Once all of the transcripts were coded, similar codes were lumped together into overarching themes. Significant quotes were highlighted and themes were ranked based on frequency: how many times they were mentioned during interview sessions. Key barriers and opportunities were revealed through this process to inform potential pathways towards revitalizing shellfish harvest. Interviewee quotes indicate their jurisdictional category and a false name to maintain anonymity.

Indigenous Resurgence

Workshop transcripts were analyzed for important data related to Semiahmoo First Nation connections to shellfish and shellfish harvest past, present and future. These data were compiled and included in a story map platform. Salish Sea Indigenous Guardians Association staff assisted with the development of the story map by providing GIS mapping support. The story map was shared with Semiahmoo leadership and community members who participated in the workshop to ensure accuracy and agreement with how the knowledge and stories were presented.

Film interviews were compiled by Hannah Mae Henry into a storytelling film. The film was viewed by Semiahmoo leadership and community members to ensure accuracy and agreement with how the knowledge and stories were presented. The film was shared with all levels of jurisdiction surrounding shellfish management in Steloqwen at a Shared Waters Roundtable gathering on June 29, 2023. Participants were invited to respond to the film through a questionnaire after the meeting and responses were collated to determine whether the opportunity to hear Semiahmah's lived experiences with shellfish might encourage them within their role to pursue revitalization of shellfish harvest for Semiahmoo First Nation. Participant responses help to reveal the impact of Indigenous resurgence storytelling in revitalizing Indigenous shellfish harvest. In addition to feedback from Shared Waters Alliance participants, a community film viewing will be hosted at Semiahmoo First Nation for anyone who is interested in participating. After viewing the film, community members will be invited to respond either verbally or in writing about how participating in the film or watching the film has empowered them towards leadership in alignment with the conceptual framework.

One additional opportunity to use the film has emerged during the course of the project, which is to come alongside Pauquachin First Nation and other Indigenous coastal communities who are calling the provincial government to take responsibility for coastal health and Indigenous rights to traditional food sources and develop a Healthy Shellfish Initiative, similar to

how shellfish are managed in Washington State (Sandborn et al., 2023). Future analysis of the impact of Indigenous resurgence storytelling will be revealed through the provincial government response.

All data were managed, stored and communicated upholding principles of ownership, control, access and possession (OCAP) principles to ensure that Semiahmoo First Nation has control over the way data were collected and used (First Nations Information Governance Centre, 2014).

Strengths and Limitations

There are a number of limitations related to my thesis research design, data collection and analysis. First, the research could have been designed with greater collaboration from Semiahmoo First Nation community. Thesis design collaboration was limited to communication with the Semiahmoo elected Chief. As Chief, he provided a clear sense of Semiahmoo community values and interests, and we had over five years of relationship and trust to draw from, which simplified the communication and decision-making process. The research would have been strengthened if more community members had taken ownership in the design and research process. That being said, there are capacity challenges within the community, being so small and dealing with so many important issues, that may have made it difficult to engage a wider group of participants in a more meaningful way. Also, the short time that I was able to connect with most of them may not have been sufficient to develop enough trust and care to engage at a deeper level. I was grateful that seventeen community members participated in the two workshop gatherings we hosted and that they were willing to share their thoughts and stories with me as part of the data collection process.

Secondly, the data collection process was limited due to the constrained timeline of the degree program and the capacity or availability of participants. I had hoped to conduct more interviews with neighbouring Indigenous communities. I was able to connect with Swinomish, Tsleil-Waututh and Semiahmoo First Nation community members, but I was unable to complete interviews with Lummi nor Nooksack Tribes because I did not receive a response from them before my research was finished. It would have strengthened my methodology to include an interview with Tsawwassen First Nation as well, but I decided to refine my scope to make the interview numbers more manageable to complete within the timeframe.

Also related to data collection limitations due to timeline and capacity, I had initially hoped that there would be some Semiahmoo First Nation community members who might be available or interested in co-producing the Semiahmoo Shellfish Story film and/or story map products. However, within the time constraints of the research process, five of the seventeen participants were willing to share their stories as part of the film, but none were available within the tight timeframe to support the filming and editing process. There was opportunity to share the film with participants and community members after it was completed and offer them the chance to provide feedback, but it would have been more aligned with Indigenous methodologies if there was greater involvement in co-production to allow for more relationality and accountability.

Third, this place-based study was limited in scope to address the problems that Semiahmoo First Nation has experienced of contaminated waters, disconnection from traditional food sources, colonial land use practices and diminished voice in decisions that affect their land and resources. Unique contexts for each coastal Indigenous community along the Salish Sea and around the world will limit the relevance of particular findings and recommendations to a wider audience. However, there may be lessons learned and conclusions drawn during this study that apply beyond the situation of Semiahmoo First Nation and Steloqwen.

Fourth, many social-ecological system analysis methods include a resilience analysis. This thesis did not include resilience analysis within its scope. Further study into how the principles of resilience apply to the system of coastal and shellfish management could reveal further insights into how best to build greater resiliency into the system.

Fifth, this thesis is not very accessible to Semiahmah community members as it is written in academic language and not very easy to digest or understand. I will be completing a supplementary short report to support this thesis, which will hopefully offer a more accessible option and will summarize the key findings and recommendations. Thankfully we have also created the film and story map products, which are definitely accessible and useful to amplify Semiahmoo voices.

In terms of strengths, the participatory action, community-engaged research approach of this research, used methods that align with Indigenous epistemologies and values. This was a good fit for addressing sensitive and complex problems that Semiahmoo First Nation is facing. Secondly, the opportunity for Semiahmah community member's voice to be heard through film and story map helped to inspire jurisdictional leaders and stakeholders in Steloqwen shellfish management to engage in further collaboration towards revitalization of shellfish harvest. Thirdly, the opportunity to gather together as Shared Waters Alliance participants to discuss next steps, helped to build bridges of knowledge, understanding and trust (Levac et al., 2020; Flicker et al., 2008; Wiebe, 2016). The research process itself provides a framework for change, allowing for collaborative solutions that last. Fourthly, the research has brought clarity to the complex and multi-layered problems related to shellfish and coastal ecosystem management in Steloqwen (Etmanski et al., 2014; Taylor and Ochochka, 2017), and recommendations can be immediately applied by jurisdictional interview participants who are engaged with the work of Shared Waters Alliance (Tandon et al., 2016). Fifthly, this thesis builds on existing Indigenous resurgence efforts, adding research and analysis that provides insight and accountability for state governments to attend to Indigenous peoples within coastal ecosystems and address long-standing and widespread shellfish harvest issues (Pauquachin First Nation, 2023).

Ethical and/or Research Review

This research was reviewed and approved by the Uvic Human Research Ethics Board (#22-0659). Care was taken to minimize inconveniences and mitigate risks of harm to participants. Interview participants were inconvenienced by taking the time to engage in interviews and review of film/story mapping materials (3-5 hrs of time). Care was taken to minimize inconveniences by enabling interviews to occur via Zoom, minimizing or eliminating

travel time and scheduling at times most convenient to participants. Inconveniences were compensated through the offering of honoraria.

The research was categorized as having minimal risk. It was possible that participants could feel emotional stress or discomfort while discussing past and present negative experiences related to separation from traditional food sources during interviews and filming process, especially for Indigenous participants. Sharing stories of past or present negative experience has potential for re-traumatization. Care was taken to ask questions in a sensitive manner and ensure free, informed and ongoing consent was in place, so that they knew participation was voluntary. Participants could choose to stop the interview at any time or choose to not answer particular questions if the experience was causing emotional stress. It was up to Indigenous community members involved as to the extent of their collaboration with the research. Care was taken to avoid any potentially intimidating situations, and activities were carried out in a safe and secure environment, one that was familiar and comfortable for the participants. Participants were fully informed about what to expect during interviews and other research activities.

Findings were shared with participants after the research was complete, so that they could engage with the level of transformation that occurred and could be empowered to continue the journey of revitalizing shellfish harvest. Participants who were included in the film (either named or unnamed) had an opportunity to review the film or their footage prior to finalization through a private screening (virtual or in person) with participants. This ensured that the film participants were comfortable with their footage/data in the film and did not face risks such as the possibility that they may feel misrepresented. Offering honoraria to participants for their time acknowledged the value of their knowledge and contribution to research and also acknowledged the potential cost of sharing stories and investing emotionally in the research process.

Chapter 4: Findings

This chapter includes the major findings of my research and describe the results that emerged through the data analysis. There are four main components provided: 1) shellfish governance roles and responsibilities, 2) social-ecological system and leverage points, 3) keys to revitalize shellfish harvest, and 4) Indigenous resurgence and storytelling. First I describe the current governance framework surrounding shellfish management in Steloqwen, comparing the Canadian and American jurisdictional roles and responsibilities. Secondly, I describe the social-ecological system within which the shellfish governance framework resides. Third, I describe emergent themes from the jurisdictional interviews, highlighting the barriers and opportunities to revitalize shellfish harvest from the interview participants' perspectives. Fourth, I describe the process of developing the film and story map products and the key messages communicated through those tools. Drawing from these findings, revealed pathways will be analyzed in the discussion chapter to determine actions to improve collaborative efforts and revitalize Indigenous shellfish harvest.

Shellfish Governance in Steloqwen

Jurisdictional interviews and background research revealed the various roles and responsibilities of multiple levels of government involved in managing shellfish in Steloqwen/Boundary Bay, within both the Canadian (**Table 5**) and American contexts (**Table 6**). A number of gaps and challenges were observed including the lack of mandate within any level of government on the Canadian side of the bay to restore coastal water quality conditions for shellfish and also the lack of clarity on how the principles of UNDRIP are meant to be applied within all jurisdictions.

Table 5. Government roles and responsibilities to manage shellfish in Steloqwen/Boundary Bay, BC and summary of identified gaps and challenges.

Jurisdiction	Government		Role/Responsibilities	Challenges/Gaps
Indigenous	Semiahmoo First Nation		Upholding Indigenous laws within reserve lands; provide voluntary leadership to the Shared Waters Alliance, a transboundary working group with the purpose of improving water quality in Boundary Bay to revitalize shellfish harvest; Guardians collect water quality samples.	Unable to harvest traditional food source (shellfish) due to federal prohibition. Restricted by reserve land boundaries, Indian Act, colonial land use, and resource use legislation. No treaty in place. No decision-making authority at regional, provincial or federal tables.
Federal	Canadian Shellfish Sanitation Program	Fisheries and Oceans Canada	Opens and closes shellfish harvest areas; enforces compliance; responsible to protect the health of the fisheries resource.	No mandate or capacity to restore shellfish harvesting areas once closed, prioritize commercial shellfish harvest areas.
		Environment and Climate Change Canada	Monitors bacteriological water quality to assess whether meeting shellfish harvest guidelines; recommends harvest classification based on monitoring results; identifies and evaluates sanitary	Only monitor in areas open to shellfish harvest; minimal to no capacity to initiate monitoring in new areas; no jurisdiction over freshwater pollution sources.

			pollution sources that may affect shellfish growing waters, including wastewater modeling and recommending emergency closures due to large rainfall events.	
		Canadian Food Inspection Agency	Oversees handling, processing, import/export of shellfish; tests marine biotoxin and microtoxin levels in shellfish tissue; responsible for public health.	Only monitor in areas open to shellfish harvest; only one Canadian lab to test for biotoxins.
	Health Canada		Sets national standards to keep environment healthy, addressing water and air pollution; developed a sustainable development strategy.	Defers to the CSSP for shellfish management.
	Transport Canada		Controls disposal of boating waste into the ocean; protects the marine environment from pollution; prevents introduction of invasive species.	Difficult to prove and enforce sewage dumping from boats; don't oversee marinas.
	Fisheries and Oceans Canada	Aboriginal Aquatic Resource and Oceans Management Programs (AAROM)	Indigenous led Fisheries and Oceans program that supports Indigenous groups as they develop aquatic resource and oceans management departments that provide fisheries, habitat and science related services[1], such as guardians programs and developing fisheries related reconciliation agreements.	Local AAROMs: Lower Fraser Fisheries Alliance and First Nations Fisheries Council of BC have prioritized salmon fisheries, not shellfish; Island Marine Aquatic Working Group (IMAWG) include shellfish within their scope, but are only working with Nations on Vancouver Island.
	Justice Canada		Developing an Action Plan to implement UNDRIPA in Canada – draft complete by June 2023. Develop a process to align existing and new legislation with the Declaration.	Much work is yet to be done to follow through with actions such as pursuing amendments and reforms to fisheries legislation, regulation or policies to support self-determination and meaningfully exercise Indigenous fishing rights; prioritize funding for Indigenous partners to support their capacity to provide fisheries, habitat, science, and oceans and marine-related services, and support participation in co-management processes and decision-making tied to aquatic resource management.
Provincial	Ministry of Environment and Climate Change Strategy		Administers Environmental Management Act and regulations; Provides pollution abatement and prevention orders; Regulates urban stormwater pollution; Oversees Regional Liquid Waste Management Plans; Develops Water Quality Objectives; Facilitates marine	Prioritizes monitoring of point source permitted discharges, not nonpoint source stormwater pollution; limited capacity to monitor cumulative effects; limited capacity to participate in inter-governmental committees such as the Stormwater

[1] Aarom.ca

			protected areas including Indigenous Conserved and Protected Areas; mandate to develop a new conservation financing mechanism to support protection of biodiverse areas.	Interagency Liaison Group (SILG) and the Environmental Monitoring Committee (EMC).
	Ministry of Forests		Establishes policy and conditions for access to, and use of, the province's forests, land, water and natural resources, and provides integrated decision-making that ensures effective stewardship and sustainable management of B.C.'s land and water base; Administers permits under the Water Sustainability Act and Administers the Riparian Areas Protection Act and Regulation.	Administers surface and groundwater licensing and change approvals that affect watershed health and coastal health; however there are currently no watershed scale objectives within which these approvals are held. Virtually all permits are approved, resulting in death by 1000 cuts.
	Ministry of Water, Land and Resource Stewardship		Leads water sustainability planning: setting goal posts, clarifying objectives with First Nations and partner organization; supports fish and seafood innovation projects; develops and deliver a long-term vision for the Clean Coast, Clean Waters Program; developing Coastal Marine Strategy and Watershed Security Strategy;	Oversee aquaculture, but no mandate to restore shellfish harvesting areas that are closed.
	Ministry of Municipal Affairs		Support fast growing municipalities with funding for infrastructure and community amenities	Municipal elected officials often don't uphold DRIPA or Indigenous rights; aging stormwater infrastructure
	Ministry of Indigenous Relations and Reconciliation		Action plan for DRIPA across ministries and reconciliation initiatives that the entire province can see, touch, and feel in their daily lives (eat?)	Action plan not yet established; significant transformation of legislation and jurisdictional frameworks are required and this will take a long time.
	Ministry of Agriculture and Food		Mandate to prioritize food security and strengthen Indigenous food systems, making more locally produced food available to British Columbians; administers Agricultural Waste Control Regulation and Codes of Practice; oversees commercial aquaculture tenures	Limited capacity to enforce regulations; hobby farms to small to benefit from Environmental Farm Plan program; right to farm seems to trump environmental protection.
	Ministry of Health	BC Centre for Disease Control	Provide publicly available data on biotoxin, bacterial water quality results and pollution sources via online shellfish map. Partner with the WATCH program to support Indigenous communities to monitor phytoplankton.	Communication and collaboration challenges and gaps between BCCDC and CSSP/PRISC. Data sharing and transparency differences. BCCDC interested in sharing more real-time data with the public. Concerned about prohibition fatigue – blanket closures without monitoring can

				result in the public harvesting without understanding the risk.
		First Nations Health Authority	WATCH pilot program to support Indigenous communities with training and resources to conduct phytoplankton monitoring to detect harmful algal blooms and support the re-opening shellfish harvesting areas; Environmental Contaminants Program supports projects that explore the link between human health and environmental contaminants.	Pilot program with limited scope to continue beyond 2023. Limited funding and staff. Phytoplankton monitoring provides some information about biotoxin risk, but if potentially harmful algae species are detected, Indigenous communities will need to test the shellfish tissue for biotoxin and there is only one accredited lab available who only allows testing within open harvest areas.
Regional (Regional District)	Metro Vancouver Regional District		Develops and administers the Liquid Waste Management Act, which includes guidance for both sanitary and stormwater discharges	Board of Municipal elected officials with varied capacity, decisions often made to support lowest common denominator; no authority to hold municipalities accountable to their monitoring and adaptive management frameworks.
	Fraser Health Authority		Administers Public Health Act and Sewerage System Regulation; authority to address failing septic systems as these are considered health hazards	No monitoring of septic systems unless reported concern.
Local (Municipal)	Municipalities: Langley Township, Langley City, Surrey, White Rock, Delta		Oversees land use decisions; maintains stormwater infrastructure; develops Integrated Stormwater Management Plans	No watershed objectives or thresholds regarding impervious surface or forest cover to guide land use decision-making; lack of capacity for adaptive management; aging infrastructure; no mandate to include Indigenous values in decision making.

Washington roles and responsibilities surrounding shellfish management are shown in **Table 6** (WCWP, n.d.; Whatcom County interview rep).

Table 6. Government roles and responsibilities to manage shellfish in Drayton Harbor, Washington State.

Jurisdiction	**Government**	**Role/Responsibilities**	**Challenges/Gaps**
Indigenous	Lummi Tribe, Nooksack Tribe	Upholding treaty rights to 50% of fish and shellfish harvest, delegated responsibility from US EPA to monitor and regulate shellfish harvest on their reserve lands and Usual and Accustomed harvest areas; communicate shellfish advisories when water quality conditions not meeting regulations for safe harvest	Downstream water quality is influenced by multiple non-point sources of pollution upstream, outside of their jurisdiction.

Federal	United States Food and Drug Administration (USFDA) United States Environmental Protection Agency (USEPA) National Shellfish Sanitation Program (NSSP) National Estuary Program (NEP)	US FDA regulates shellfish harvest federally. US EPA funds State/County water quality programs for shellfish, oversees the NSSP and NEP, and determines national shellfish harvest standards and guidelines for the classification of growing areas in accordance with international standards.	Limitations of NEP funding (riparian buffer widths, difficult to use to support transboundary efforts, extensive reporting requirements, competitive funding process and limited funds available, increased administrative burden)
State	Department of Health (DOH) – Environmental Health and Safety	Regulates marine water quality and shellfish, NSSP compliance. Classifies shellfish growing areas as open, restricted, conditional or prohibited based on annual marine water quality monitoring (at least 6 samples per year). Areas near sewage treatment plants and marinas are permanently prohibited based on modeling. Staff support Shellfish Protection Districts once established at County level and continue to monitor 6x per year to assess classification of growing areas.	Large sample data set mean that high results take a long time to "fall off", can have challenges getting out on boat in inclement weather
	Department of Ecology (DOE) – Water Quality Program	Regulates non-dairy agriculture, administers the Water Pollution Control Act. Monitors water quality, provides technical support to address pollution sources. Enforces act when landowners unwilling to fix an identified preventable pollution problem.	Denial of access/visibility of issue needed to document problem, private property rights in rural areas, political will to use enforcement authority may be lacking
	Department of Agriculture (DOA)	Regulates Dairy Nutrient Management Program, inspects dairy farms for compliance, provides technical support and monitors water quality. Informs partner agencies about potential manure-related discharges and complaints regarding dairy and non-dairy agricultural properties.	Regulations require creation of Dairy Nutrient Management Plans, but don't specifically say that they have to follow that plan or update it on a regular basis.
Regional (County)	Whatcom County Public Works – Natural Resources	County required to establish a Shellfish Protection District and Recovery Plan when a shellfish growing area is downgraded by the DOH. In Whatcom County, Public Works coordinates collaborative efforts to carry out the plans and pollution identification and control (PIC) program for marine and freshwater. Non-regulatory staff lead monitoring, data management, and PIC-program related education efforts, including a dog waste pledge program. Outreach focuses on behavior change and includes	Difficult to track down multiple nonpoint sources of pollution like pet waste, boat and RV pump outs or holding tanks, urban wildlife, composting facilities, etc.

		incentives like septic and small farm rebates and pet waste bags.	
	Whatcom County Health – Environmental Health	Administers and regulates on-site sewage system (OSS) program. Provide education, technical support and notifications regarding OSS operation and maintenance (O&M). Enforce codes and investigate complaints. Provide rebate program to encourage O&M. Charge landowners $!9/yr for O&M program – requires evaluation of the OSS every 1-3 years depending on the type–of system. Offer homeowner course to train how to evaluate OSS.	Some push-back from landowners who don't want to have their OSS evaluated every three years. Initially the program required that the first evaluation be done by a specialist, then subsequent inspections could be done by the homeowner provided they take a training course. They have since dropped the requirement for a specialist evaluation and provided a rebate program, and both changes were well received.
	Whatcom County Planning & Development Services	Regulates land use in unincorporated Whatcom County, ensuring that farms comply with the Critical Areas Ordinance. Approves farm plan applications through Whatcom County's Conservation Program on Agricultural Lands.	Must see visual evidence of violation (livestock in buffer area), confusion about applicability of various regulatory programs to different types of operations (not always clear to landowners what rules they need to follow)
	Whatcom Conservation District	Farm planning assistance, data management, water quality data mapping, volunteer coordination. Provides cost share and rebates to farmers who want to improve farm practices and improve water quality. Hosts education opportunities. Habitat enhancement and riparian planting with State and Federal funding support. Partner with City of Lynden on stormwater outreach.	Work hard to become a "trusted messenger" that is not seen as regulator/government. Voluntary changes often occur at a very slow pace, sometimes over years
	Drayton Harbor Shellfish Protection District	Develop a SPD Recovery Plan (Citizen Advisory Committee tasked to provide advice to County Council on shellfish recovery plan) Implementation of recovery plan is coordinated by Whatcom County Public Works, with participation from all jurisdictions listed on this table.	
Local (Municipal)	City of Blaine and Custer	Stormwater management and outreach	Growing urban development pressure and aging stormwater infrastructure adds stress to the system. Sanitary sewer cross-connections with storm sewers are difficult to find.

Social-ecological System

The social-ecological system surrounding Indigenous shellfish harvest on the Canadian side of Steloqwen: tsepoleq/Semiahmoo Bay involves many elements or variables, as shown in Appendix 3. Foundationally, the system was built within a colonial paradigm that values capitalism, resource extraction, economic growth and efficiency, without embracing the underlying importance of ecosystem health for human wellbeing (Raworth, 2017; Whitmee et al., 2015). Physically central to the system are bivalve shellfish or clams, as well as the overall coastal biodiversity within the bay ecosystem. Contaminated water, upland pollution sources, and biotoxins are also key elements of the system; they cause pathogens or phytotoxins to be taken up into the clams and other bivalves, making them unsafe to eat. Therefore as the potential for pollution and/or biotoxin in the bay increases, the risk to human health is elevated, which triggers the Canadian federal government to prohibit shellfish harvest.

All levels of government are involved within the system. Federal agencies regulate shellfish harvest; however, recreational nor Indigenous harvest management have not been a priority within the program (DFO, 2022; Sandborn et al., 2023c). Provincial and Municipal governments regulate the majority of upland pollution sources but do not consider the stringent guidelines required to ensure safe shellfish consumption as this is a matter within the jurisdiction of the federal government and outside of their jurisdiction.

External drivers such as urban development exacerbate the input of pollution sources by increasing population density, impervious surfaces and fossil fuel use within the Steloqwen/Boundary Bay watershed, which in turn amplifies climate change impacts. Competing government priorities such as the need for affordable housing are further amplifying the impact of urban development and increasing sources of pollution, while limiting funding capacity to shellfish remediation for Indigenous food, social and ceremonial purposes. Semiahmoo First Nation remains disconnected from their traditional food source of clams because of unaddressed pollution sources and a lack of attention to the problem.

Semiahmoo capacity to be involved in coastal governance leadership and water quality monitoring has the opportunity to intercept existing system structures and focus attention on remediation action while improving relational connections to the land and water. A detailed causal loop diagram can be found in Appendix 3. A simplified version highlighting key variables, drivers and functional relationships is shown in **Figure 6**. Key variables (rectangles), drivers (ovals), and functional relationships of the social-ecological system: direct links (solid blue arrow), feedback (double-sided blue arrow), and external links (dashed black arrow) are described.

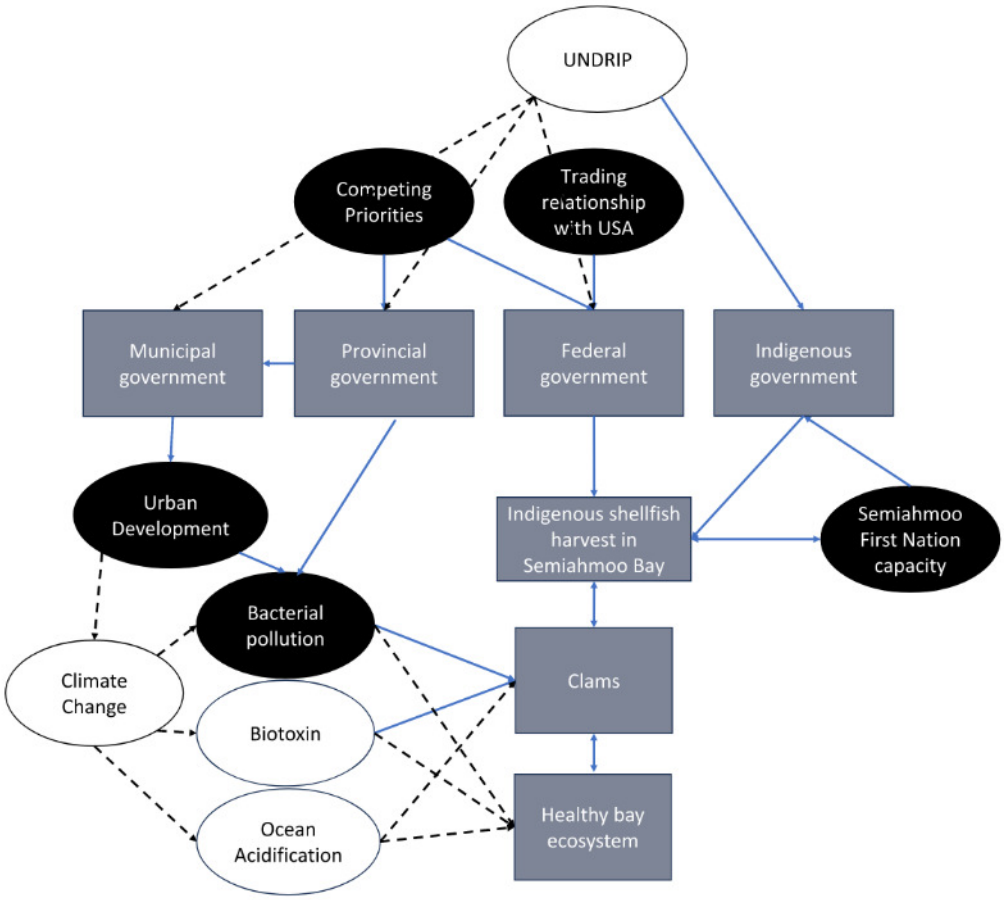

Figure 6. Simplified social-ecological system map of shellfish management in Steloqwen/Boundary Bay. Key variables (rectangles), drivers (ovals), and functional relationships of the social-ecological system; direct link (solid blue arrow), feedback (double-sided blue arrow), and external link (dashed black arrow).

Important intervention or leverage points are revealed as the systems map is explored. With insight drawn from Meadows (1999), jurisdictional interviews, and Indigenous storytelling workshops, the most effective places to intervene will be explored in Chapter 5.

Revitalizing Indigenous Shellfish Harvest

Thematic analysis of the jurisdictional interviews revealed numerous barriers to be addressed in order to revitalize shellfish harvest and even more opportunities to move towards revitalizing shellfish harvest. To describe these findings, I will use the SENĆOŦEN words: QI,ÁTEN̲ meaning "someone being stopped" for the barriers and ŚKEM¸SET meaning "trail or path" for the opportunities. Key QI,ÁTEN̲ (barriers) and ŚKEM¸SET (opportunities) are described within this section and will be discussed further in Chapter 5 to inform the next steps to revitalize shellfish harvest. Key QI,ÁTEN̲/barriers identified were jurisdictional complexity, pollution sources, and capacity issues (**Figure 7**). Key ŚKEM¸SET/opportunities identified were more numerous than QI,ÁTEN̲ and included monitoring, collaboration and Indigenous leadership (**Figure 8**).

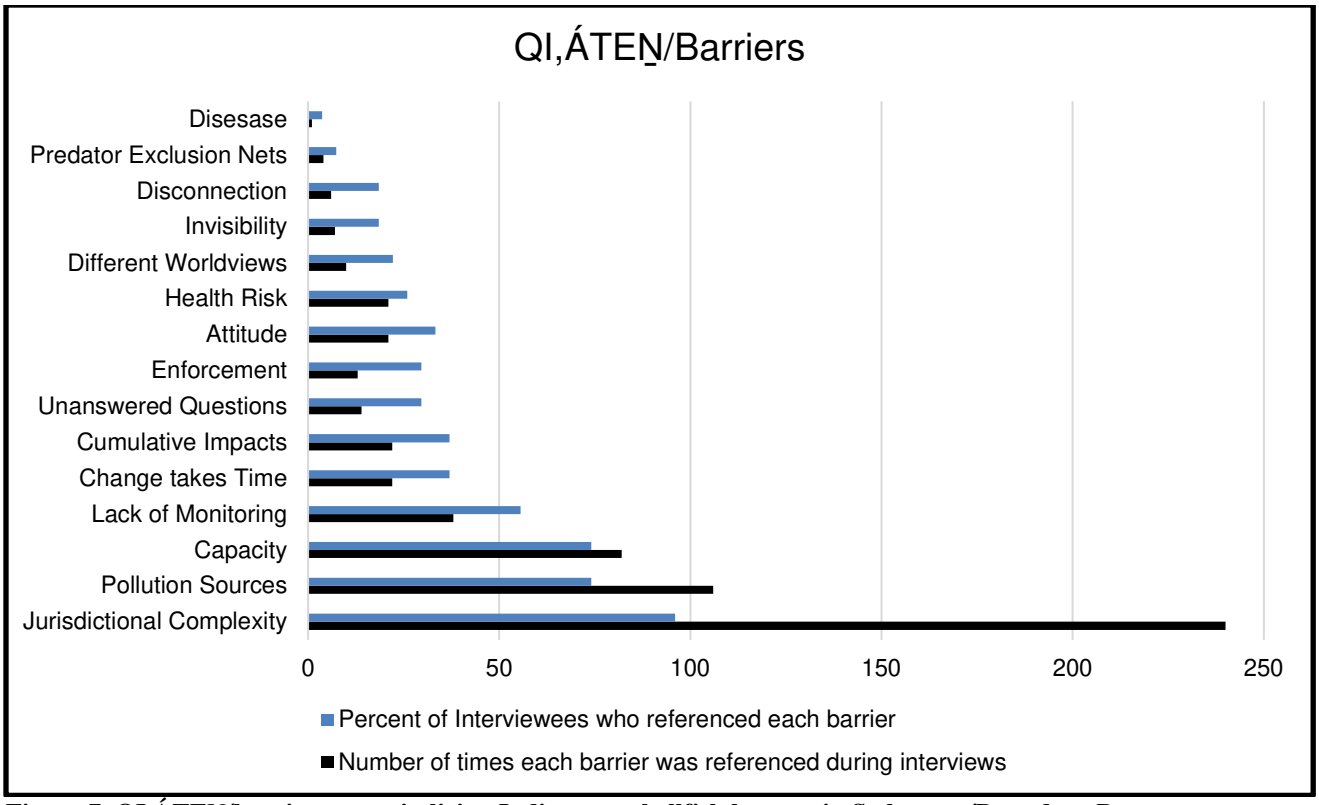

Figure 7. QI,ÁTEN̲/barriers to revitalizing Indigenous shellfish harvest in Steloqwen/Boundary Bay
(Source data from jurisdictional interviews, n=31).

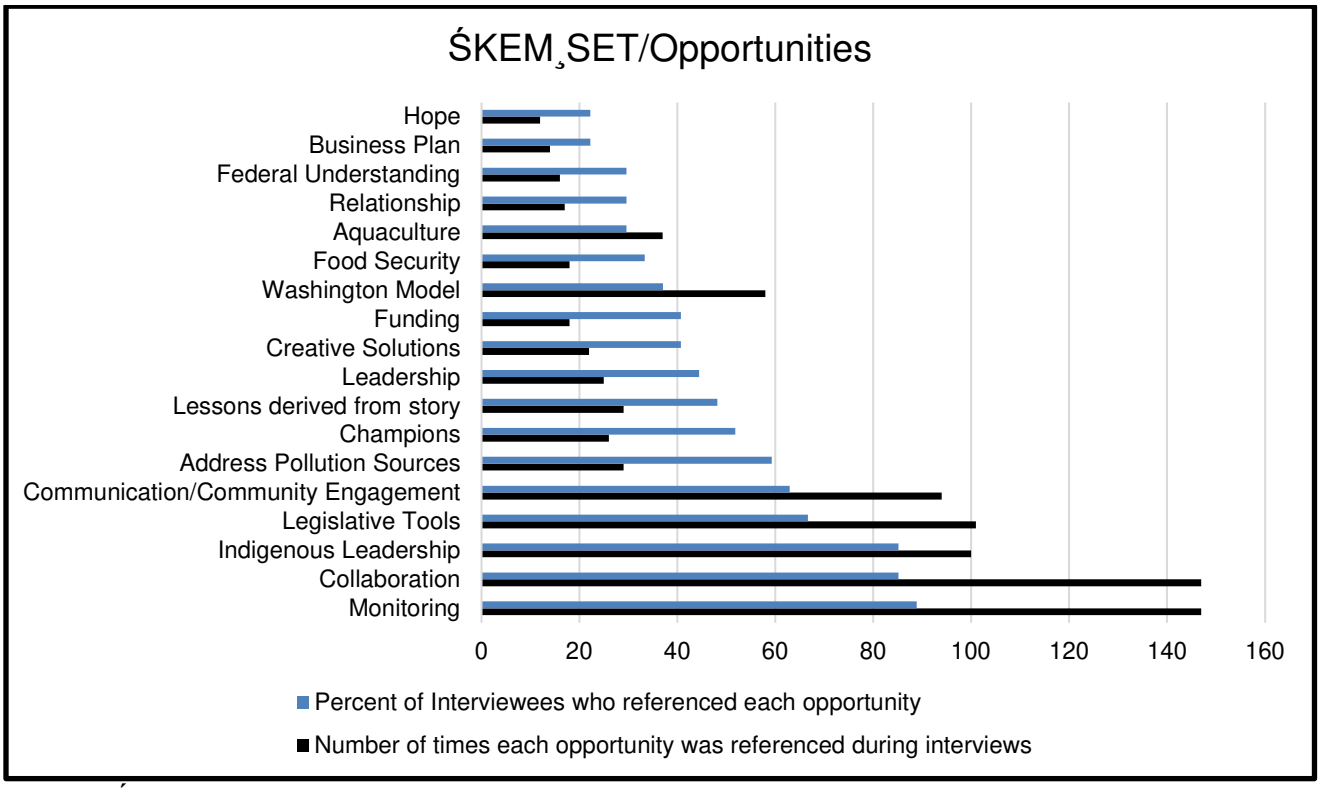

Figure 8. ŚKEM̓SET/opportunities to revitalizing Indigenous shellfish harvest in Steloqwen/Boundary Bay
(Source data from jurisdictional interviews, n=31).

QI,ÁTEN = Someone being stopped, Barriers

The three themes noted most frequently during jurisdictional interviews were as follows:

1. Jurisdictional Complexity
2. Pollution Sources
3. Capacity

Jurisdictional Complexity

The QI,ÁTEN (barrier) identified most frequently across all jurisdictional interviews was that of jurisdictional complexity surrounding shellfish management, particularly in British Columbia, Canada. As described in the system map, multiple levels of government are involved in governing and influencing where, when and how shellfish are harvested (**Figure 6**). Each level of government has a defined mandate and area of jurisdiction, which overlaps in some cases and leaves gaps in others (**Table 5** and **Table 6**). Overall, there is a lack of leadership, coordination and accountability between and among all levels of government involved in shellfish management, resulting in a "*soup of jurisdictions*" (Erin, Academic interviewee, 2023). The following section highlights the main challenges that limit shellfish harvest for Semiahmoo First Nation related to jurisdiction at transboundary, federal, provincial, regional and municipal levels of governance. The challenges focus primarily on the Canadian side of the border because that is where Semiahmoo First Nation reserve lands are located and they are most affected by Canadian jurisdictions.

Transboundary jurisdiction

"What does it mean, the act of creating a border? Not just on the waterways, but also on the people that are connected to those waterways?"

Erin, Academic Interviewee, 2023

The waters and the creatures of the Salish Sea flow in all directions, ignoring international borders. Lummi First Nation are some of Semiahmoo's closest relatives and their location on the south side of the 49th Parallel means a completely different management system. In 1996 when two Semiahmoo community members were charged for harvesting clams in a closed area, on the beach adjacent to their reserve lands, their Lummi relatives on the other side of the bay were legally harvesting and they continue to do so while Semiahmoo members remain disconnected.

> *"It's not just a bacterial issue or a scientific issue. It's not just a political issue. It's all of it together"* Erin, Academic interviewee, 2023.

There are some attempts by Canada and the United States to collaborate within the shared waters of the Salish Sea through the Joint Statement of Cooperation on the Georgia Basin and Puget Sound Ecosystem (EC & USEPA, 2000), and production of the Salish Sea Action Plan (Government of Canada and USEPA, 2021), and the Health of the Salish Sea Ecosystem Report (USEPA, 2022). However, these agreements do not include Indigenous communities. The

border remains as a barrier to Semiahmoo First Nation whose territory was divided in half when the border was established, separating relatives and disconnecting the people from their food sources and seasonal traveling rhythms.

Canadian Shellfish Sanitation Program

Federally, the Canadian Shellfish Sanitation Program (CSSP), made up of representatives from Fisheries and Oceans Canada, Environment and Climate Change Canada, and the Canadian Food Inspection Agency, has the shared goal to ensure that bivalve molluscan shellfish are safe to eat, by controlling their harvest in Canadian tidal waters (DFO, 2022). Numerous challenges were identified within this program, including role complexity, commercial/export priorities driving scope, a lack of remediation mandate and overall limited capacity to deliver. The distinct roles and interdependence cause complications for program delivery (**Table 5**). Initially designed to support wild commercial harvesters, the CSSP continues to prioritize commercial harvesting and aquaculture, with limited time and capacity to focus on areas for recreational harvest or areas important for Indigenous Food, Social and Ceremonial use (DFO, 2022). Communication from the CSSP regarding priorities and resources available to support growers and Indigenous communities is limited, resulting in confusion. This results in inefficiencies and frustration for growers and those trying to work with them. Their budget hasn't been increased in 20 years, not even keeping up with inflation (Shellfish grower/private industry Interviewee, 2023).

While the three federal agencies regulate shellfish harvesting across the country, they do not restore shellfish harvest areas that have been closed and they have no jurisdiction over pollution sources (Non-profit Interviewee, 2023), which are either coming from upland freshwater sources (provincially, regionally or municipally regulated) or from boating wastewater (Transport Canada regulated). Not a program that is proactive with regard to pollution sources, the CSSP is very much a reactive program, establishing blanket closures in any coastal areas where these is a potential risk of shellfish contamination.

Additionally, Environment Canada has no mandate or capacity to monitor water quality within coastal areas unless they have already been classified as open and safe to harvest. There is a mechanism for Indigenous communities or interested parties to apply for an area to be re-classified, however the CSSP received over 80 requests for reclassification of shellfish harvesting areas in the past five years and none of these areas have been re-opened for harvest due to lack of CSSP capacity (DFO, 2022). The delivery model relies on the applicant to provide documented evidence that all known and potential pollution sources be identified, controlled or remediated, placing the onus on Indigenous communities to monitor and report without providing any funding or support. Unsurprisingly, closed areas have increased on the Canadian side of the Salish Sea by 44% since 1989 (USEPA, 2022).

Colonial government structures operate within siloed departments where staff working on particular fish species do not interact with others who manage different fish within the same ecosystem (CFN). These isolated structures make it difficult to understand the complex coastal ecosystems where myriad species co-exist and are interdependent. As one non-profit interviewee noted:

> *"There is a need to manage fisheries more holistically. The Oceans Act provides some framework for this, however within the Pacific Region, the Oceans Senior person is not at the level of the top or Fisheries management, so you need someone at an equal level if you want to change things organizationally".*
>
> Patrick, Non-profit Interviewee, 2023

Another challenge within the federal management of shellfish is that Health Canada is responsible for assessing toxicity levels in food, conducting risk assessments according to the average Canadian. This is a problem when it comes to Indigenous communities who eat up to 14 times more seafood than the average Canadian (Non-profit interviewee, 2023). Even urban Indigenous communities with ready access to supermarkets eat up to 6 times as much seafood (Non-profit interviewee, 2023). Health Canada doesn't look at the toxicology of wild food. The CSSP collects data on shellfish toxicity in commercial harvesting areas that are open; however, we don't know what the contaminant levels are in seafood eaten by many coastal Indigenous communities. This is a jurisdictional and information gap with the greatest risks landing on Indigenous communities.

Provincial agencies

The Province of BC holds responsibility to manage, protect and enhance the environment, including intertidal areas, however there are no provincial staff allocated to pursuing shellfish objectives for food, social and ceremonial purposes. BC Ministry of Environment and Climate Change Strategy is at capacity and focused on managing permitted point source discharges under the Environmental Management Act. They are not currently focusing on managing nonpoint source pollution, nor assessing cumulative impacts, other than in the northeastern corner of BC in response to the Blueberry River Supreme Court decision Yahey v. BC (Gibride et al., 2023; Provincial/State government Interviewee, 2023).

Current provincial Boundary Bay Water Quality Objectives include bacterial pollutant parameters as indicators; however, they "are set to protect the most sensitive designated water uses" within the freshwater context (provincial jurisdiction) and do not include shellfish harvest as a protected water use (Bull, 2010). Protected water uses include primary contact recreation and irrigation. The standards established to protect these uses are much less stringent than those required to protect shellfish for consumption. Regardless, provincial water quality objectives are not a legally prosecutable tool; they must be considered when proposing new development projects in an area, but they are not enforced.

Under the Environmental Management Act, the Province has authority to exercise powers under sections 83 and 84 to ensure that individuals and municipalities are held responsible to control, abate or remediate any substance entering the environment that is causing pollution (EMA, 2003). When it comes to urban stormwater however, there is tension in terms of provincially mandating municipalities to uphold standards as it may be perceived as "treading on toes" and wandering into the realm of the local government jurisdiction of land use. Municipalities are held accountable to monitor and manage stormwater by developing Integrated Stormwater Management Plans as a requirement under the regional Liquid Waste Management Plan; however these are more focused on hydrotechnical considerations of flow and capacity, rather than water quality or ecosystem health.

Provincial governments have an opportunity to take a watershed approach to environmental protection and establish watershed-scale sustainability objectives. They have established a number of these in more remote watersheds, largely comprised of provincial crown land and have seen some success in monitoring and pursuing watershed sustainability objectives using these tools (Provincial/State government Interviewee, 2023). Within the urban environment surrounding Steloqwen/Boundary Bay, the same tension of treading into municipal land use planning jurisdiction has caused provincial governments to be hesitant in developing these objectives and thresholds. There are also competing priorities such as the need for affordable housing, so efforts are being made to streamline residential development, often minimizing environmental protection considerations. Some municipalities are interested in looking for watershed scale objectives to inform land use decisions, while others might feel threatened or oppose provincial regulation (Provincial/State government Interviewee, 2023).

The Province regulates a number of activities that occur within coastal ecosystems, including: environmental assessments, tourism and recreation, aquaculture (marine plants, shellfish and finfish), marinas, log handling, conservation and scientific research, commercial harvest of vegetation. BC is currently developing a Coastal Marine Strategy to address the cumulative effects of all of these activities, however there still is no legal framework to uphold the strategy.

Regional governance

Metro Vancouver Regional District is made up of elected representatives from the 21 member municipalities and one treaty First Nation. They work together to collaboratively build plans and deliver regional-scale services such as sanitary waste treatment, drinking water, and regional parks. When municipal elected officials join the Metro Vancouver Board, they take an oath to hold a regional perspective in decision making and consider what is best for the region as a whole, upholding the purposes of the Regional District to provide "stewardship of public assets" and foster "the current and future economic, social and environmental well-being of its community" (LGA, 2015). There is no accountability mechanism holding Board members to these purposes of good government for the community and therefore it may be tempting for members to vote on behalf of what's best for their municipality, rather than the region (Regional government Interviewee, 2023).

Metro Vancouver has been delegated authority from the Province to oversee stormwater management through the administration of a Liquid Waste Management Plan. The Plan provides guidance for Metro Vancouver member municipalities to manage wastewater and stormwater; however, historically the Regional District has not had any authority to hold municipalities accountable to the plan (Regional government Interviewee, 2023). At the time of writing, Metro Vancouver was in the process of updating the Plan and both the Regional and Provincial governments have an opportunity to listen to Indigenous values and incorporate these into the Plan. For example, accountability mechanisms could be written into the plan, holding Municipalities responsible to meet water quality guidelines suitable to protect shellfish harvest in Metro Vancouver receiving waters.

On the waste management side, there are numerous agencies with overlapping scope in terms of environmental protection but with differing roles and responsibilities that are not always clearly communicated. For example, Regional Health Authorities are responsible to ensure that wastewater doesn't enter surface water or tidal waters under the Municipal Sewerage Regulation; however, they don't currently have a mandate or capacity to monitor on-site sewage systems or septic systems to determine if they have been installed appropriately or if they are functioning as intended (Regional government Interviewee, 2023). In fact, the Vancouver Island Health Authority doesn't have records for 60% of the homes surrounding Baynes Sound, an important shellfish harvesting area for commercial growers (Shellfish grower/private industry Interviewee, 2023). It is up to individual landholders to ensure that they have a proper septic system installed and to get a third party contractor to come and inspect it as required. Septic systems are expensive to maintain, inspect and/or replace. Without any enforcement or monitoring, this has become a gap in governance resulting in an undermanaged pollution source.

Municipalities

Urban stormwater is managed by municipalities with guidance from the BC Ministry of Environment through Metro Vancouver's Liquid Waste Management Plan. Ideally water would be managed on a watershed scale to account for cumulative impacts of development and to enable the pursuit of ecological health. as one non-profit interviewee noted:

> "*If we can't get a cross-municipal border vision, we can't get true watershed management*" (Dean, Non-profit Interviewee, 2023).

However, municipal boundaries are not aligned with watershed boundaries and therefore municipalities manage streams and stormwater within the scope of City bounds with little to no collaboration across borders. For the Semiahmoo Bay watershed or drainage area there are five Canadian municipalities and one American municipality who currently manage their stormwater individually. Canadian municipalities don't typically consider shellfish harvesting as a value they are managing for. They will monitor and manage bacterial pollution sources to a recreational standard for swimming beaches and to an irrigation standard in rural areas, however the stringent shellfish standards are not considered a priority. So municipalities manage for general principles of pollution prevention and monitor and regulate to uphold the values within their jurisdiction (Municipal government Interviewee, 2023).

Municipalities typically have Integrated Stormwater Management Plans in place for all subwatersheds within their boundaries, however there is no coordinated tracking system or watershed scale objectives, linking stormwater management to inform land use decisions. For example, when the province reviews applications for development near streams, each decision is made in isolation and watersheds are experiencing cumulative impacts: death by a thousand cuts due to jurisdictional blind spots (Municipal government Interviewee, 2023). Linked to this challenge, is the current reliance on qualified professionals to conduct assessments on a project by project basis, rather than considering the watershed scale context of potential cumulative impacts. This professional reliance model is discussed further in Chapter 5.

Aquaculture

The CSSP shellfish safety system was built to support commercial aquaculture in Canada. Aquaculture, or shellfish farming is governed by both the federal and provincial governments. Fisheries and Oceans Canada provide federal licenses; however the provincial government issues Crown land tenures because the intertidal lands belong to the Crown (Provincial/State government Interviewee, 2023). Then Transport Canada issues a navigable waters permit. So all three jurisdictions need to work together to issue an aquaculture permit. Processing shellfish from an aquaculture operation is complicated in terms of its licensing framework and food safety and distribution system. Since Semiahmoo First Nation are not interested in pursuing aquaculture at this time, we won't go into detail on this complication. Bivalve shellfish need to be processed in a federally licensed plant (Provincial/State government Interviewee, 2023).

Indigenous jurisdiction/sovereignty

Semiahmoo First Nation have been practicing their way of life on the lands and waters of the Salish Sea since the time of the last flood, approximately 10,000 years ago (Elected Chief Harley Chappell, personal communication, Dec., 2021). Indigenous law is the articulation of this way of life; it comes from the Creator and is established in relationship with the laws of nature (Redvers et al., 2020; Borrows, 2010; Ballantyne et al., 2022; Kimmerer, 2015). Indigenous communities including Semiahmoo First Nation, have the right to practice, uphold, and strengthen their laws through self-determination and pursuing language and spirituality (United Nations, 2007). While this is true, the reality that Semiahmoo First Nation experiences are restricted by the colonial jurisdictional frameworks described above.

Semiahmoo First Nation are restricted under the Canadian Fisheries Act from harvesting shellfish within a closed area and so are limited by the shortcomings of the CSSP and the jurisdictional complexity described in this section. There is a lack of clarity at all levels of government involved in shellfish management on the Canadian side of Steloqwen how to apply the principles of UNDRIP. There is a need to re-consider how shellfish are managed in Steloqwen and throughout the BC coast to address the many gaps and challenges noted above.

Jurisdictional Complexity - Summary

In summary, current jurisdictional frameworks are insufficient to effectively govern the coastal waters of the Salish Sea. There is a lack of coordination and oversight due to no single agency taking responsibility or leadership for restoring shellfish harvest. It is difficult to know who to speak to or who is responsible for what due to the complicated nature of overlapping jurisdictions and due to the frequent turnover of federal and provincial staff (Academic and Provincial/State government Interviewees, 2023). Staff turnover is a structural challenge that is rooted in a worldview that is focused on individual "progress" and economic advancement. This contrasts with Indigenous worldviews that value long-term place-based knowledge development. There is a lack of accountability and clarity of responsibility to clean up the mess we've made on the landscape that drains into these waters. There is a need for "*realignment of jurisdictional boundaries between city, county, province/state, federal, tribe.*" (Academic Interviewee, 2023). One provincial interviewee noted that there is a need for a governance model where the members are accountable to meet shared objectives with this question:

"How can we enable jurisdictions to come together in a more deliberate way to deal with these issues?"

Provincial/State government Interviewee, 2023

Pollution Sources

Another strong theme that arose from the jurisdictional interviews was the QI,ÁTEN (barrier) of pollution and contaminated waters. Steloqwen is held in a prohibited state in terms of shellfish harvest due to the presence of known and/or potential sources of bacterial pollution as well as biotoxin. Because bivalve shellfish are filter-feeders, they can bioaccumulate contaminants and toxins within their tissue, making it unsafe to eat. The most common causes of illness from consuming shellfish are from pathogens associated with untreated human or animal feces such as Norovirus, naturally occurring bacteria such as *Vibrio parahaemolyticus*, and marine biotoxins found in algae, resulting in diarrhetic shellfish poisoning (DSP), paralytic shellfish poisoning (PSP) or amnesic shellfish poisoning (ASP) (Wan et al., 2018).

Bacterial Pollution

There are multiple potential sources of bacterial pollution throughout the Semiahmoo Bay and TA'TALU (Little Campbell River) watersheds due to government authorized land use, including: failing septic systems, agricultural runoff, road runoff, stormwater outfalls, sanitary pump station overflows, in addition to pet waste and wildlife (Zevit et al, 2008). Recent water quality monitoring efforts have shown consistent fecal bacterial pollution in the upper watershed, most likely from septic or agricultural sources; however the highest concentrations of fecal pollution is coming from urban stormwater outfalls and urban streams near the mouth of the TA'TALU and entering directly into Semiahmoo Bay (**Figure 9**).

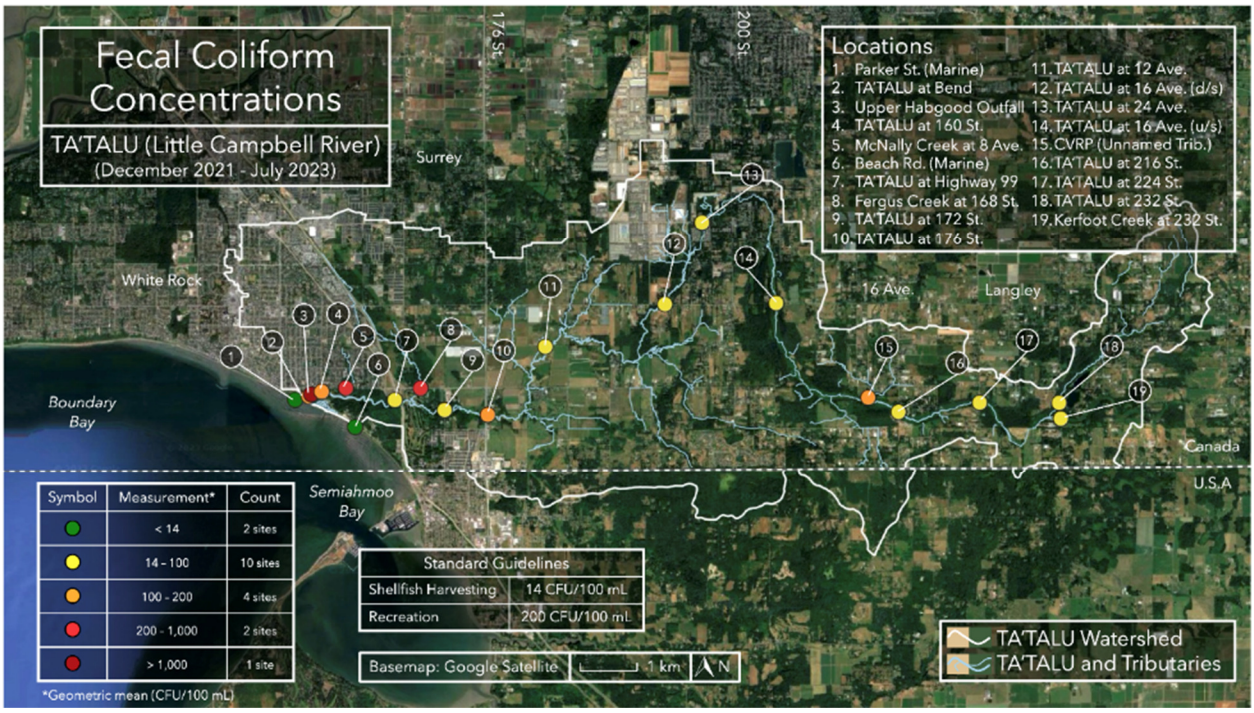

Figure 9. Bacterial pollution levels within the TA'TALU/Little Campbell River watershed and Tsepoleq/Semiahmoo Bay

Source: S. Esau, A Rocha Canada. Freshwater Boundary Bay Technical Working Group presentation (personal communication, June 22, 2023). Map created by A.Baylis.

Urban Stormwater

Urban development near the mouth of the TA'TALU River is associated with a deterioration of water quality, showing elevated bacterial pollution (**Figure 9**). Urban development is anticipated to continue to increase within the municipalities of Langley Township and Surrey City to meet the growing demand for housing and industrial land. For example, the population in Surrey grew by 9.7% from 2016-2021, the fastest growth of Metro Vancouver with an average of over 4000 people arriving per month (Pablo, 2022). Populations are predicted to continue to increase in the area surrounding Semiahmoo Bay, at rates greater than regional/provincial rates (Ip and Lavoie, 2020); with Surrey reaching over 880,000 by 2051 (City of Surrey, 2022).

In addition to bacterial pollution, urban environments are associated with increased suspended solids, metals, nutrients, pharmaceuticals, hydrocarbons and toxic contaminants such as 6PPD-Quinone, a chemical linked with up to 90% pre-spawn mortality rates in Coho salmon populations (Tian et al., 2021; DOE, 2022; Yunker, 2015). As urban development increases, impervious surfaces increase, and impacts on aquatic life can be measured as low as 0.5-15% total impervious area (Arnold and Gibbons, 1996). Based on 2019 orthophoto imagery and analysis, the TA'TALU watershed has an impervious area of approximately 18%, showing an increase of 3% since 2015. This is above the suggested level of 10% impervious surfaces in urbanizing watersheds to prevent impact on stream health, and is expected to increase with expanding development pressures.

Common pollution challenges within the urban environment include: cross-connections between sanitary and storm sewer infrastructure, aging storm sewer infrastructure exacerbating the first problem. Storm sewer pipes are laid in the ground side by side with sanitary sewer pipes and as they age and degrade, cross connections can become more common. In addition, there were unknown locations of pipe infrastructure installed on Semiahmoo Reserve lands as early as 1913 to support Campbell River Lumber Company operations, then Surrey and White Rock activities; White Rock officially separating itself from Surrey in 1957 (Brown, 2014). Records for these pipes were apparently lost during a flood in White Rock's City Hall prior to digitization and nobody knows their status or locations under an area known as Semiahmoo Park, where stormwater contamination levels are consistently showing high fecal coliforms (Juteau, 2008; P. Simonin presentation, June 29, 2023). This is an environmental justice issue where Surrey and White Rock walked away from aging infrastructure they installed on Semiahmoo First Nation reserve lands that are now causing pollution issues. The Municipalities have greater capacity to update stormwater infrastructure and mapping information systems within their borders, whereas Semiahmoo First Nation lacks the capacity to get this issue addressed.

Local urban streams such as McNalley Creek and Fergus Creek (**Figure 9**) have also shown consistently high levels of fecal coliform pollution. This contamination could be coming from stormwater cross-connections with sanitary sewage and/or mis-managed pet waste. Pet ownership has increased throughout the recent Covid-19 pandemic with 60% of households owning at least one cat or dog (CAHI, 2022). Spills from industrial sites or sedimentation from construction sites are reported approximately once per month in the McNalley and Fergus Creek watersheds (Surrey staff, personal communication, June 2023).

Cumulative Impacts

The challenge with numerous non-point sources of pollution is that they may be less consequential independently, but the accumulated impact is significant. Urban, agricultural, and industrial pollution sources are transported along roadways into ditches and piped stormwater systems, "*bring(ing) a cocktail of problems to the receiving environment*" (Catherine, Regional government Interviewee, 2023). Sources are difficult to track and manage within the multijurisdictional landscape surrounding Steloqwen and "*there's … a whole level of unpredictability that comes around it*" (Catherine, Regional government Interviewee, 2023).

In addition to fecal pollution sources entering the bay through overland runoff, there are also direct inputs through wildlife (Steloqwen/Boundary Bay is a Key Biodiversity Area with abundant waterfowl and other bird species) and recreational boat discharges. There are small marinas based in White Rock, Crescent Beach and the City of Blaine, as well as some recreational boating traffic within the bay. While regulations exist to prevent raw sewage discharge from boats within 12 nautical miles of shore (Vessel Pollution and Dangerous Chemicals Regulation, 2021), this is difficult to track and enforce.

Compared to the days of abundant salmon and healthy clams that Semiahmoo First Nation community members share about in their stories, the watersheds surrounding Steloqwen are incredibly degraded by the cumulative impacts of multiple pollution sources. Without regulated thresholds or watershed health goals, we will continue to accumulate impacts and deteriorate ecological function. The Provincial government holds a cumulative effects

framework to inform natural resource decisions; however due to limited funding, provincial staff within the South Coast Region are focusing efforts on permitted discharges, rather than non-point source pollution and there are no long-term monitoring programs in place to assess water quality of receiving waters in Steloqwen (Provincial/State government Interviewee, 2023).

Biotoxin

The shellfish closures in Steloqwen/Boundary Bay are due to both sanitary (bacterial pollution) and biotoxin risks. These data are not being collected by government on the Canadian side of Steloqwen; the closures are risk-based due to lack of information. Biotoxins are produced by naturally occurring microscopic algae or phytoplankton in marine environments. Under certain conditions: warm temperatures, elevated nutrients, sufficient sunlight these algae can "bloom" or rapidly reproduce, increasing the risk of illness (CFIA, 2012; DOH, n.d.). Since bivalve shellfish are filter feeders and feed on phytoplankton, these toxins can accumulate in their tissue, potentially causing illness or death if consumed.

Biotoxin are especially challenging because they are invisible, they are difficult and costly to test for, numerous (approximately 200) different phytoplankton species are linked with the toxins, and they cannot be treated by freezing or cooking bivalves (Hallegraeff et al, 2021; McIntyre et al., 2021). The laboratory tests to detect biotoxin are complicated and the only available location to test in Canada is the one local Canadian Food Inspection Agency-approved lab in Burnaby (CFIA, 2021; Shellfish grower/private industry Interviewee, 2023). There are ways to sample for the presence of phytoplankton species that typically produce dangerous toxins like Paralytic Shellfish Toxins (PST) such as *Alexandrium* spp., and restrict shellfish harvest when these species are detected. This risk management process is being facilitated through the First Nation Health Authority WATCH (We all take care of the harvest) program in selected pilot project areas in BC (FNHA, 2023) and is also being done in Drayton Harbor through a citizen science group (Haupt, 2023). If harmful algal blooms are detected, recreational shellfish harvest is restricted in those areas as a precautionary approach.

Biotoxin levels appear to be increasing along the Pacific Coast of North America, correlated with increasing sea temperatures, climate change, El Nino events, eutrophication and anthropogenic activity (Hallegraeff et al., 2021; McIntyre et al., 2021). As urban and agricultural development continue to increase, along with climate change impacts, we can expect that harmful algal blooms will also increase, increasing the risk of bivalve shellfish consumption.

Ecological Interactions

It is important to consider how bivalve shellfish fit within the wider ecological system of Steloqwen. Little is known about species composition of bivalve shellfish let alone the complex interactions with the abundance of biodiversity and habitat features within the bay. One of the world's highest rated Important Bird Areas and a designated Key Biodiversity Area, Steloqwen provides habitat for millions of ducks and shorebirds as well as numerous species at risk (IBA Canada, n.d.; KBA Canada, 2022). Bivalve shellfish play an important role in intertidal food webs, contributing to the diets of waterfowl such as Northern Pintail, Mallard and Green-winged teal (Baldwin and Lovvorn, 1994). Therefore pollution affects not only shellfish and human health, but contaminants also move up the food web, extending the impacts throughout estuarine and marine ecosystems (Burd et al., 2018). As intertidal organisms, bivalve shellfish must be

adaptable to constantly fluctuating conditions: water level, salinity, temperature, pH. Climate change amplifies the vulnerability of these intertidal organisms and the food webs associated with them (Alava et al., 2017). Increased water temperatures due to climate change results in more frequent harmful algal blooms. These can cause a higher risk of marine biotoxin accumulation in shellfish, which may require more frequent monitoring/sampling (DFO, 2022)

Pollution Sources - Summary

In order to satisfy federal government requirements for reclassification of Semiahmoo Bay as a shellfish harvesting area, it must be demonstrated that all sources of pollution are identified and controlled, and that remediation efforts were successful to address pollution (CSSP, 2019). A 30 point data set must be provided. This remains a challenging QI,ÁTEN (barrier) and connects to questions of justice and jurisdiction. How is it that all of this extra territorial pollution is generated by upstream land users and governance and yet Semiahmoo First Nation, downstream is held responsible to ensure all pollution sources are addressed for their own food security and cultural wellbeing?

Capacity

Sixty-three percent of jurisdictional interview respondents indicated capacity as a significant QI,ÁTEN or barrier to revitalizing shellfish harvest. As previously mentioned, there is a lack of capacity across all levels of Canadian jurisdictions to effectively manage shellfish such that pollution sources are addressed and contaminant levels are monitored to ensure safe and legal harvest.

Canadian government jurisdictional capacity

The current federal shellfish management framework does not have sufficient capacity to address the growing awareness of Indigenous communities' rights to harvest shellfish for food, social and ceremonial purposes. There is limited capacity for biotoxin testing even for commercial shellfish growers (Academic, Provincial/State government and Shellfish grower/private industry Interviewees, 2023), and not enough staff to manage shellfish effectively.

> *"That's just the problem (in) a lot of government agencies. I've got, like, half the staff that I should have. and I just can't get around to all of it."*
>
> Matthew, Provincial/State government Interviewee, 2023

Provincial jurisdictions do not have sufficient capacity to address non-point pollution sources and are focusing efforts on permitted discharges (Provincial/State government Interviewee, 2023). Regional Health Authorities do not currently monitor septic systems, but only respond to complaints due to a lack of capacity and the high number of septic systems in rural areas (Regional government Interviewee, 2023). Municipalities are responsible to maintain and upgrade stormwater infrastructure to ensure that the water flowing from stormwater outfalls into freshwater and marine environments is not causing pollution. However, they also complain of a lack of capacity to address aging infrastructure and do not currently have capacity to treat stormwater (Municipal government Interviewees, 2023) or even to analyze water quality monitoring results to enable adaptive management (Municipal government Interviewee, 2023).

What would it take for municipalities to establish appropriate green infrastructure such as biofiltration wetlands or rain gardens to treat stormwater in the Semiahmoo Bay watershed?

Significant capacity is needed to foster relationship building between government decision makers and Indigenous communities (Municipal government Interviewee, 2023), as well as the capacity to coordinate efforts, share information and work together to address complex problems like water quality in Steloqwen (Non-profit Interviewee, 2023). Provincial representatives were clear:

> *"Even if we were given a mandate to come together and work (on collaborative watershed sustainability initiatives), we don't have enough people to do it in every watershed that has problems."*
>
> Leah, Provincial/State government Interviewee, 2023

Professional Reliance Model

One of the ways government capacity challenges are being addressed is through the use of qualified professionals, which adds another barrier to taking a cohesive watershed approach in coastal ecosystem management (Carter, 2014). Government staff do not have the capacity to conduct or ground truth every study to determine the potential impacts of proposed development. Instead, they rely on qualified professionals such as Registered Professional Biologists to conduct the assessments and submit their reports to government staff for review. In the absence of an overarching watershed-scale plan stating objectives and thresholds to maintain a thriving ecosystem, each project is assessed individually and often doesn't take the cumulative effects of multiple projects into account. While professional biologists are held accountable under a Code of Ethics, Standards of Practice and Auditing programs through the College of Applied Biology (CAB, 2023a), they are also employed by developers to get the job done. Conflicting pressures can result in an inaccurate representation of the true impacts and/or inadequate information for decision makers (Carter, 2014). Since 2003, there have been 82 complaints within the CAB due to breaches of the Professional Reliance Act and/or Code of Ethics (CAB, 2023b). Professional biologists, of which I am one, have such a reputation that they are sometimes called "biostitutes" by the environmental community (Erin, Academic interviewee, 2023). The professional reliance model runs counter to the community-based monitoring model as access to data is restricted to the client and often only shared with those deemed to have the expertise needed to interpret it. Lastly, this model is rooted in a colonial paradigm where nature is considered separate from humans and that it can be best understood by western science "experts" providing objective information to decision makers, valuing this information over subjective cultural knowledge of ecosystem values.

Semiahmoo First Nation capacity

There is also a lack of capacity within Semiahmoo First Nation, to provide leadership and facilitate the collaborative work necessary to assess and address pollution sources in Steloqwen. They are a small nation: 100 members on reserve, with a small leadership team (1 elected Chief and 2 elected Councillors) and just a handful of staff (<10). Although they are a small nation, their traditional territory extends across what is now known as southern BC and throughout much

of the Salish Sea, extending to many of the Southern Gulf Islands and San Juan Islands (**Figure 10**).

Through the colonial system of consultation, Semiahmoo First Nation are pulled into numerous decision making processes in a rapidly developing landscape throughout their traditional territory. They would like to be able to meaningfully contribute towards decisions, but they do not have the capacity to review stacks of reports and attend hundreds of meetings to share their values and meaningfully contribute to decision making. In addition to the rapid pace of decision-making and land use change happening in surrounding municipalities that overlap their territory, Semiahmoo has many important issues to address within their own community. For example, Semiahmoo were on a boil-water advisory for 16 years, just finally lifted in 2021 (Gamage, 2021). They are dealing with climate change impacts like sea level rise and flooding and land failures within their territory. They are developing emergency response plans and economic strategies to bring resources into their community. Revitalizing traditional food sources like shellfish is one important initiative within a long list of important initiatives, with very limited resources.

Capacity - Summary

In summary, there is a need for consistent, **long-term funding to** support collaborative processes across multiple levels of government and led by Indigenous communities. Why is it that all levels of Canadian government have restricted capacity in this area of shellfish management when billions of dollars are being spent on flood management in BC? Could it be that there isn't a loud enough voice communicating the urgency of this problem? Could it be that there hasn't been enough clarity describing the extent of the problem and potential solutions? It is clear that Semiahmoo First Nation's holistic worldview will help to bring alignment between the multiple jurisdictions needed at the table to address this complex problem. Their long-term vision and values of relationship will bring unity and focus to collaboratively revitalize shellfish harvest. As all levels of government become more aware of this issue facing numerous coastal Indigenous Nations, they should respond by empowering Indigenous leadership and provide the funding necessary to sustain the long-term monitoring required to enable ongoing coastal ecosystem improvement and access to healthy clams.

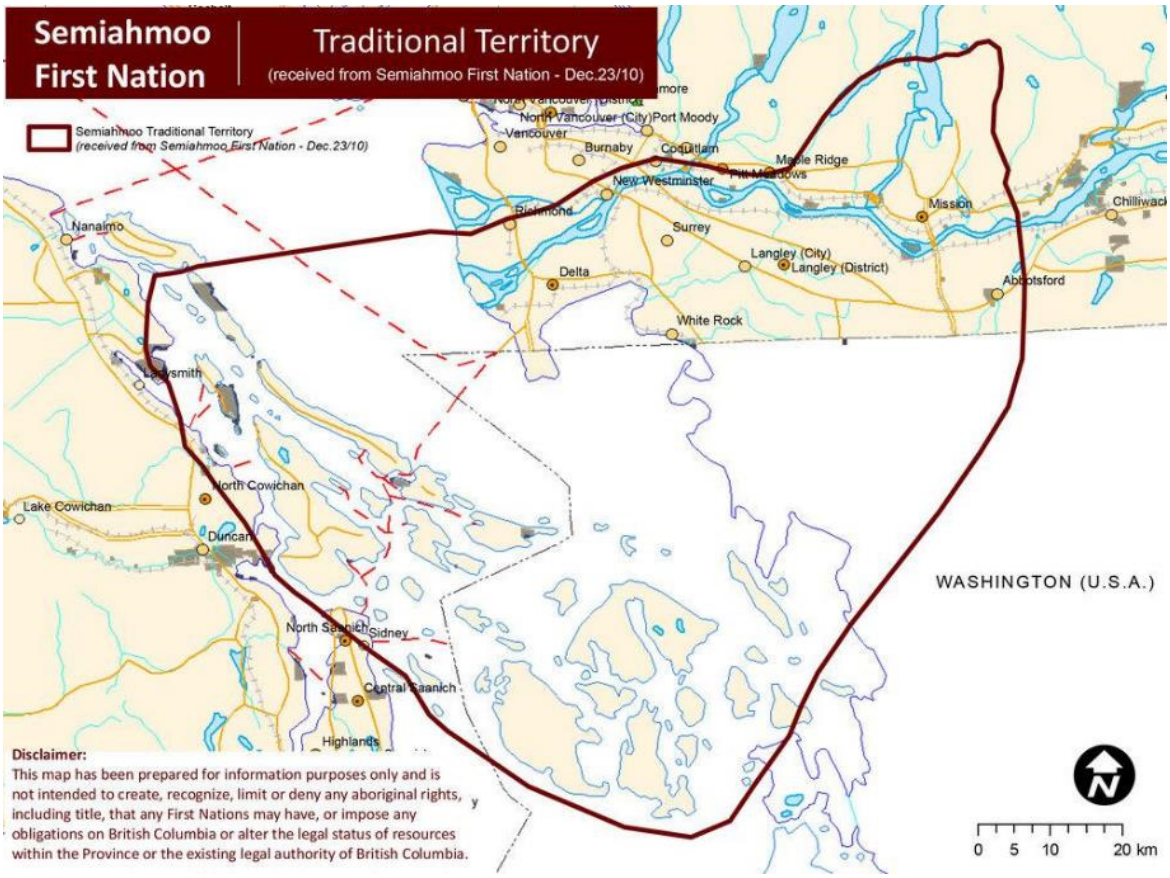

Figure 10. Semiahmoo First Nation traditional territory.
Source: Semiahmoo First Nation. (2010, December 23). *Traditional Territory*. Land, Research & Resource Management. https://www.semiahmoofirstnation.ca/land-research-resource-mgmt

ŚKEM¸SET = Trail/Path, Opportunities

Thematic analysis of the jurisdictional interviews revealed numerous ŚKEM¸SET (pathways) or opportunities to revitalize shellfish harvest. Dominant themes of ŚKEM¸SET were identified as: collaboration, monitoring, Indigenous leadership, and legislative tools. Additional ŚKEM¸SET are shown above in **Figure 8**. The following section describes the top four keys to revitalizing shellfish harvest as identified through the jurisdictional interviews using SENĆOŦEN words:

1. ȻEN,TOEL (being together)/ḴO (got together with) = Collaboration
2. XĆETSW̱ (you decide, look over, measure, figure out) = Monitoring
3. Indigenous leadership and ĆEĆINES (teeth) =Legislative tools

For each of the themes, I begin with a story from one of the interview participants. This is to align with Indigenous methodologies and avoid fragmenting stories (Kovach, 2009). The stories help with interpretive meaning-making, ensuring that the results were contextualized appropriately.

ȻEN,TOEL (being together); ⱪO (got together with) = Collaboration

Story of collaboration:
Semiahmoo First Nation played such a critical role in our efforts to restore shellfish harvest in Drayton Harbor. I'm going to take you back to 1999 because, first of all, we had to build a huge network of partners before getting underway and Semiahmoo First Nation was the very first entity to financially support our ambitious goal of addressing pollution sources and restoring shellfish harvest in Drayton Harbor. It was a very big challenge, and they provided $5,000. Drayton Harbor and Semiahmoo Spit were an important historic gathering areas for Semiahmoo First Nation. They didn't have access to shellfish in Boundary Bay or Drayton Harbor, and our goal was to restore tribal, recreational, and commercial harvest in Drayton Harbor and to go from completely prohibited hopefully to at least conditionally opened. From Washington Department of Health's point of view, when we started out, Drayton Harbor was not a priority. Okay. Everybody was walking away from what seemed like an absolute hornet's nest full of intransigent pollution sources. The fight just seemed too monumental, particularly since Whatcom County is an agricultural powerhouse with an identity centered on terrestrial agriculture, such that producing food on land and maintaining that part of their economy was the main priority.

But we had a different view point. At the outset, Puget Sound Restoration Fund had partnered with Geoff Menzies and Trillium Corporation to find a path forward. Geoff had been growing oysters commercially in Drayton Harbor for years. The horbor sill produced world-class oysters, and from our perspective, it was not right to turn our back on an area that had provided shellfish for subsistence and ceremonial purposes and for commercial operations for a long long time. It was not right to turn away from that, and we felt like we had to take it on.

And so, the strategy was to create a community Oyster Farm. The Drayton Harbor Community Oyster Farm, as it came to be called, became a project umbrella encompassing multiple efforts to address pollution sources, engage and maintain community involvement, manage the oyster farm, and publicize our efforts.

And once you say, publicly, that this is what you mean to do, restore shellfish harvest, then that's what you've got to do. Invest in it, put a timetable on it, and not mess around. And after that it was like, Oh my gosh, okay, that's what we're going to do. We're throwing it down. We're starting the clock, and we're planting oyster seed. The bay is going to do absolutely everything to grow those oysters, just as it always has. It's going to demonstrate before our eyes the power of the marine system to produce world class oysters, right? And are we gonna shrink from doing our part? No, we've got to step up and do what we humans need to do to clean up the bay.

So, it became a beautiful melding between the bay, the community, and all the agencies involved in addressing different pollution sources. It was an absurdly ambitious goal to set, and wildly we met it. It took a lot of effort, and a lot of partnerships, and I am so incredibly grateful to Bernard Charles of Semiahmoo First Nation, his daughter, Joanne Charles, and also Bernard's grandson. Not only did they put up the first down payment on this effort, but every single time we had a seeding event, or an oyster work party, they came out, and connected with the oysters being grown in Drayton Harbor, a place that had fed their people for thousands of years. They were there every step of the way. And even though they were reconnecting to the bay through Pacific oysters, not the native oysters, they were still getting that marine food connection. It was incredible, actually, and they made it very meaningful for us to be able to partner with them on this.

Betsy Peabody, Executive Director, Puget Sound Restoration Fund
March 2023

Drayton Harbor went from prohibited in 1999 to 575 acres conditionally open in 2004 and 810 acres fully approved in 2016. Current status remains open, however there are prohibited areas surrounding a marina and sewage treatment plant, as well as areas along the eastern shoreline. Collaborative efforts are ongoing to identify and control pollution sources, engage the community and maintain safe and legal shellfish harvest in Drayton Harbor.

In order to address the jurisdictional complexities and multiple pollution sources, a collaborative approach is critical. Many stakeholders have caused and continue to contribute to this problem of contaminated waters and contaminated clams; now stakeholders must come together and take shared responsibility to find creative solutions. One example of a collaborative approach to revitalize shellfish is ongoing on the south side of Steloqwen, in Drayton Harbor, Washington. The story is described above by Puget Sound Restoration Fund Executive Director, Betsy Peabody.

There is much to be learned from American neighbours on the Washington State side of Steloqwen. While it certainly is not a perfect situation (challenges and gaps are described in **Table *6.* Government roles and responsibilities to manage shellfish in Drayton Harbor, Washington State.Table 6**, shellfish harvest areas are expanding along Washington coastlines, not diminishing as they are in Canada, so there are some lessons to be learned. American interview participants shared a bit of history, describing some of the context that has set the stage for success in terms of shellfish harvest revitalization, not only for Indigenous communities, but for recreational and commercial harvesters as well.

The story goes all the way back to the time of early settlers in the mid-1800s when settlers started to set up canneries and exploit the local fisheries resources. Indigenous Tribes surrounding the Salish Sea including: Tulalip, Puyallup, Squaxin Island, Makah, Muckleshoot, Upper Skagit, Nooksack, Nisqually, Lummi, Skokomish, Port Gamble S'Klallam, Lower Elwha S'Klallam, Jamestown S'Klallam, Suquamish, Yakama, and the Swinomish have been fighting to uphold their treaties and their right to fish since those early days (*United States v. State of Washington*, 1974). Four different interview participants noted the significance of the Boldt decision that ruled in favor of Tribes being entitled to 50% of the fish harvest that passed through their usual and accustomed fishing grounds (*United States v. State of Washington*, 1974). Notably, District Judge Boldt also ruled that Tribes were to be co-managers of the state's fisheries, ensuring joint management into the future. Since then, Tribes and State government have had to find a way to work together to estimate fish populations and agree on management strategies and practices (Dougherty, 2020). A second significant decision was the extension of this ruling to include shellfish in 1994 (*U.S. v. State of Washington*, 1994). Arriving at these decisions wasn't easy or simple, they involved decades of legal proceedings and protests and activist leadership from Indigenous Tribes (Dougherty, 2020). Indigenous fishermen were arrested for fishing in off-reservation areas and situations sometimes became violent (Dougherty, 2020).

It was the persistence of these Indigenous communities and those that came alongside to support them, that has allowed for the current situation in Washington. A few notable governance decisions were made along the way as well. The United States Congress established the National Estuary Program in 1987, a non-regulatory program under the Federal Clean Water Act for the protection and restoration of water quality and ecological health in 28 estuaries around the country, including Puget Sound, which includes the southern portion of Steloqwen: Drayton Harbor (PSP, 2022; US EPA, 2015). In 2007, Washington passed legislation to create the Puget Sound Partnership, a state agency that brings multiple levels of government, non-profit organizations, academia, businesses and the general public together to collaboratively deliver the Puget Sound National Estuary Program goals through a shared Action Agenda (PSP, 2022). In 2016, the US EPA implemented a funding model to support the collaborative work of the Partnership, the Northwest Indian Fisheries Commission and three strategic initiatives that work together to focus on improving habitat, shellfish and stormwater management in Puget Sound. State of the Sound health indicators have been developed and collaborative efforts are working to improve the overall health of this coastal ecosystem, including through public engagement efforts and on-line communication tools. This model is State legislated and funded, with hundreds of staff contributing resources towards monitoring and restoration efforts to improve the health of this coastal ecosystem, including shellfish growing areas.

Embedded within this legislated framework is the requirement to create Shellfish Protection Districts and Advisory Committees whenever water quality monitoring results drops below the guidelines for safe shellfish harvest within a shellfish growing area. Shellfish Protection District Advisory Committees are coordinated by County level regional governments and funded in part through property owner fees who reside within the Protection District watershed (Revised Code of Washington [RCW], 2008; Whatcom County Charter, 2008). District requirements include the development of a Pollution Identification and Control Plan to guide water quality monitoring efforts, as well as public engagement resources and incentives to address pollution sources. This includes working with agricultural land holders to improve manure and livestock management, educating and equipping rural landholders to maintain their on-site septic systems, and inspiring pet owners to manage their pet waste properly (Regional government Interviewee, 2023). The monitoring programs are designed to narrow down hot spots and identify pollution sources so that they can be addressed promptly. Water quality data is reported in real-time onto a publicly available website so anyone in the community can see where the water quality problems are located, which increases the awareness of the issues and encourages the general public to become involved in finding solutions (Regional government Interviewee, 2023).

For Drayton Harbor, a Shellfish Protection District was formed in 1995 to address water pollution concerns and has been providing a framework for collaborative efforts to improve conditions for shellfish since then. This framework in addition to other State water laws provides a regulatory backstop that supports innovative community-based initiatives such as that which the Puget Sound Restoration Fund coordinated in the early 2000s (Non-profit Interviewee, 2023).

In summary, key ingredients to successful collaborative tables include strong committed champions and leaders, Indigenous leadership, sustained funding models, shared positive vision and goals, clear communication and community engagement, opportunities to celebrate and feast

together, and a regulatory framework to establish accountability. There is strength in numbers, increased efficiency and a greater coverage of the issues when we draw people together. Applying these key ingredients as leverage points within the social-ecological system, Indigenous leadership rises to the top as this would evoke a paradigm shift to a more holistic, relational, and longer-term perspective. Secondly, shared positive vision and goals would be effective, changing the goals of the system from a risk-based, commercially-driven system to one that is focused on rehabilitation of coastal ecosystems and revitalization of shellfish harvest. Thirdly, strong committed champions and leaders in all levels of government, but particularly federal and provincial governments who hold legislative responsibility for shellfish, coastal waters and upland pollution sources, will bring power to change the system structure. This leads to the fourth intervention of establishing a regulatory framework that ensures accountability and sustained funding models. Both of these interventions effect the rules of the system. Finally, clear communication and community engagement, including opportunities to feast together would influence the structure of information flows, who has access to information to effect the system. Several other examples of active and inactive collaborative initiatives to address similar challenges were revealed during jurisdictional interviews and are described in Appendix 4.

XĆETSW̱ (you decide, look over, measure, figure out) = Monitoring: long term, watershed scale, transparent, informing action

Story about Monitoring:
"We have been doing a lot of study at Lone Tree Point in the middle of the West Shore of the Swinomish Reservation. Lone Tree is one of our ancestral and current gathering and harvesting areas. We've been studying the beach geomorphology so you can see how that shore form changes over time. Lone Tree is the main access to all of the beaches important to our Tribal Community for both subsistence shellfishing as well as every other year, beach seining for salmon. Thus, we study the geology to understand future trends of erosion and deposition to make recommendations for restoration projects to ensure continued habitat and fisher access. Lone Tree is surrounded by critical nearshore habitat for forage fish and juvenile salmonids and part of protecting that habitat is monitoring and understanding the water quality.

We have had a water quality delegated program from EPA for a long time. A good portion of the last 20 years has been status monitoring of the Reservation's water quality for conventionals of pH, temperature, dissolved oxygen, nutrients, turbidity, and bacteria. We have monitored at stations in our freshwater creeks that empty into our marine waters, and in marine water stations that surround the Reservation. We've collected the data under an EPA approved Quality Assurance project plan (QAPP) and have used that same plan with minor updates throughout the entire period of data collection (1995-present) so we can compare our entire record of data all together. Back in the day when I first started (2000), it was me and one technician doing everything and all we could do is collect the data. Our work was to collect the data now and analyze later, because you can't go back in time and collect data but at some point in future, we can do trend monitoring or trend analysis to understand where our water bodies were doing well and where there might be problems.

We've been able to expand our bacteria monitoring from collecting samples and sending them out to a contract lab to developing our own processes in house since our bacteria standards have been approved by EPA. In the last 3 or 4 years, we've building our capacity and processes to be approved in our Quality Assurance project plan. Now, we can do a whole bunch of samples and be more responsive to bacteria issues, since we have a 24 hour turnaround for determining the bacteria

counts, we can resample as needed, and provide beach advisories for recreation or shellfish harvest. We're doing 3 bacteria indicators: E. Coli, Enterococcus and Fecal coliform on a monthly basis for our ambient water quality monitoring. We also have an EPA Beaches program which monitors our recreation and shellfish beaches once a month and once a week in the summer as we wanted to gear it towards when people would be in the water and swimming or shellfishing to have more samples. An important part of protecting public health is getting the information about possible high bacteria out through advisories. Our Communications department set up a system through text alerts to notify the Community when and where there are high bacteria counts. We can tell people, Don't go swimming out here, or use caution, or this beach is closed for swimming, shellfishing or both. I know this has been a good resource for our Community as we have lots of swimmers, canoers, fishers, and shellfishers that rely on clean water."

Todd Mitchell, Environmental Director, Swinomish Department of Environmental Protection, Swinomish Indian Tribal Community

Importance of Monitoring

All jurisdictions interviewed, highlighted the need to establish and sustain ongoing monitoring of water quality, in order to assess remediation effectiveness and to ensure that clams are safe to eat. One non-profit interviewee noted the value of collecting water quality data:

> *"Generating data creates power when we can translate what the data is telling us, we can have a strong basis for decision-making and taking action on pollution sources. It helps us to prioritize efforts and determine which areas to focus on in the future."*
>
> Philip, Non-profit Interview participant

Currently on the Canadian side of Steloqwen/Boundary Bay, there is not an established monitoring program in place to assess conditions for shellfish. The most recent federal assessment for shellfish harvest classification in Steloqwen was conducted in 1977 (Ferguson and Kay, 1978). The CSSP will not conduct any more monitoring unless Semiahmoo First Nation can provide documented evidence that all actual and potential pollution sources have been identified and assessed and deemed non-impactful to growing bivalve shellfish (CSSP, 2019). This is a substantial task for the Nation to complete and it is difficult to know where to begin.

Water flows downhill and Semiahmoo First Nation's reserve lands are located at the mouth of the TA'TALU/Little Campbell River where it enters tsepoleq/Semiahmoo Bay. These waters literally receive all of the contaminants distributed across the landscape within the 70 km^2 watershed area. This "urban runoff" is channeled through road-side ditches and storm drains into piped systems and urban streams, entering the TA'TALU and tsepoleq. Water quality conditions in the bay are an accumulation of land use decisions that have been made by all levels of government as well as individuals, whether or not they recognize their connections or contributions to these ecological processes.

Monitoring History in tsepoleq/Semiahmoo Bay

Water quality monitoring in tsepoleq has been conducted over the years through the collaborative Shared Waters Alliance Roundtable which has been active in some way since 1998 until the present, with a gap between 2011-2017. Exploratory marine sampling in the early 2000s found that the majority of 31 stormwater outfalls entering tsepoleq were contaminated by fecal coliform bacteria that sometimes reached elevated counts associated with sewage-impacted waters and that correlated with the 19 nearshore marine sampling locations (Goble, 2001; Cheung, 2003). Samples were also collected in the TA'TALU (Little Campbell River) and McNalley Creek, a tributary to the TA'TALU freshwater sites. A circulation study conducted in 2002 found that the TA'TALU (Little Campbell River was by far the most significant contributor of fecal coliform contamination to Semiahmoo Bay (Hay & Company, 2003). Further study of the TA'TALU and tributaries by the BC Ministry of Environment found that the bacterial pollution with greatest impact on Semiahmoo Bay was coming from urban stormwater outfalls near the river mouth (Juteau, 2008). More recent sampling has been initiated by A Rocha Canada, a non-profit conservation organization in partnership with the City of Surrey and Langley Environmental Partners Society. 2020-2023 results have confirmed 2005-2007 results showing high levels of contamination from urban stormwater outfalls and urban streams near the river mouth, and have also indicated some improvements in water quality within the nearshore marine environment (Esau, 2023).

Washington Model

It is clear that ongoing monitoring is required to assess the effectiveness of remediation efforts and to ensure shellfish are being grown in suitable conditions for consumption to protect human health. Washington State provides a model for long-term monitoring with a number of key components (NOAA, 2011):

1. Federally approved quality assurance plans and standards;
2. Long-term funding commitments from all levels of government;
3. Prompt and transparent reporting of results on-line;
4. Holistic approach to engagement and outreach, including incentives to address pollution sources; and
5. Legislated framework to coordinate local collaboration.

Indigenous Nations and Tribes located in Washington State have the opportunity to participate in shellfish harvest governance and management within their territories. Swinomish Tribe has been carrying out a water quality program delegated from the US EPA for nearly 30 years, that includes nearshore monitoring as well as freshwater inputs. Based on monitoring data, the Tribe can set their own openings and advisories for shellfish harvest depending on current conditions. They have capacity to analyze bacterial concentrations on-site using standardized IDEXX trays and an incubator, rather than submitting samples to a lab for analysis. This provides them with accurate fecal coliform, E.coli and Enterococci bacteria most probable number concentration within 24 hours of sampling. These standards have been approved by the US EPA, so they are enforceable. Rapid communication of results gives the Swinomish Tribe the information they need to inform community members and the general public when it is unsafe to harvest.

The Washington Shellfish Initiative has been successful to restore over 6,400 acres of previously closed shellfish beds in Puget Sound between 2007-2019, while the Canadian side of the Salish Sea continues to increase their closed shellfish harvesting areas (USEPA, 2022).

Guardians and Community-based Monitoring

Semiahmoo First Nation are a small community and are building capacity through partnerships and training up their young people as guardians to participate in community-based monitoring. Guardianship shifts the power towards Indigenous communities so that knowledge creation, intergenerational knowledge transfer, and knowledge ownership lies with the First Nation. This can support self-governance, better knowledge and conservation of watersheds, restoration of degraded ecosystems, and improved community health, pride and culture, benefiting both Indigenous communities and everyone else (Greening et al., 2020; Allen et al., 2018; Wilson et al., 2018). One of the non-profit interview participants noted:

> *"When community members are involved in collecting data and communicating that knowledge about their watershed in a transparent way, questions immediately arise within the community about actions to address pollution sources. What can we do to improve conditions? It is an opportunity to initiate dialogue that is solutions oriented."*
>
> Philip, Non-profit interview participant

Semiahmoo and Shared Waters Alliance are doing what they can to train up young leaders to become guardians who monitor water quality and shellfish health in addition to other aspects of watershed health within their traditional territory. One of the ways Semiahmah community members are monitoring is through periodically getting out on the beach and "turning the beds", practicing their traditional methods of shellfish harvesting. This is a way for community members to connect with the land and the water and the clams and learn from nature and each other through the process. Though perhaps not as empirical as western perspectives of monitoring, the act of being on the water and actively engaging the land teaches us a lot about how the ecosystem is doing (Greening et al., 2020). Semiahmoo will need provincial and federal government support to sustain this important work.

Cumulative effects

The state of Semiahmoo Bay is the result of cumulative impacts from numerous pollution sources due to extractive colonial systems and ways of being on the land that don't prioritize the long-term health of ecosystems or acknowledge the relationships. By monitoring water quality in the bay, we are beginning to reveal these cumulative effects on water and the clams that filter the water and the people that feed on the clams. Indigenous cumulative effects assessment frameworks identify current and future pressures on species that are important to them, including expert-informed data from Indigenous knowledge holders, local biologists, and government resource managers to support a collaborative approach to planning and decision-making (Adams et al., 2022; Zeeg and Kwon; 2019). Semiahmoo First Nation knows how important this process is and is looking to partners around the Shared Waters Alliance Roundtable to support this important work.

Holding a vision of cumulative benefits to the health of the Salish Sea, including tselopeq/Semiahmoo Bay, Semiahmoo First Nation continues to pursue healthy food, healthy connections for not only their community members, but also the wider community of people who rely on the health of the bay. They are asking a similar question to those in the Great Lakes region: "How long will it take to be able to eat the clams, the amount of clams we want to eat, and all be safe? Thinking about the most vulnerable people: youth, elders, pregnant, etc." (Gagnon et al., 2018). Results from Gagnon et al.'s (2018) study found that it all comes down to global regulation frameworks, linking regional, national and international efforts and uniting goals across a long timescale. In this case, they were looking at airborne persistent pollutants, hence the importance of international regulations, but the same considerations must be made in tselopeq/Semiahmoo Bay where the fate and transport of pollutants are crossing international boundaries and there must be agreement across borders if we are to effectively improve conditions.

In summary, consistent ongoing water quality monitoring is critical to pursuing and sustaining healthy shellfish harvesting conditions. Washington State offers a successful model to follow. It is important to note the value of Indigenous leadership and data ownership as well as maintaining a collaborative watershed-based approach. One non-profit interviewee commented on the current lack of monitoring happening on the Canadian side of Steloqwen, with an invitation to pursue reconciliation:

> *"We're not empowered. So how do we create power? I feel it is by generating those data and having a good reflection of what those data are telling us, and then figuring out how those data can inform, you know, forward looking (action). Reconciliation is not about saying sorry folks, we made a mistake, my ancestors made a mistake. In my view that's really patronizing, that's a failure of reconciliation. In my view, reconciliation means, hey, let's protect the water that you used to drink and fish in and swim in, and you can't do so safely today".*
>
> Philip, Non-profit interview participant

When we consider these findings and apply them to the social-ecological system, long-term Indigenous-led monitoring falls into the category of "gaining around positive feedback loops" (Meadows, 1999). The more we monitor, the more we understand current conditions and can address pollution sources and other problems on the landscape. This in turn helps to inform our adaptive monitoring practices, further improving water quality conditions that lead to revitalized shellfish harvest. While not ranked as effective as some of the other factors noted above in the ȻEN,TOEL/Collaboration section, monitoring plays an important role in sustaining and empowering the work of ecosystem remediation.

Indigenous Leadership and ĆEĆINES (TEETH) = Legislative tools

Both Indigenous leadership and legislative tools were dominant themes that arose during jurisdictional interviews. This section starts with a story from Semiahmoo elected Chief Harley Chappell. He has been providing courageous and sacrificial leadership in the collaborative work of Shared Waters Alliance, drawing stakeholders into this important work of revitalizing

shellfish harvest in Semiahmoo Bay. One of the things consistently raised at the Shared Waters Alliance Roundtable has been the need to find and implement "teeth" to hold agencies accountable to engage more fully in the process of revitalizing shellfish harvest and "teeth to elevate responsibility and provide funding, capacity and leadership. What was clear from the interview results was the need for both Indigenous leadership and legislative tools to provide these so called "teeth".

Upholding Indigenous Law

Semiahmoo elected Chief, Harley Chappell shares a story that was passed on through generations about the origins of their people. They are Lhaq'temish, survivors of the flood. They tell this story because it reminds them and others of who they are and where they came from. They are survivors and their people and laws have been here since time immemorial.

A long long time ago, one of the elders of the community foresaw- had the vision of a major flood coming in the area. So they built two giant canoes and they filled one canoe all full of supplies and covered it with the cattail mats and then soon enough again said it's coming it's coming now they put all the children in the canoes and again they covered the children with the mats and soon enough the flood came and the water started to rise and the village of the people they all passed, they all deceased in the flood and those canoes rose and soon enough the water started to recede and it came back down - from what we were told one of those canoes landed just right around the corner from where we are here. And soon enough the children started to leave and they started to branch off and remake life. One of the older ones was very very well taught. She said, "I need to send out the runners and we need to go gather all those people back together again". And when they did that they were going to put a suffix on your name, "Mish" that's going to signify who you are and where you come from that you're Lhaq'temish. So when we cross the united states border we hit a lot of those mish communities. And I asked my elder, "Why didn't we and our relatives directly to the south of us the Lummi, why didn't we change our names, why did we not change, why are we not Semiahma-ish?" And he said, "Well, you're still home, you're still here". So we understand that we've occupied and we've flourished in this territory since that time of the last flood, which when we compare science with our traditional teachings we figure that's about eight to ten thousand years. So we've been here for a long time in the area but we became Canadian Semiahmoo when the border was built and when the reserve system was developed. So we've been here a long time. Our responsibility and our job to be on the north side was to protect our interests and protect not only our fishing areas but our clam beds, our resources. Historically it was that access to resources was really the important piece that we shared with one another and then not only internally within our community but externally with neighboring nations and neighboring communities.

Elected Chief, Harley Chappell

Indigenous laws are the ways of life and teachings that have been passed down for generations and that continue to govern the practices, unique to each Indigenous community (Redvers et al., 2020; Napoleon, 2017; Borrows, 2002). From Chief Harley's story we see that Semiahmah people have occupied these territories for millenia. They hold responsibility to protect the health and abundance of salmon and shellfish along with their supporting ecosystems within their territory. Additionally, they depend upon these fish and shellfish for their wellbeing and economic livelihood. Chief Harley speaks about the importance of returning to these stories

so that Semiahmah will remember who they are and where they came from, that they are survivors, they are strong, and they are care-takers of this place.

A number of local examples of Indigenous communities upholding or articulating their laws came up during jurisdictional interviews. For example, Kitasoo Xai'xais Nation declared its own Marine Protected Area under Indigenous Law (McSheffrey, 2022). The Kitasoo have a long history of marine stewardship rooted in their laws and teachings (Ban et al., 2019). Other examples include: SḰAUTW̱ (Tsawout) Marine Law and subsequent partnership with a seaweed aquaculture operation (Bremner-Mitchell, 2022; Gailus et al., 2022); Tsleil-Waututh First Nation leading a collaborative process to develop an Action Plan and updated Water Quality Objectives for Burrard Inlet (Kerr Wood Leidal and Tsleil-Waututh First Nation, 2017). On the American side of the 49th parallel, Indigenous Tribes have jurisdiction over the intertidal zone and many Tribes including Swinomish hold treaties that enable delegated authority from the US EPA to monitor and manage shellfish harvest within their Usual and Accustomed fishing grounds (SITC, 2017; Tim, Indigenous interview participant).

Lower Fraser Fisheries Alliance (LFFA), a voice for the First Nations of the Lower Fraser River to promote and support the management of a robust and expanding fishery (LFFA, 2016), has worked in collaboration with West Coast Environmental Law to articulate Indigenous Laws of the Lower Fraser (Ballantyne et al., 2022). Semiahmoo First Nation is a member nation of the LFFA but did not directly participate in the revitalizing Indigenous law for land, air and water (RELAW) process. Through the project, foundational principles and legal processes were drawn from stories and articulated within a series of documents to guide decision-making, responsibilities, rights and standards when it comes to managing fish in the Lower Fraser. While the focus of the project was on salmon fisheries, most principles also apply to bivalve shellfisheries.

Indigenous laws of the Lower Fraser River, of which Semiahmoo traditional territory overlaps, state that "the inherent jurisdiction and title of the peoples of the Lower Fraser can be traced back to the time of the eternal ancestors who established the ancient connection between peoples and their territories" (Ballantyne et al, 2022, p.6). Ancient teachings guide local Indigenous worldviews and practices, such as shxwelí / šxʷəlí, the spirit that enables interconnectedness of all things and all beings have a role to play in maintaining the health of land and water, upholding reciprocity (Ibid, 2022). Shellfish for example, filter the waters of the Salish Sea and feed many creatures such as otters, bears, birds and humans.

Upholding UNDRIP and DRIPA

In speaking with American jurisdictional interviewees, there was repeated reference to the Boldt decisions 1 (1979) and 2 (1989), which ruled that Indigenous communities have a right to fish within their usual and accustomed grounds and that they can take up to 50 percent of the harvest of all fish species, calculated river by river and run by run, and the second ruling (Boldt 2), refers to shellfish (Dougherty, 2020).

Semiahmoo First Nation do not have a treaty and are not pursuing that particular pathway to uphold their rights at the time of writing. However, their inherent rights to access traditional food should be upheld according to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) as well as the Canadian UNDRIP Act (UNDRIPA, 2021) and the Declaration

on the Rights of Indigenous Peoples Act (DRIPA) in BC (DRIPA, 2019). Nine of the 46 UNDRIP articles are currently not being upheld while Semiahmoo First Nation are disconnected from their traditional food source of shellfish (Appendix 5). It is the responsibility of all Canadians, including all levels of government to take action and to make this situation right. The lack of implementation of UNDRIP in BC has resulted in numerous failures for Semiahmoo First Nation to access justice according to their rights as Indigenous peoples.

Additional Legal Options

Semiahmoo First Nation has the opportunity to pursue additional legal options to assert their authority and rights to harvest shellfish within their traditional territory. Potential options include: government to government agreement with provincial or federal agencies (Provincial gov't interview, 2023), a collaborative roundtable similar to the Cowichan Watershed Board (CWB, 2018), a Water Sustainability Plan under the Water Sustainability Act (Curran and Nie, 2020), an Indigenous-led Regional Assessment under the Impact Assessment Act (IAAC, 2021), a cumulative effects assessment similar to what the Kitasoo Xai'xais, Nuxalk and Wuikinuxv First Nations completed in 2022 (Adams et al., 2022), or an International Joint Commission application to address a transboundary water quality concern (International Joint Commission, 2023).

Indigenous Storytelling

The goal of the Semiahmoo storytelling workshops was to amplify Indigenous voices, to discuss questions that matter to Semiahmah within their community related to revitalizing shellfish harvest. Through conversations with Chief Harley, we decided to frame the sessions around sharing about their connections to shellfish in the past, present and future. Stories and knowledge discussed during the workshops were summarized in a story map format: https://arcg.is/1CvHjP0, as well as a short 7 minute film: https://youtu.be/s6nPOVcz3Po.

Emergent themes from the workshops revealed a deep and rich connection to the living coastal ecosystem including clams. Clams were a critical food source and an important way to connect together as community members. One community member noted how they used to get together on Sundays to eat together and attributed that to their time spent together harvesting clams on the beach. Fond memories were shared about a time when they went down to visit their Lummi relatives and bake clams together on the beach. They also shared knowledge from their grandparents' teaching about when it was safe to go and harvest clams, based on the season and the presence of birds feeding on the beach.

One participant shared this story:

> *"When we were growing up, we'd always go out to dig clams. So we go out there in the middle of winter time, snow coming down. We go out there digging clams, and we'd be so excited to get these clams right away. As soon as we got home, we cleaned them and ate them and had a snack before bed or whatever time it was, didn't even matter if it was 12 o'clock at night, my sister would sit there and cook*

them up. And then my brothers too. But it was just always a treat, just to get to eat clams."

Barb Calder, Semiahmah community member

In the present season of disconnection from clam harvest due to the federal government prohibition, Semiahmah community members shared about the loss of intergenerational knowledge because they aren't able to gather on the beach to share this traditional practice. There was a sense of frustration due to this disconnection and lack of government remediation action, but also a feeling of hope that this might be a season when Semiahmoo First Nation can take a leadership role and assert their right to harvest clams. Over the past few years, they have been getting out on the beach to turn the beds, as Harley says: "just to maintain that relationship". There is also hope generated through the collaborative efforts of organizations coming alongside Semiahmoo to support this work.

Part of the workshop discussion included myself and Chief Harley sharing about recent water quality monitoring work that Shared Waters Alliance partners have been collecting to identify pollution sources. This was an important opportunity to share information and empower Semiahmah community members with knowledge of current water quality conditions. Chief Harley and Joanne Charles (Semiahmoo First Nation Councillor) were also able to share about recent engagement that they have had with provincial and federal government representatives, advocating for cumulative effects assessments and environmental assessments of Steloqwen.

"Nobody really cares at government level. At government level, they're all like, oh yeah, so it's a little nation that wants to dig clams, what's the big deal? But it's a much bigger issue. And it's a systemic problem that nobody wants to fix. Nobody wants to resolve that issue. They just kinda go: oh yeah, okay, that's what happens with growth, that's what happens with development. You know, and it's like No, there's no sustainability in that way of thinking."

Harley Chappell, 2023

"The good thing is, that there is momentum under the Truth and Reconciliation calls to action, UNDRIP and DRIPA legislation, that isn't caught up to where it should be, but the reality is that there are forward thinking people in some of the positions that we deal with and they're like, oh my god, I can't believe that you've been dealing with this for this long, we should do something about that."

Joanne Charles, 2023

Throughout the workshops and film interviews, hopes for future revitalization of shellfish harvest were discussed. Of greatest interest was re-connecting the younger generations to clam harvesting, re-establishing those relationships. Also of interest was the opportunity to pursue aquaculture opportunities such as establishing a clam garden or oyster farm or geoducks. Information gaps that need to be filled were identified: sediment, tissue and water quality within the bay to locate potential appropriate harvesting sites. Ongoing Shared Waters Alliance monitoring can help to answer these questions.

During the second workshop, we went out onto the beach to turn the beds and practice harvesting clams. Unfortunately, the day we went out, the tide wasn't low enough to dig for

horse clams, so only smaller clams were dug up that day. I learned from community members that the most desirable and largest clams are located very far out, up to 1 km from shore, and only accessible at low low tides. Semiahmah community members have a wealth of knowledge about the coastal ecology within Steloqwen and I have a lot to learn.

Here are a couple of quotes from the film that was produced through the workshops. Chief Harley shared about the importance of returning to clams as part of their diet:

> *"We need to feed part of ourselves that's ancient. And to be able to have that accessibility to that makes us complete in not only a nutritional way but in a spiritual way."*
>
> Harley Chappell, Semiahmoo elected Chief

And one community member shared about their hopes for the future:

> *"Maybe some of the younger kids can go with their grandmas and experience what I experienced, and you know, the family would get back together again."*
>
> Steve Cook, Semiahmah community member

The film was shared with Chief Harley and Semiahmoo community members to provide opportunity for feedback and reflection. The film was also shared with decision-makers surrounding shellfish management in Steloqwen as part of a Shared Water Alliance Roundtable gathering. Forty six participants joined in on the Roundtable gathering, including six Shared Waters Alliance Core Team members who organized the event. Thirty eight participants attended in person and two presenters joined virtually, representing thirty different organizations/jurisdictions (Appendix 6). Roundtable participants had the opportunity to provide reflections on the film via an online survey that was distributed after the gathering. 90% of respondents indicated that the film positively influenced their participation in the work of Shared Waters (25% response rate). The gathering organizers weren't included in the survey respondents. A number of participants provided reflections:

> *"It really helped me understand the crucial, non-monetary values of shellfish harvesting to the Semiahmoo people."*
>
> Catherine, Regional Government participant

> *"The stories of the multi-generational cultural history of place "humanizes" the business of environmental restoration & regeneration."*
>
> Pierre, Regional Government participant

> *"Traditional food and traditional activities to share as a community are so important. Hearing that directly from indigenous voices is powerful and involves you. I wanted to join them on the beach."*
>
> Pauline, Non-profit participant

For the Story Map, information was gathered and compiled from workshop recordings with guidance from Chief Harley to communicate Semiahmoo First Nation's connection to shellfish and to Steloqwen in the past, the present and into the future.

Chapter 5: Discussion and Analysis

"Growing up we relied on this resource to feed our family. It was nourishment, it was necessity, and also good therapy too, for us to be out there in the sand, work your muscles, get the fresh air. It's that food that, it's what I'm supposed to eat. It's what I've grown up on."

Leah Charles, Semiahmah community member

Returning to the research questions and conceptual framework, I have applied a critical coastal governance lens, critiquing existing coastal governance conditions revealed in the research findings and highlighting potential interventions that will result in transformation of the system to revitalize Indigenous shellfish harvest in tselopeq/Semiahmoo Bay. Although the interview findings were complex and varied, revealing a very complex coastal governance system surrounding shellfish management, I draw hope from Westley et al. (2007) who note that "*the very complex forces of interconnection that make systems resistant to change are the same ones that can be harnessed to propel change*" (Westley et al., 2007). Centering benefits on those most affected by this problem, I refer to Semiahmah community voices as they describe their connection to clams and the living bay: Steloqwen. During her interview on the beach of tsepoleq, one of the Semiahmah community members described how important clams were and are to her and her community (quoted above). This is resurgence, an amplification of Indigenous knowledge and teachings. Current coastal governance surrounding shellfish management in Steloqwen is complex, involving all levels of government on both sides of the Canada/US border. As we examine this complex system from the perspective of Semiahmoo First Nation, many challenges are revealed. I will focus on the Canadian side of Steloqwen because Semiahmoo Reserve lands are located on the Canadian side of the bay and are most affected by this portion of the system. This critique draws on all three components of the study: jurisdictional interviews, resurgence storytelling, and social-ecological systems analysis, evaluating the coastal governance system using Meadows (1999) leverage points. Based on the findings, I start by deconstructing the current coastal governance framework highlighting observed challenges, and then provide potential reconstruction ideas and intervention actions.

Firstly, the colonial worldviews underpinning the system that see the natural environment as a resource to extract, that consider the natural environment to be separate from humans, that value economic growth over environmental health and do not consider the consequences that economic growth has on environmental health, minimize the value of a flourishing bay ecosystem and revitalized clam harvest. Canadian governments have literally walked away from degraded coastlines in British Columbia. This method of management is in direct contrast to Indigenous teachings of EȾÁTEL, which means that everything is connected and it is important to pay more attention to areas that are damaged or hurting, not less (Kovach, 2009; Redvers et al., 2020; Kimmerer, 2015; Leanne and Corinne, Indigenous interview participants).

Secondly, the goals of the system were developed to facilitate commercial shellfish harvest and they continue to focus on this aspect of shellfish management, devaluing those areas

of importance for Indigenous food security, as well as areas for recreational harvest. These goals make it appear simpler and more cost-effective to apply blanket closures to shellfish harvest in polluted harvest areas, rather than contributing sparse budgets towards monitoring and addressing pollution sources to rehabilitate these areas.

Thirdly, the governance framework structure that arises from this colonial worldview has separated the management of coastal ecosystems into different departments by species, and separated freshwater from seawater, rather than considering them holistically as watersheds in a way that acknowledges their interdependence. The federal government holds the power in the system to open or close shellfish harvest, but they do not have jurisdictional authority over all of the pollution sources upstream. Additionally, this structure is influenced by competing priorities of other federal departments including housing, healthcare and climate change. Even within the federal department of Fisheries and Oceans, competing priorities of more visible issues such as salmon declines and impacts on killer whales minimize the relative importance of shellfish.

Fourthly, the rules of the system, such as the requirement for federal government staff to conduct shellfish classification sampling, disempowers Indigenous communities and decreases efficiency within the system. Delegated responsibility to conduct sampling would empower Indigenous communities to determine whether environmental conditions were safe for harvesting shellfish and also would provide more people who can be out on the land, collecting data and not be restricted to minimal federal government staff. Additionally, the enabling legislation frameworks within Canada governing coastal ecosystems, including stormwater management, offer guidelines, strategies and plans, without the prescriptive requirements or accountabilities in place necessary to enforce.

Fifthly, the structure of information flows, in terms of access to information is restricted. The issue of prohibited shellfish harvest is not well known among the public, nor among higher level politicians who hold the budgets. The issue of water quality and shellfish is largely invisible, despite the fact that it is affecting numerous coastal Indigenous peoples. And the structure of the system is such that if water quality monitoring is happening, the results are not publicly shared. It would be valuable for these data to be shared widely, to raise awareness of the issue and to engage the public in addressing pollution sources.

Lastly, gains around positive feedback loops – a positive feedback loop was identified within the system when Semiahmoo First Nation capacity is increased, Indigenous guardian monitoring would increase and therefore knowledge of current water quality conditions would increase, informing action to address pollution sources, which would in turn improve water quality conditions in the bay, leading to revitalized shellfish harvest. Revitalized harvest would increase Semiahmah's connection to the bay and their traditional food source, improving their health: physically, mentally and spiritually, which in turn would increase their capacity to be out on the land and water, collecting more knowledge and data to inform ongoing efforts to address pollution sources, thereby improving water quality conditions. The impact of this positive feedback loop can be amplified by enhancing Semiahmoo First Nation capacity.

Table 7 identifies potential system intervention actions to effect change and address the challenges identified within the critique of coastal governance above. These re-construction ideas and actions are expanded upon below.

Table 7. Summary of potential intervention opportunities to effect coastal governance systems change to revitalize Indigenous shellfish harvest in Steloqwen/Boundary Bay

Intervention Opportunities[2]	**Coastal governance critique: reconstruction**	**Semiahmah Community Voices clarifying the path forward**
The mindset or paradigm out of which the system – its goals, structure, rules, delays, parameters – arises	Shift the paradigm towards Indigenous values of reciprocity and relationship building, seeing the ocean and the shellfish as relations with a responsibility to care for them, not only for this generation, but for future generations. This would be a powerful intervention into the system, shifting power towards Semiahmoo First Nation and other coastal Indigenous nations to care for local coastal ecosystems, resulting in healthier bays benefiting all the creatures that depend on them and also revitalizing shellfish harvest. Examples of how to shift power towards Semiahmoo are: - establishing Semiahmoo leaders in positions of authority ie. Metro Vancouver Board, Fraser Basin Council and/or BC/Federal Cabinet; and/or - establishing Indigenous-led watershed governance.	Rebuild reciprocal relationships – Paradigm shift *"When we lose that relationship you know, we don't understand the importance of it, and when we don't understand the importance of it, you know people lose that feeling and that need to protect it and take care of it. And I mean the bay in general; the bay is alive. And when we understand our relationship with nature, it's being able to give and take; to be able to take care of it, and protect it, at the same time being able to access the food sources that come from it. And our responsibility to her out there, our responsibility to her and ensuring that she's well; and when we understand that she's well, she'll take care of us. So it's that reciprocal relationship that we need to rebuild."* Harley Chappell, Semiahmoo elected Chief
The goals of the system	Apply the United Nations Declaration on the Rights for Indigenous Peoples to the Canadian Shellfish Sanitation Program; expand the goals to elevate the importance of revitalizing Indigenous shellfish harvest. This would include prioritizing the remediation of shellfish harvest areas for Semiahmoo First Nation as well as other coastal Indigenous Nations.	Revitalize Steloqwen through collaborative remediation – Change the Goals and System Structure *"The hopes for the future is… to revitalize our Bay and to do the remediation that needs to happen. I think it's bringing awareness to the neighbouring municipalities and local government that this is a priority to Semiahmoo."* Harley Chappell, Semiahmoo elected Chief
The power to add, change, evolve, or self-organize system structure	Re-align jurisdictional responsibilities to address gaps and provide mechanisms for watershed-scale collaboration.	
The rules of the system (such as incentives, punishments, constraints)	Empower Semiahmoo First Nation to have the authority within the system to monitor and determine when it is safe to harvest shellfish. Establish long-term monitoring programs under Semiahmoo guardian leadership to assess conditions based on Indigenous values and targets.	Responsibility to Steloqwen and ensure she is well – Change the Rules and Information Flows

[2] In order of greatest to least effectiveness according to Meadows (1999) leverage points.

	Establish prescriptive legislative to hold polluters and governments accountable to meet water quality guidelines that allow the bay to flourish.	*"Our responsibility to her out there, our responsibility to her and ensuring that she's well."* Harley Chappell, Semiahmoo elected Chief
The structure of information flows (who does and does not have access to what kinds of information)	Bring visibility to the impacts of water pollution and restricted shellfish harvesting through communications and community engagement. Combine voices of multiple coastal Indigenous communities on both sides of the Canada/US border to amplify the importance of this issue. Ensure transparency of data collection to raise awareness of pollution sources and to engage the community in addressing those sources.	
The gain around driving positive feedback loops	Increase Semiahmoo First Nation capacity by allowing space to heal from past harms, by providing resources to build Guardian programs, by providing resources to pursue self-determined economic development opportunities.	Being able to do it, not only for our own - enhance capacity *"You know, being a small nation, being a small community, for a long time we've had a very small voice. But i think of not only us Indigenous people, I think a lot of us as humans we struggle with (connection to creation) these days. So being able to not only do it for our own, but for the good and the well-being of all who call our territory their home."* Harley Chappell, Semiahmoo elected Chief

Rebuild reciprocal relationships - Paradigm Shift

"When we lose that relationship you know, we don't understand the importance of it, and when we don't understand the importance of it, you know people lose that feeling and that need to protect it and take care of it. And I mean the bay in general; the bay is alive. And when we understand our relationship with nature, it's being able to give and take; to be able to take care of it, and protect it, at the same time being able to access the food sources that come from it. And our responsibility to her out there, our responsibility to her and ensuring that she's well; and when we understand that she's well, she'll take care of us. So it's that ***reciprocal relationship that we need to rebuild.****"*

Harley Chappell, Semiahmoo elected Chief

Findings through the jurisdictional interviews and literature review have shown that current Canadian shellfish governance is diminished by competing priorities, is lacking leadership, cohesion and capacity, and is driven by commercial interests. The general lack of attention, value and priority placed on protection and remediation of contaminated shellfish harvesting areas for food, social and ceremonial purposes on the Canadian side of Steloqwen, demonstrates that value paradigms of current Canadian coastal governance frameworks are not prioritizing reciprocal relationships with creation and have not since colonization. There is a need for a paradigm shift and priority shift within all levels of government on the Canadian side of Steloqwen, to recognize the importance of shellfish as a food source and cultural/spiritual centerpiece, core to who Semiahmoo First Nation are as a community and important to numerous coastal Indigenous communities within the Salish Sea and beyond. There is an urgency to make this situation right, as an act of reconciliation and for the health of the Steloqwen (Bradbury et al., 2019; Brousselle and McDavid, 2021); this issue has been ignored for long enough.

When we peel back the layers to uncover the deeper reasons behind the problem of disconnection from shellfish harvest: contaminated water, poor land use practices, and a lack of monitoring or resourcing for remediation, value systems that underlie legislative frameworks and land use decision making are revealed. Each of the QI,ÁTEN/ barriers (**Figure 7**) reveals a history in British Columbia of de-valuing Indigenous communities, their laws and culture; of stolen land, stolen children and stolen authority of resources on the land and in the waters (TRCC, 2015; Wilson-Raybould, 2022). Current colonial management frameworks are based on values of capitalism, extraction, economic growth and efficiency, without embracing the underlying importance of ecosystem health for human wellbeing (Raworth, 2017; Whitmee et al., 2015). Canadian governments have literally walked away from contaminated coastlines in British Columbia. This method of management is in direct contrast to Indigenous teachings of

EȾÁTEL, which means that everything is connected and it is important to pay more attention to areas that are damaged or hurting, not less (Kovach, 2009; Redvers et al., 2020; Kimmerer, 2015; Leanne and Corinne, Indigenous interview participants).

To address this complex problem, value systems need to be evaluated and short-comings revealed (Brousselle and McDavid, 2021). There is a need for transformational change, for each of us to pay attention to Creation and how she is hurting, to truly prioritize the restoration of Indigenous rights, and to position Indigenous communities with the capacity to lead, holding values of good relationship, seven generation thinking, and reciprocity (Kimmerer, 2015; Wilson-Raybould, 2022). Leroy Little Bear (in Alfred, 2005) talks about "revitalization of the Warrior's Way", as a re-awakening of Indigenous ways, for Indigenous people to know who they are and where they come from, to be reconnected to creation and the Creator, seeking restoration and reciprocity. As Chief Harley Chappell (2023) states:

> *"When we understand our relationship to nature… and our responsibility to her out there (Steloqwen/Boundary Bay),.. and ensuring that she's well, and when we understand that she is well, she'll take care of us."*

Meadows (1999) describes how to change paradigms by pointing out the failures in the existing/old paradigm and modeling the new one, inserting people with the new paradigm in visible places of power. In the case of Semiahmoo First Nation and Steloqwen shellfish, Semiahmoo should have a place at the table in land and water use decisions that affect their territory. For example, they should be included as part of the Metro Vancouver Regional Board along with the other First Nations with territory in the region. They could also be involved in leadership of shellfish classification decisions, within the CSSP framework. Another way to visibly shift power is through establishing a watershed governance framework, with Semiahmoo First Nation in a leadership role and those holding key jurisdictional responsibilities to be involved as collaborators. Governance structure can provide the ĆEĆINES (teeth) necessary to hold jurisdictions accountable to addressing pollution sources and attaining the shared goal of a healthy bay ecosystem.

Indigenous-led governance mechanisms could bethe following:

1) articulation of Semiahmoo Indigenous Law (Redevers et al., 2020; Napolean, 2016; ILRU, 2021; WCEL, n.d.),
2) government to government agreement with provincial or federal agencies (Provincial gov't interview, 2023),
3) a collaborative roundtable similar to the Cowichan Watershed Board (CWB, 2018),
4) a Water Sustainability Plan under the Water Sustainability Act (Curran and Nie, 2020),
5) an Indigenous-led Regional Assessment under the Impact Assessment Act (IAAC, 2021),
6) a cumulative effects assessment similar to what the Kitasoo Xai'xais, Nuxalk and Wuikinuxv First Nations completed in 2022 (Adams et al., 2022), or
7) an International Joint Commission application to address a transboundary water quality concern (International Joint Commission, 2023).

Whichever model or framework is pursued, the important factors are: Indigenous leadership and legal mechanisms to hold jurisdictions accountable to their piece of the collaborative work.

Revitalize Steloqwen through collaborative remediation - Change the Goals and System Structure

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The hopes for the future is… to revitalize our Bay and to do the remediation that needs to happen. I think it's bringing awareness to the neighbouring municipalities and local government that this is a priority to Semiahmoo.

Harley Chappell, Semiahmoo elected Chief

The goals of current Canadian shellfish management frameworks are to protect human health by blanket harvest prohibitions and to protect economic trade with the United States by focusing on commercial growing areas. Current goals do not include remediation of shellfish beds nor do they include prioritizing revitalizing Indigenous access to shellfish (DFO, 2022). Meadows (1999) states that changing the goals of a system is the most significant leverage point within a system after paradigm shifts. One way to change the goals within this system, is to align the Canadian Shellfish Sanitation Program with the United Nations Declaration on the Rights of Indigenous Peoples. Numerous articles under UNDRIP apply to this issue as described in Appendix 5. Alignment with UNDRIP would require the goals of the system to expand and would elevate the importance of revitalizing Indigenous shellfish harvest. The goals and structure of the system would certainly include remediation of degraded harvest areas important for Indigenous food, social and ceremonial purposes and would require redress for the damages caused due to pollution and due to disconnection of harvest.

Realization of UNDRIP in relation to shellfish should also include re-aligning of jurisdictional responsibilities to address gaps. One way to do this would be to provide a mechanism for watershed-scale collaboration, holding all jurisdictions accountable to their responsibilities of shared watershed goals – in this case including the revitalization of shellfish harvest. Key ingredients to successful collaborative approaches were identified through the jurisdictional interviews: strong committed champions and leaders, sustained funding models, shared positive vision and goals, clear communication and community engagement, and opportunities to celebrate and feast together.

Shared Waters Alliance is well-positioned to help facilitate this mechanism of watershed-scale collaboration. However, there are some improvements that need to be made to ensure effective collaboration. Leadership within the Shared Waters Alliance work needs to be more clearly articulated and defined as part of a governance structure that outlines roles and responsibilities. Strategic funding models should be explored to sustain capacity within the group. The vision and goals of a healthy Steloqwen/Boundary Bay have drawn people together; however, the group would benefit from more opportunities to celebrate and feast together. As we pursue these principles of ⱡEN,TOEL (being together), we will together change the goals of the system surrounding shellfish management.

Responsibility to Steloqwen and ensure she is well – Change the Rules and Information Flows

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"Our responsibility to her out there, our responsibility to her and ensuring that she's well."

Harley Chappell, Semiahmoo elected Chief

Current rules of the system disempower Indigenous communities and lack accountability for jurisdictions responsible to manage coastal ecosystems. Delegated responsibility to Semiahmoo First Nation to conduct shellfish harvest classification monitoring would empower them to determine whether environmental conditions were safe for harvesting. This would also help to build capacity within the system of coastal governance, shifting federal government responsibility to supporting Indigenous communities, rather than conducting the entire program themselves.

Additionally, Canadian enabling legislative frameworks governing coastal ecosystem management, including stormwater management, do not have sufficient teeth to hold jurisdictions or polluters accountable. Pollution sources need to be addressed to ensure that Steloqwen is well. To hold polluters responsible, the rules and information flows of this system need to change. Currently pollution from numerous non-point sources continue to accumulate and wash into waterways during rain events through storm drains or ditches or urban streams and enter the TA'TALU and Steloqwen. There is a need for new rules within the system that don't allow this constant flow of pollution sources into the receiving environment, holding polluters accountable to address the pollution sources, ultimately pursuing XĆETSW̱ (you decide, look over, measure, figure out). Three key components are needed:

1) prescriptive legislation with clear rules on pollution thresholds and targets;

2) information flow to decision-makers and general public: water quality monitoring with prompt, transparent communication of results; and

3) interception of pollution sources via: storm water treatment, biofiltration and green infrastructure, agricultural waste management, septic system maintenance, pet waste control, and any other pollution source control required.

In addition to pollution source interception and control, overall permeability of our watersheds need to be increased to allow for nature to do the good work of filtering out contaminants before they reach waterways (Barrett, 2011; Arnold and Gibbons, 1996).

This prescriptive legislation model is active in Washington State, where State law holds local governments accountable to monitor and address pollution sources whenever shellfish growing areas become contaminated, recognizing the Tribes as co-managers of commercial fisheries (NOAA, 2011). For Drayton Harbor, the southern portion of Steloqwen, monitoring results are reported via an online mapping platform, providing prompt transparent data sharing and accountability to the public (WCWP, n.d.). There is an opportunity to learn from and apply the Washington example through the implementation of a Provincial Healthy Shellfish Initiative on the Canadian side of Steloqwen (Sandborn et al., 2023).

Municipalities regulate land use within their borders with authority delegated by the province through the BC Local Government Act (LGA, 2015). The province therefore has ultimate authority over municipal land use decisions (Buholzer, 2022; LGA, 2015); however, the province has been tentative to intervene on municipal land use decisions unless it relates to existing regulation pathways such as urban development works in and about a stream (Epstein, 2017). The province could assert its authority through the development of watershed-scale objectives to hold municipalities to account and address the cumulative effects of local developments. Buholzer (2022) describes the possibility of the province over-ruling municipal processes by creating "residential land reserves" to address the housing crisis. Could this also be an approach the province takes to address the climate change crisis and sea level rise and Indigenous rights to traditional territory and food sources?

Municipalities and Indigenous Rights

Municipalities have an opportunity and responsibility as neighbours and representatives of the crown to pursue reconciliation (Hoehn and Stevens, 2018; Flynn, 2021). Canadian examples exist of municipalities taking this role seriously and recognizing Indigenous sovereignty on the lands of municipalities (Bouvier and Walker, 2018; Helps, 2022). Within the municipalities surrounding Semiahmoo Bay, municipal staff and local elected officials are making some efforts to listen to the Indigenous communities in their neighbourhoods, including Semiahmoo First Nation. Municipal staff have been participating in the work of the Shared Waters Alliance Roundtable for years, contributing towards water quality monitoring and sharing data. In February and May, 2022, elected officials from all five Canadian municipalities gathered to make a commitment to collaboratively address the problem of contaminated waters and shellfish harvest restrictions (Browne, 2021).

Local governments on the Canadian side of Steloqwen are faced with numerous land use decisions that overlap with Indigenous traditional territory. To uphold the principles of UNDRIP, municipalities must build relationships with overlapping Indigenous communities to pursue Indigenous rights of self-determination, and social, cultural, and economic wellbeing, but there is a lack of clarity on the practical steps required (BC Ministry of Indigenous Relations and Reconciliation, 2021). The duty of municipalities to consult and accommodate treaty and aboriginal rights remains uncertain as a result of the BC Court of Appeal decision in 2012 - *Neskonlith Indian Band v Salmon Arm (City) 2012 BCCA 379* that held that the municipality did not have a duty to consult with the Neskonlith Indian Band over a potential land development application. This decision was made prior to more recent reconciliation legislation and even at the time it was debatable whether the court was asking the correct questions to arrive at a suitable solution (Imai and Stacey, 2014).

Practically, there are challenges for municipalities to legitimately build relationship with local Indigenous communities, especially when there are numerous overlapping Nations' traditional territories within these areas. Municipal interview representatives (2023) described the following challenges:

1) Municipalities and Indigenous communities are built on different worldviews. There are many competing values, interests and priorities to consider. For example, demand for affordable housing has growing municipalities providing streamlined processes to enable faster development, without taking the time to consider all of the implications on watershed health or downstream impacts.

> *"You have kind of like two different governments that have different ways of operating that see the world differently. And I find that in some cases just that difference in worldview is really challenging, because the value that one holds is just as important as the value that the other holds. And sometimes there's a bit of an impasse, and you just like, you know, right, like, whereas First Nations are gonna, they hold a lot of value to their past, to their culture like even down to cultural soils. Right? Like they don't want us to move soils that maybe once were walked upon out of the area right, where and time is not as much of a value to them. Whereas we have, you know, more the colonial system, where everything's set up and rigid, and wants things fast, fast, and wants it done now, now, now, and all has to be done within these constraints right? And so when you kinda got those 2 merging, it can be really challenging."*
>
> Michael, Municipal Interview Participant

2) Current municipal systems of Indigenous consultation are unclear, inefficient, and costly. It takes time to build meaningful relationships, and staff don't feel like they have the capacity within their budgets to justify the level of time required.

> *"(There is) too much paperwork for First Nations to review in the name of "consultation" and UNDRIP – not fair to low capacity communities. We could be hitting them five different times for one project, and I almost feel like the colonial system is again being unjust… burying them in paperwork."*
>
> Michael, Municipal Interview Participant

3) Navigating different needs and protocols of different Nations with overlapping traditional territory is complicated.

There is a need to bring clarity from the provincial and federal governments to hold municipalities accountable to their responsibilities under UNDRIP/DRIPA, acknowledging the challenges and supporting local governments with the capacity to engage in a good way with local First Nations.

Being able to do it, not only for our own - Enhance Capacity

You know, being a small nation, being a small community, for a long time we've had a very small voice. But i think of not only us Indigenous people, I think a lot of us as humans we struggle with (connection to our Mother) these days. So being able to not only do it for our own, but for the good and the well-being of all who call our territory their home.

Harley Chappell, Semiahmoo elected Chief

Indigenous leadership has been identified as critical for shellfish management systems change; to enable a paradigm shift and to adjust the goals of the system. The systems map also revealed a positive feedback loop when Semiahmoo First Nation capacity is increased, their guardians program can be built up to consistently monitor water quality, knowledge of water quality conditions will improve, we will understand when conditions are safe to harvest, and federal government entities will be more likely to allow for a legal shellfish harvest opening, thereby increasing connection for Semiahmoo with shellfish as part of their diet, improving their overall health and in turn contributing to building their capacity. Meadows (1999) describes the benefits of systems change when we catalyze positive reinforcing feedback loops. Enhancing capacity for Indigenous leadership will strengthen the system, will bring us closer to the goal of revitalizing Indigenous shellfish harvest, and will sustain the work over the long-term for water quality conditions to continue to improve and the health of Steloqwen to thrive, benefiting all.

> *"There have been wrongs done over history that we're trying to recover from and because of some of those wrongs we now miss a piece of who we are."*
>
> Harley Chappell, Semiahmoo elected Chief

Enhancing capacity within Semiahmoo First Nation will not be a simple process. They are a small nation, divided from their relatives and main village sites when the US/Canadian border was established. Residential schools and disease and the Canadian Indian Act framework have diminished their population numbers and restricted their opportunities to self-determination, education, economic development and infrastructure. They are faced with significant challenges within their small community such as: addressing sea level rise, coastal erosion, flooding, and landslides, housing limitations, addiction and mental health challenges (H. Chappell personal communication, 2022). Dr. Dawn Smith noted during a teaching session at the University of Victoria in June 2023, that for her Nuu-chah-nulth community, they are "trying to get out of a dark place; to heal, to take advantage of the opportunities around them". There is a healing that needs to take place within many Indigenous communities even as they are needed as leaders to transform broken systems. Smith (2023) speaks about the importance of self love in this healing process and how part of that is self knowledge. "*Getting to the truth (is) hard (and) getting to reconciliation (is) harder*" (TRCC, 2021, p.7). Canadian communities need to allow our Indigenous neighbours to heal well and to build them up with respect, honour and love.

Capacity building has been evident on the American side of the Salish Sea when Indigenous communities have been able to pursue self-determined economic opportunities that bring resources into communities and allow them to hire more staff. Simms et al. (2016) suggest one way to enhance capacity for First Nations is by developing a resource sharing agreement with the provincial government of British Columbia, for example through water licence fees or fisheries licences. They also note that capacity needs to be enhanced within colonial governments as well, to increase awareness of Indigenous laws and to address fragmentation of colonial jurisdictions that further exacerbate Indigenous capacity issues (Simms et al., 2016).

Summary and Revisiting the Conceptual Framework

To summarize the discussion and analysis, recommended actions to improve collaborative efforts and advance the goal of revitalizing shellfish harvest for Semiahmoo- First Nation include the following:

1) shift the colonial governance paradigm to an Indigenous worldview upholding reciprocal relationships by establishing Semiahmoo First Nation leadership in positions of authority to influence land and water management ie. Metro Vancouver Board, Fraser Basin Council, and/or Provincial (BC)/Federal Cabinet; and by pursuing Indigenous led watershed governance with ĆEĆINES to hold jurisdictions accountable to shared goals;

2) apply UNDRIP to the Canadian Shellfish Sanitation Program and expand the goals to elevate Indigenous shellfish harvest values. Re-align jurisdictional responsibilities to address gaps and provide mechanisms for watershed-scale Indigenous-led collaboration (ȻEN,TOEL). Key elements to support successful ongoing ȻEN,TOEL/collaboration: strong committed champions and leaders, sustained funding models, shared positive vision and goals, clear communication and community engagement, and opportunities to celebrate and feast together;

3) assert Semiahmoo First Nation authority to monitor and determine when it is safe to harvest shellfish. Implement a long-term pollution identification and control plan (XĆETSW̱), with leadership from Indigenous Guardians programs and collaboration with partner organizations. Establish prescriptive legislation to hold polluters and governments accountable to meet water quality guidelines that allow the bay to flourish;

4) enhance Semiahmoo First Nation and colonial government capacity to ensure that Semiahmah have space to heal and that they are equipped with the resources they need to lead well.

Each of these action steps were revealed through a critique of coastal governance using complex social-ecological system leverage point analysis, including insight from the many jurisdictions involved in Steloqwen shellfish management, and through attending to the land and water and Semiahmoo First Nation knowledge and story. This affirms the conceptual framework presented at the beginning of the research. **Figure 11** shows an updated conceptual framework diagram with the stepping stone actions revealed as a pathway towards Indigenous shellfish revitalization.

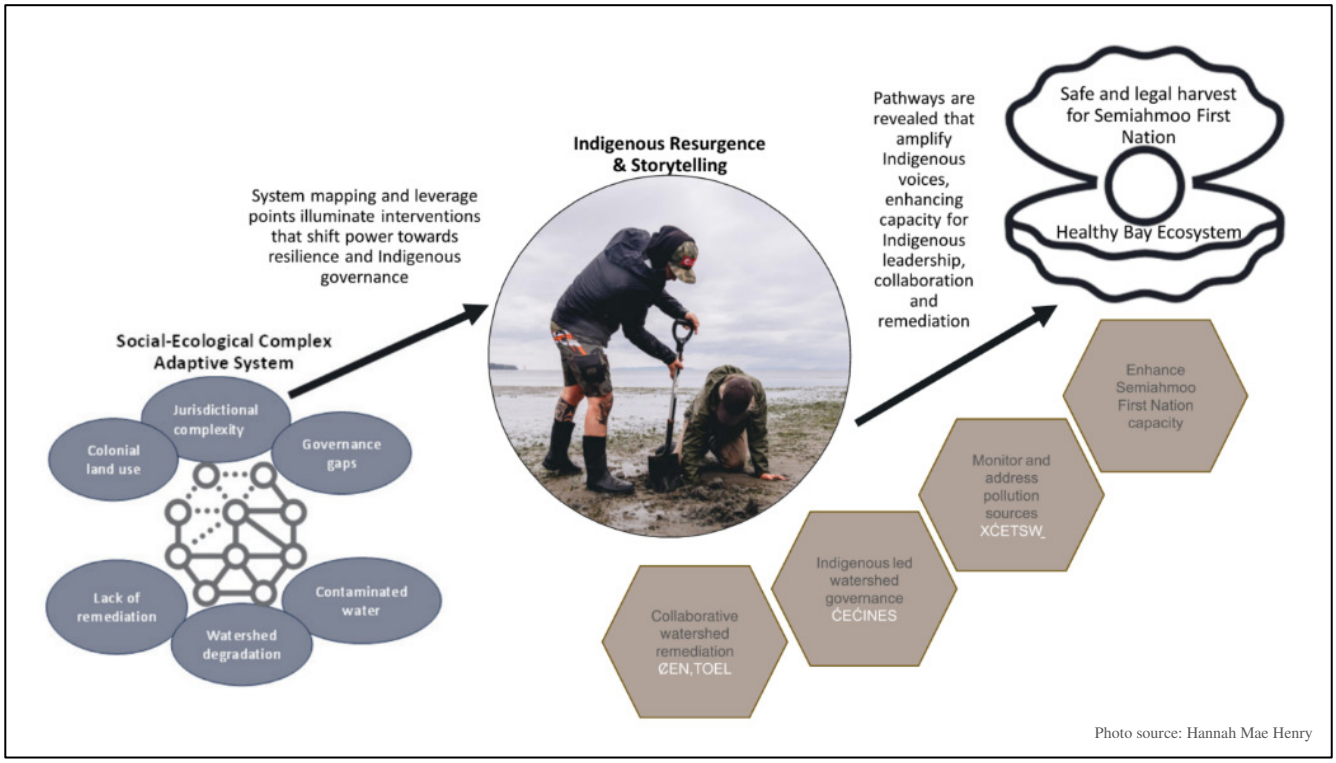


Figure 11. Conceptual Framework revisited to assess fit with findings

Chapter 6: Conclusion

The purpose of this study was to amplify Semiahmah community voices and reveal actionable outcomes that move towards transformative governance and restoration of a healthy bay ecosystem, offering pathways towards revitalization of shellfish harvest in tsepoleq/Semiahmoo Bay. Semiahmah voices were amplifed through the film and story map products as well as the participatory process of sharing the film with decision-makers and stakeholders, those participating in the Shared Waters Alliance Roundtable. Participant responses demonstrate that sharing Semiahmoo First Nation's story and connection through the film has positively influenced their level of participation in the collaborative work of Shared Waters Alliance, to improve water quality in Steloqwen for the revitalization of shellfish harvest. Findings have shown that all levels of government will need to be involved in this process of rebuilding reciprocal relationships and collaboratively addressing pollution sources until the shelled ones are healthy enough to eat again.

Keys to Revitalize Shellfish Harvest

This research builds on existing Indigenous resurgence literature and social-ecological systems literature by demonstrating how both can be applied in the context of transboundary coastal ecosystems to generate innovative solutions to the overlapping problems of food insecurity and watershed degradation related to shellfish harvest prohibition. Through the research, key barriers and opportunities have been identified and discussed to reveal a pathway towards revitalizing shellfish harvest in Steloqwen.

Firstly, jurisdictional roles and responsibilities related to coastal ecosystem management need to be clarified and re-defined to close existing governance gaps and to be aligned with Indigenous values. Not only to meet obligations under UNDRIP, but also because of the holistic and sustainable nature of Indigenous values as demonstrated by Semiahmoo First Nation's teachings and other examples of local Indigenous community's leadership and laws.

Secondly, pollution sources must be identified and controlled, which requires both a consistent, coordinated, and well-communicated monitoring plan as well as a collaborative approach to addressing the variety of potential pollution sources.

And thirdly, Semiahmoo First Nation capacity must be bolstered to provide a leadership role in collaborative efforts.

All three of these key barriers can be addressed by taking a systems thinking approach to identify leverage points and by applying Semiahmoo Indigenous teachings to each of the actions. This will involve: 1) ƛ̓EN,TOEL, jurisdictional alignment to allow for Indigenous led collaborative watershed remediation, 2) ĆEĆINES, Indigenous led watershed governance with teeth to hold jurisdictions accountable, and 3) XĆETSW̱, Indigenous led collaborative process of looking over, measuring, figuring out and deciding where the pollution sources are and how best to address them. All of these solutions rely on Indigenous capacity to provide leadership and uphold their rights of sovereignty and self-determination.

Indigenous Resurgence Movement

Local Indigenous communities are rising up and providing leadership through their traditional knowledge and teachings interwoven with new technologies, exercising their rights to traditional lands, waters and resources and addressing complex problems such as biodiversity loss, food insecurity, and climate change (Bennett, 2023; Gamage, 2023a; Gamage, 2023b; Kloster, 2023; Pauquachin First Nation, 2023). Through establishing Indigenous Marine Protected and Conserved Areas, practicing traditional herring fisheries, revitalizing ancient clam gardens, and awakening archaeology studies Indigenous communities are growing stronger through resurgence and are calling colonial governments to action. It is beyond time for policy makers to pay attention to Indigenous voices and support them in leading the way towards innovative solutions to these global problems.

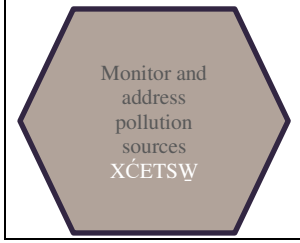
Recommended Next Steps

Pathways have been revealed, grounded in Semiahmah voices and clarified through complex systems analysis. To operationalize this research, Semiahmoo First Nation will need to be acknowledged and supported as leaders with the capacity and authority to carry out governance in their territory, influencing land and water management on a watershed scale. The following short, medium and long-term steps are recommended to achieve the vision of revitalized shellfish harvest and a healthy bay ecosystem

Table *8*). The timelines of short, medium and long-term steps align with the life cycle of the horse clams that live under the sand near the low low tide line in Semiahmoo Bay. In the next 1-3 years (short-term recommendation timeline), the pathway towards shellfish harvest revitalization feels somewhat vulnerable and small like the baby clams. Horse clams begin as shell-less, free-swimming larvae in the water, less than 1mm in size, dispersed by mature clams sometime between mid-February and April (Hiebert, 2016). They reach sexual maturity after 3-5 years (medium-term recommendation timeline). The longest lived horse clams were estimated to be 29 years old and can grow up to 20 cm in length (Ibid.). Learning from nature, we look forward to a day when these baby clams have reached maturity and grown to be a large size, good enough to eat (long-term recommendation timeline).

Table 8. Recommended next steps to revitalize Indigenous shellfish harvest in tsepoleq/Semiahmoo Bay.

Actions to Effect Systems Change	**Baby Horse Clam (1-3 years)**	**Mature Horse Clam (5-15 years)**	**Elder Horse Clam (15-30 years)**
Paradigm Shift – Rebuild Reciprocal Relationships  	Pursue leadership roles for Semiahmoo First Nation on Metro Vancouver Board, Fraser Basin Council, and/or Provincial (BC)/Federal Cabinet. Semiahmoo First Nation will determine a watershed governance pathway for Steloqwen with support of the Shared Waters Alliance Core Team. Get out on the land – practice turning the shellfish beds once or twice annually to revitalize the practice. Connect and learn from similar initiatives. Build transboundary relationships. Celebrate and feast together with those who have access to shellfish – ie. Lummi and Nooksack relatives. Amplify collective Indigenous voices. Potential to pursue justice and governance shifts through the International Joint Commission.	Established leadership role for Semiahmoo First Nation on Metro Vancouver Board, Fraser Basin Council and/or BC/Federal Cabinet. Fully functioning watershed governance led by Semiahmoo First Nation. Regular rhythms of getting out on the land, practicing shellfish harvest and feasting together is building relationships with each other and the land. Regular (bi-annual?) gatherings of Shared Waters Alliance Roundtable participants to shared knowledge and build relationships.	Semiahmoo First Nation holds the power to determine when shellfish conditions are safe to harvest. Semiahmoo young people are connected to the land and know how to harvest shellfish and other resources from the beach. Local decision makers, municipal elected officials and staff, regional, provincial and federal staff connected to shellfish management have a connection with Steloqwen and have aligned their decision-making processes to uphold Indigenous values and UNDRIPA/DRIPA legislation.

Change the Goals and System Structure – Revitalize Steloqwen through collaborative remediation 	Semiahmoo will advocate for the CSSP to apply UNDRIP and expand their goals to elevate Indigenous values. Semiahmoo will stand with other coastal First Nations in calling provincial and federal governments to initiate a Healthy Waters Initiative, modeled off of Washington State, including prescriptive legislation that holds polluters and governments accountable and mechanisms for watershed-scale collaboration. Develop a clear collaborative plan with targets to pursue cumulative benefits and improve the health of Steloqwen and the Salish Sea as a whole.	The goals of the system have changed from a narrow focus on commercial shellfish growing areas and blanket harvest closures, to adequate government investments and commitments to coastal remediation. Implementation of the BC Coastal Marine Strategy, including a Healthy Shellfish Initiative.	Led by Indigenous Nations, all levels of government on the Canadian and American side of Steloqwen are working together on well-articulated, well-funded actions to achieve shared goals of a healthy bay ecosystem and maintaining revitalized harvest for seven generations.
Change the Rules and Information Flows – monitor and address pollution sources 	Federal, provincial, regional and municipal governments support and contribute towards a holistic long-term monitoring plan to consistently assess and address pollution sources, with leadership from the Semiahmoo First Nation guardians program. Monitoring will include both sanitary (bacterial) pollution sources and biotoxin. Monitoring results will be reported immediately to enable swift responses to address pollution sources.	Semiahmoo has delegated authority to sample and analyze results using in-house testing kits. Shared Waters Alliance will support the development of an Indigenous biotoxin lab modeled after the Alaska Indigenous Tribes. Voices of multiple coastal First Nations are combined to amplify the importance of shellfish and coastal ecosystem flourishing.	Semiahmoo has the capacity to conduct their own testing of bacterial pollution and biotoxins. Semiahmoo Guardians have authority to enforce environmental laws to address pollution sources and hold polluters accountable. Public and political awareness has increased so that the shellfish issue is visible and valued by governments and society.

Catalyze reinforcing positive feedback loops – enhance Semiahmoo First Nation capacity to lead  	Establish more sustainable long-term funding sources to support Semiahmoo's priorities of revitalizing shellfish harvest. Raise up more Semiahmoo community members and/or staff to be engaged in this work. Expand the Shared Waters Alliance Core Team to potentially include other First Nations and/or local/regional government depending on the chosen governance model. Semiahmoo to pursue self-determination and economic growth initiatives. Allow sacred space for Semiahmoo First Nation to heal from past wrongs. Semiahmoo could seek compensation for the lands and resources that have been damaged without their free, prior and informed consent (UNDRIP, 2007; Article 28)	Semiahmoo capacity is enhanced through economic opportunities, staff and community members are trained and equipped to take leadership roles in watershed governance and Guardian monitoring and enforcement to protect and restore Steloqwen shellfish harvesting grounds. Shared Waters Alliance participants support the shared vision of a healthy bay ecosystem and revitalized shellfish harvest.	Semiahmoo First Nation is reconnected to their traditional food source of shellfish in Steloqwen. Steloqwen is a healthy coastal ecosystem. Semiahmoo continues to provide leadership through watershed governance and Guardianship.

Through a collaborative approach, under Indigenous leadership, Steloqwen will be restored and shellfish harvest revitalized. As Indigenous voices are attended to, current governance priorities will shift to uphold Indigenous values, including the revitalization of traditional food sources such as shellfish. These principles and recommended steps can be applied to similar contexts all along the coast of British Columbia where coastal Indigenous communities are experiencing the same disconnection from shellfish as Semiahmoo First Nation. It is our responsibility to take the achievable steps to enable Semiahmoo First Nation to return to shellfish harvest in tsepoleq/Semiahmoo Bay as outlined in this paper. These are necessary steps towards reconciliation where everyone benefits. It is reconciliation we can eat (Sandborn, et al., 2023).

Figure 12. The next generation of clam harvesters holding horse clams in tselopeq/Semiahmoo Bay.
(Photo source: Hannah Mae Henry, 2022).

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Appendices

Appendix 1: Important Terms

Action Research: a "democratic and participative orientation to knowledge creation. It brings together action and reflection, theory and practice, in the pursuit of practical solutions to issues of pressing concern" (Bradbury, 2015, p.1)

Axiology: branch of philosophy that study values: what do we value? What values guide our research? (Lyon, n.d.).

Colonialism: the "subjugation of Indigenous ways of knowing and knowledge production, as well as being complicit in the creation and maintenance of a **fabricated hierarchy** of humankind" (Reid et al., 2019).

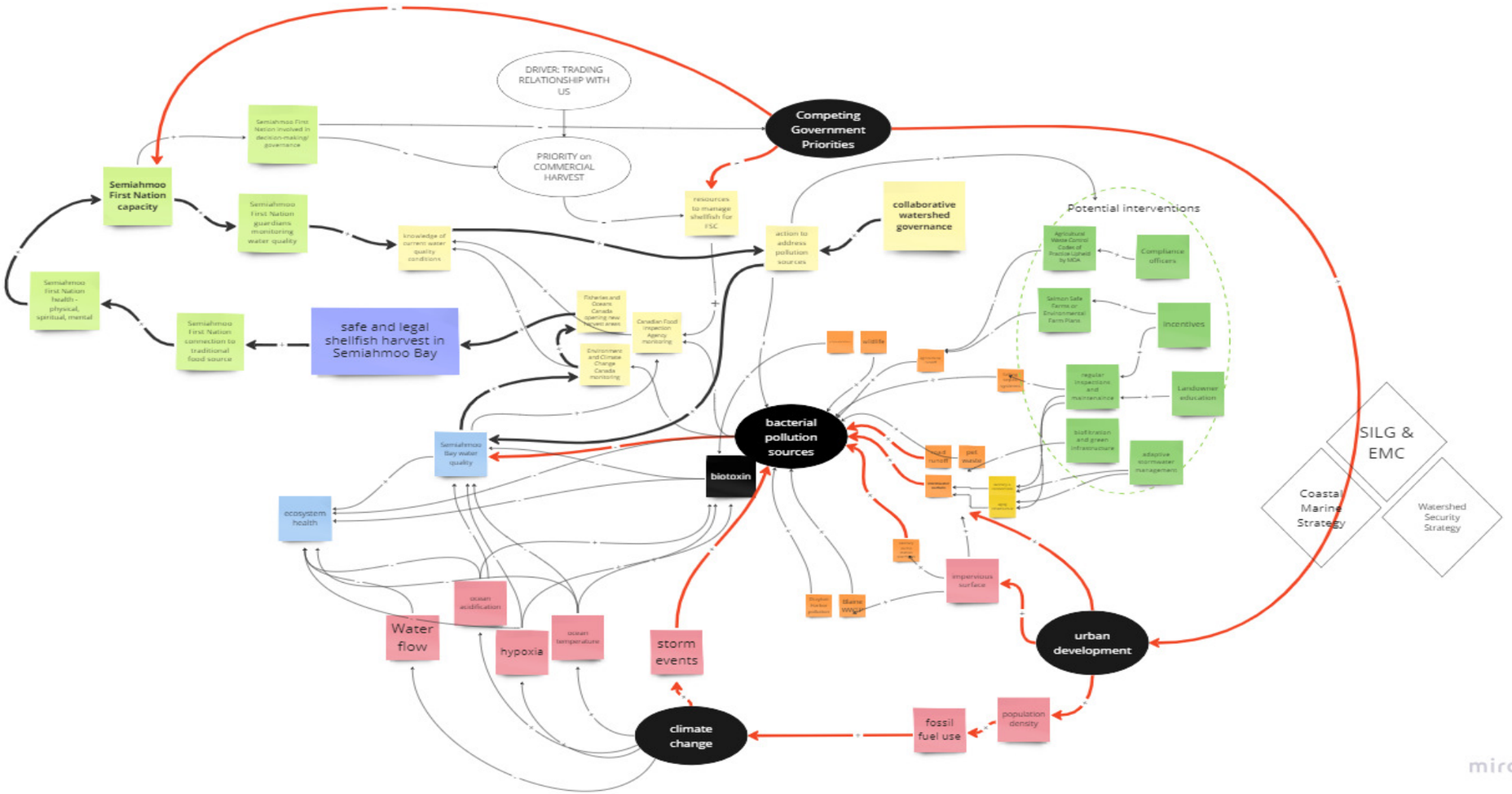
Epistemology: "the understanding of knowledge that one adopts and the philosophy with which research is approached". (Cochran et al., 2008; p.24)

Interpretivist lens: in contrast to positivism, where a single reality can be understood by observation, interpretivism "holds that reality is subjective", and research relies on multiple perspectives to understand the problem. "Through this lens, research is inherently shaped by the researcher, who brings their own subjective view of observed phenomena based on their personal experience" and knowledge or solutions generated "are not objectively right or wrong", but "relative to the time, context, and culture that it emerged from" (Rogers, 2020).

Appendix 2: Jurisdictional Interview Questions

1	What is your personal and/or professional connection to Semiahmoo/Boundary Bay/Salish Sea? Are there any stories you would be willing to share?
2	What is your personal and/or professional connection to shellfish - clams, oysters, mussels? Are there any stories you would be willing to share?
3	How do you feel about the closure of shellfish harvest in Boundary Bay and all the way up the coast of BC?
4	What are the main barriers/challenges related to Indigenous shellfish harvest in the Salish Sea?
5	How do you think these barriers might be overcome to see shellfish harvest be revitalized?
6	What is the scope of your jurisdictional responsibility or level of participation in relation to shellfish harvest within Semiahmoo Bay? In other words: what can **you** do to revitalize shellfish harvest?
7	What other opportunities do you see that could be done to address this problem?
8	Are there any reflections or stories you would like to share related to this topic?

Appendix 3: Complex System Map



Appendix 4: Examples of Collaborative Initiatives to address components of shellfish harvest revitalization

We All Take Care of The Harvest (WATCH) is a program initiated by the First Nations Health Authority and draws together participants from Indigenous communities and the BC Centre of Disease Control and shellfish researchers at Vancouver Island University (FNFA, 2023). Indigenous communities are trained how to monitor for harmful algal blooms (HAB), which provides them with information on the risk of biotoxin presence in shellfish. This empowers Indigenous communities to make their own decisions about when it is safe to harvest. Limitations within this program are that it is a pilot, with a sunset date on funding in 2024 and communities still rely on the single federally approved lab to measure biotoxin within shellfish tissue. While the presence of algae indicates a potential risk of biotoxin, it does not directly link to levels of biotoxin in the clams themselves. First Nations Health Authority is pursuing the development of an Indigenous lab to analyze biotoxin, similar to how things are managed in Alaska.

Sitka Tribe of Alaska. In 2013, tribal community members from Sitka Tribe reached out to neighbouring tribes to collaborate and work together to address the increasing challenge of biotoxins in shellfish due to warming ocean temperatures. A few years later they have established a lab where they can test for paralytic shellfish poisoning and have raised awareness across the State about the concerns and conditions of toxins shellfish. This program has linked western science and Indigenous ways of knowing together and established Indigenous sovereignty through the holding and sharing of knowledge (SEATOR, 2021).

Burrard Inlet Action Plan was initiated by Tsleil-Waututh First Nation to develop-Indigenous led objectives for the health of Burrard Inlet (Kerr Wood Leidal & Tsleil-Waututh First Nation, 2017). Now a collaborative table with all levels of government, industry, academia and the non-profit community, they are working towards developing water quality objectives to protect the most vulnerable water use for multiple parameters within the Inlet, including a goal to revitalize shellfish harvest. Tsleil-Waututh First Nation have been successful to work with the CSSP to open a harvest area in a remote area of Indian Arm. Not a traditional harvest site and hosting only invasive species of clams, it still provides an area to revitalize traditional practices of clam harvest, allows sharing of knowledge from elders to the next generation and helps to re-connect community members with the lands and waters (Cora and Lindsey, pers comm, 2023).

Island Marine Aquatic Working Group (IMAWG) is an Aboriginal Aquatic Resource and Oceans Management (AAROM) initiative funded through Fisheries and Oceans Canada (IMAWG, 2020). They provide a table and technical support for Vancouver Island-based Nations to gather and learn about current DFO fisheries management measures. Nations then have an opportunity to offer feedback related to their rights-based fisheries, with a focus on salmon conservation and food security rather than commercial operations. They have also been providing some guidance and support related to shellfish harvest management and process for Island Nations. The goal is to provide clarity on roles and responsibilities and hold both sides (DFO and First Nations) accountable to uphold agreed upon responsibilities (SThompson).

Cowichan Watershed Board was formed in 2009/2010 after severe droughts in 2003 and 2006 and floods in 2009 drove political will to improve watershed governance (Hutchins et al, 2014). Cowichan Valley Regional District collaborated with Cowichan Indian Tribes to co-fund and co-chair a leadership table to provide direction on priority actions in the watershed and implement the watershed plan (Hutchins et al, 2014; TRutherford and HPritchard personal communication, 2023). Regional District

funds came through gas tax. Starting as an interest board with federal and provincial government representatives invited to the table, it has morphed into a governance board and registered society (2013), with stakeholder working groups providing advisory roles (Hutchins et al., 2014). The Board provides leadership and advice through consensus decision-making, with an emphasis on educating themselves to ensure well-informed decisions. Monthly meetings include information sessions presented by subject experts on aspects of watershed governance or watershed issues to inform decision making (Hutchins, 2014). The Board does not have authority to legislate activities, but provide leadership and advice through community engagement and communications. Collaborative efforts continue to address pollution sources in the watershed towards revitalizing shellfish harvest, under the target of estuarine health (TRutherford/HPritchard, 2023). Water quality monitoring in partnership with DFO enabled them to address a sewage input issue in Cowichan Bay. They supported Cowichan Tribes and the Province of BC in the development of a Watershed Sustainability Plan to address water quantity concerns in the Xwulqw'selu/Koksilah watershed (CWB, 2023).

Indigenous Aquaculture Collaborative - a network of Indigenous communities in Hawaii and along the west coast of North America, organizations, universities and Pacific Region Sea Grant offices; working together to advance Indigenous Aquaculture through a community of practice (IAC, 2021). Sea garden initiatives have been mapped, information resources are shared, and common goals and practices are developed throughout a network of place-based coastal-food systems (Pacific Sea Garden Collective, 2022).

Swinomish Joint Comprehensive Plan - first comprehensive planning effort attempted between a tribe and a county in the Nation (Ayer, 1991; Baker 1986; Churchill, 1991; Larsen, 1989; O'Brien, 1986 in Zaferatos, 2004).
Example of Swinomish regional collaboration (Zaferatos, 2004).

Stormwater Interagency Liaison Group (SILG) and Environmental Monitoring Committee (EMC) - chaired by Metro Vancouver staff, an information sharing forum for federal, provincial, regional and municipal staff on stormwater management research. EMC is also chaired by Metro Vancouver staff but is a collaboration of provincial and federal representatives who provide input on issues of stormwater management within Metro Vancouver.

Additional collaborative tables were illuminated throughout the research that are no longer functional for various reasons:

Georgia Basin Ecosystem Initiative was a federally (Environment Canada) driven program, launched in 1998 to support the sustainability of the "Georgia Basin" before it was called the Salish Sea, and inspired by the example of the Coast Salish People who "exercised sound environmental stewardship over the land and resources of this unique and sensitive ecosystem": Sqelatses meaning "home", for thousands of years (Government of Canada, 2003). Out of this initiative a transboundary plan was developed in collaboration with the US EPA, and a Canadian Georgia Basin Action Plan was developed involving all levels of government including workshops with regional and municipal government, attempting to coordinate our approaches to ecosystem health on the holistic watershed scale of the Salish Sea (Government of Canada, 2003). Numerous collaborative projects were established, including the first transboundary working group to improve the health of Semiahmoo Bay, the beginnings of Shared Waters Alliance. The work aligned with one of the GBEI objectives: "clean water to protect and improve aquatic ecosystem health and human well-being in the Georgia Basin", specifically: "productive shellfish harvesting areas are maintained and restored to ensure a sustainable shellfish resource for the benefit of commercial, recreational and First Nation users". (Lanarc Consultants, 1999, p.5).

When Stephen Harper's Conservative government came into power in 2006-2015, along with Gordon Campbell's Liberal government in British Columbia in 2001-2011, widespread massive cutbacks were made to environmental programs and legislation across the country; the Georgia Basin Ecosystem Initiative dissolved along with other collaborative interjurisdictional programs like the Fraser River Estuary Management Program (FREMP), which dissolved in 2013 when the federal government representatives withdrew their support and delegated FREMP responsibilities to the Port Authority (Langer, 2019). FREMP was officially initiated in 1984, but formed out of baseline studies that started in 1977, to provide collaborative oversight of estuary health and to coordinate review of development projects proposed in the Fraser River Estuary, including Steloqwen/Boundary Bay (O'Riordan and Wiebe, 1984). This example is shared to note how fickle government initiatives can be due to our colonial political structure that has the potential to drastically change priorities every election cycle (4-5 years).

Additional inactive examples:

- Norovirus Working Group - BC Ministry of Agriculture (Aquaculture) initiated to address virus outbreak concerns for commercial shellfish producers in Baynes Sound, Vancouver Island. Provincial staff brought together CFIA, Health Canada, shellfish producers, municipal and regional government representatives, commercial fishers, and Vancouver Island University researchers to develop a monitoring program and characterize the problem so that it could be addressed. Various sub groups formed to tackle components of the problem (MRoth). This working group no longer exists due to lack of capacity for ongoing leadership within the provincial government.
- Traditional Seafoods of Vancouver Island First Nations - initiated through a federal DFO-Health Canada funded project to host gatherings of Vancouver Island First Nation communities for information sharing and feasting. It was a beautiful time of celebrating wild Indigenous foods and learning about the latest scientific studies and Indigenous knowledge; approximately 35 different Nations participated. 9 years in a row.

Appendix 5: United Nations Declaration on the Rights of Indigenous Peoples articles that apply to the revitalization of Indigenous shellfish harvest.

UNDRIP Article	**Application to Semiahmoo First Nation Shellfish Harvest**
Article 8 1. Indigenous peoples and individuals have the right not to be subjected to forced assimilation or destruction of their culture. 2. States shall provide effective mechanisms for prevention of, and redress for: (a) Any action which has the aim or effect of depriving them of their integrity as distinct peoples, or of their cultural values or ethnic identities; (b) Any action which has the aim or effect of dispossessing them of their lands, territories or resources; (d) Any form of forced assimilation or integration;	Prohibition of shellfish harvest for two generations has forced the destruction of SFN's cultural practice of harvesting shellfish and has stopped them from being able to pass on that traditional knowledge to future generations
Article 11 1. Indigenous peoples have the right to practice and revitalize their cultural traditions and customs. This includes the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artifacts, designs, ceremonies, technologies and visual and performing arts and literature. 2. States shall provide redress through effective mechanisms, which may include restitution, developed in conjunction with indigenous peoples, with respect to their cultural, intellectual, religious and spiritual property taken without their free, prior and informed consent or in violation of their laws, traditions and customs.	SFN have not been able to continue practicing cultural ceremonies that involve shellfish harvesting.
Article 18 Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision making institutions.	SFN were not involved in the decision making process for land use surrounding their reserve lands that have degraded water quality. Neither have they been involved in decisions related to the prohibition of shellfish harvest.

Article 19 States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them.	The federal government did not gain free, prior and informed consent from SFN before adopting and implementing the shellfish harvest prohibition in 1962, nor did they receive SFN's free, prior and informed consent regarding land use development decisions within the Boundary Bay watershed that has resulted in contaminated waters.
Article 20 Indigenous peoples have the right to maintain and develop their political, economic and social systems or institutions, to be secure in the enjoyment of their own means of subsistence and development, and to engage freely in all their traditional and other economic activities.	SFN is unable to enjoy the subsistence of eating local clams, mussels and oysters from Boundary Bay as they have done since time immemorial.
Article 26 1. Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired. 2. Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired. 3. States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned.	SFN are unable to use or develop the shellfish resources that exist in abundance on the lands that they have traditionally harvested for generations.
Article 28 1. Indigenous peoples have the right to redress, by means that can include restitution or, when this is not possible, just, fair and equitable compensation, for the lands, territories and resources which they have traditionally owned or otherwise occupied or used, and which have been confiscated, taken, occupied, used or damaged without their free, prior and informed consent. 2. Unless otherwise freely agreed upon by the peoples concerned, compensation shall take the form of lands, territories and resources equal in quality, size and legal status or of monetary compensation or other appropriate redress.	SFN have not been compensated for the loss of access to their traditional food source of local shellfish, even though it has been damaged without their free, prior and informed consent.

Article 29 1. Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination. 2. States shall take effective measures to ensure that no storage or disposal of hazardous materials shall take place in the lands or territories of indigenous peoples without their free, prior and informed consent. 3. States shall also take effective measures to ensure, as needed, that programmes for monitoring, maintaining and restoring the health of indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented.	The environment (of Boundary Bay) has not been conserved or protected, which has damaged the productive capacity of SFN lands to supply healthy shellfish. Reparations have not taken place to address these concerns. Monitoring and maintenance of the environment have not been undertaken to restore the health of Indigenous peoples
Article 40 Indigenous peoples have the right to access to and prompt decision through just and fair procedures for the resolution of conflicts and disputes with States or other parties, as well as to effective remedies for all infringements of their individual and collective rights. Such a decision shall give due consideration to the customs, traditions, rules and legal systems of the indigenous peoples concerned and international human rights.	Despite attempts of SFN to bring this problem to the representatives of the Canadian Shellfish Sanitation Program, they have not provided assistance to monitor current conditions nor provide any remedies to address the problem of contaminated water.

Appendix 6: Shared Waters Alliance Participant Organizations

Organizations who were represented at the Shared Waters Alliance Roundtable gathering in Surrey, BC on June 29, 2023.

Number of Participants	Affiliation	Jurisdiction
2	A Rocha Canada	Non-profit organization
2	BC Centre for Disease Control	Provincial/State
2	BC Ministry of Water, Land and Resource Stewardship	Provincial/State
1	BC Nature	Non-profit organization
1	Birds Canada	Non-profit organization
2	Canadian Food Inspection Agency, CSSP/PRISC rep	Federal
2	City of Surrey	Municipal
1	City of White Rock	Municipal
1	Corp of Delta	Municipal
1	Drayton Harbor Oyster Company	Shellfish Grower
1	Environment and Climate Change Canada	Federal
1	Fisheries and Oceans Canada	Federal
3	Fraser Basin Council	Non-profit organization
2	Langley Environmental Partners Society	Non-profit organization
2	Metro Vancouver	Regional
1	Nooksack Tribe	Indigenous
1	Salish Sea Indigenous Guardians Association	Indigenous-led non-profit organization
4	Salish Sea Initiative Coordinator	Indigenous
2	Semiahmoo First Nation	Indigenous
1	Surrey Environmental Partners	Non-profit organization
1	Township of Langley	Municipal
2	University of British Columbia	Academia
1	University of Victoria	Academia
1	Washington Dept of Agriculture	Provincial/State
2	Washington Dept of Ecology	Provincial/State
1	Washington Dept of Health	Provincial/State
1	Whatcom Conservation District	Regional
1	Whatcom Country Health and Community Services	Regional
1	Whatcom County Public Works	Regional
2	World Wildlife Fund	Non-profit organization
46	Total	