# Against the Current:
# Redefining Relationships Within Salmon Ecosystems

by

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Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

at

Dalhousie University
Halifax, Nova Scotia
March 2018

# CONTENTS

## ABSTRACT

How cultures view nature and the environment shape how we dwell within the environment. When examining wild salmon and their habitat along the Fraser River watershed it is clear that these perceptions have had a detrimental impact. Therefore, this thesis attempts to balance the needs of people and salmon while addressing current perceptions of nature within the context of a salmon eco-park. Through examining key relationships along the Vedder-Chilliwack River, a major Fraser River tributary, this thesis provides a framework for salmon habitat, while also providing opportunities for co-learning about salmon, habitat, and harvesting.

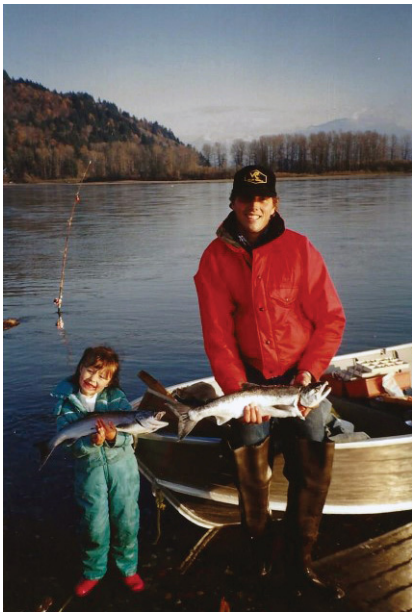
## ACKNOWLEDGEMENTS

In going through the thesis process I encountered many who were open to sharing their knowledge about wild salmon with me. While it would be impossible to name them all I would like to thank, Walter Regan and the Sackville Rivers Association, Ernie Victor and the Stó:lo Research and Resource Management Centre, Lina Azeez and the Watershed Watch Salmon Society, and Natashia Cox from the Fraser Valley Watersheds Coalition. The knowledge and insight you all shared was both helpful and inspiring.

This thesis also would not have been possible without help from both Elisa Dainese and Catherine Venart. I thank you both for your guidance, patience, and willingness to teach.

Finally, I want to thank my fishing partner, my family, and to all those I have fished with along the way.

# CHAPTER 1: INTRODUCTION



Fishing at Old Orchard in 1993.

## My Story

I was born in Ladner, British Columbia, close to both the ocean and the Fraser River. I lived there until I was four when my family moved to Surrey, British Columbia, still within a short distance from the Fraser River and its many Lower Mainland tributaries. My surname, Van Vliet, is Dutch. Van means ‘from’ or ‘of’ and Vliet translates to minor stream or waterway. So while I am from Surrey, I am also from the waterway. This is fitting considering shortly after I was born my father started taking me fishing for salmon on the Fraser River. Sometimes my mother, my siblings, or my uncles and father’s friends would join us. The one constant was my father and I. I still recall the time when I was younger and I was so sick that my father decided to go without me. My mother found me halfway down the block in tears as I had tried to chase after my father’s truck.

The two of us had many fishing spots along the river but the one I remember most was across from Old Orchard Road Bar, just upriver from where the Vedder River meets the Fraser River in between Chilliwack and Sumas Mountain. Some of my earliest memories are bar fishing on those gravel shores. To me the entire day was like an event. Waking up between 4:00 and 5:00 AM in order to get to the fishing spot before anyone else. Bundling up in the warmest clothes possible, but also making sure to bring a change of clothes in

case the weather warmed up. It would take about half an hour to drive to the boat launch. From there we would load up our small car-topper boat with all our gear and whomever was joining us that day. Sometimes we would have to make multiple trips across the river, the boat so laden with stuff that the water was mere inches from the rail of the boat. While we fished this spot between early spring and early winter I still recall the fall most vividly.

The autumn trip across the river was equally quiet and musical. Every year the river changes shape making each trip unknown and dangerous while the fluctuating tides added to this danger. Additionally, I remember the fog on those fall mornings. It was usually so thick I could barely see the front of the boat from my spot beside my father near the boat motor. This meant navigating the river cautiously. We all remained silent while we listened to the putter of the boat engine and strained to hear for changes in the water depth by the sound of the water and more importantly tried to listen for other boats. It was also slow going. The trip across mid-day would take between five and ten minutes. During these early morning fog trips it would take much longer, the fog adding to the feeling that time was standing still. By going slow it ensured the boat would not get stuck on any shallow spots on the river if and when we hit them. It was at these moments that my uncles or my father would get out of the boat and tentatively walk the boat across these sections, navigating the fast current and ensuring they didn't step off a drop-off or into soft spots in the gravel, silt, and sand.

Once across, we would rush to setup our fishing rods and cast the gear out. Then we would dig our rod holders into the gravel and hang a bell off of each fishing rod.[1] It was only after this ritual had been performed that we would consider unloading the rest of our stuff and setting up our 'camp'. At the same time someone would collect sticks and logs that had washed up onto the shore to use for firewood. Until the sun burned off the fog by mid-day the fire was our only source of warmth. With this we could now all settle into our chairs beside the fire, hoping to hear the sound of the bells ringing over the crackle of the fire, indicating that a salmon was on the hook.

To me the river comes alive in the fall. First there are the sounds of the river rushing by and splashing against the shore. Next, the sound of the various rocks, gravel, and sand

1 Small bells are used on a bar fishing setup as an indicator. When a fish bites the hook both the line and the rod will move and the bell will then ring.

underneath your feet as you walk along. Then there are the salmon jumping and splashing as they swim upriver; the seagulls, eagles, and turkey vultures all sounding off as they fight and feast on salmon. Finally, there are the occasional sounds of the lumber mill and dirt bikes on the other shoreline. Only those sounds and the sounds of other boats and tugs make you realize that civilization is nearby.

There are also the smells. The river itself has a smell, one which I cannot fully describe. Then there is the scent of the silt, the sand, the wet sticks, trees, and vegetation. The smell of the rotting flesh of spawned out and dead salmon is the most powerful and poignant. Only by standing by the fire, inhaling the fragrance of the smoke, can you get relief from that smell.

There are also the feelings of textures, temperatures, and pressures. By walking through the water along the shore one truly experiences the river. Some days the water is so cold, you can feel it through your boots and many layers of socks. Other days it provides a necessary relief from the beating rays of the sun. The current is not consistent along the riverbanks and only through walking through the water, pitting yourself against this undulating pressure, can you fully appreciate this. The ground is equally inconsistent, an area that may look solid will reveal itself to be soft and forgiving only when you walk across it. This becomes most precarious as you walk within the water, unable to see and relying solely on your footing.

Finally, there is also the light. The hazy and dense fog in the autumn morning moistens your already chilled face and provides a diffused and mystical aura around the river. Walking through the fog, one feels as if the entire world is in hiding, only willing to slowly reveal itself with each slow step you take. When the fog finally wears off and the sun bursts through, those first few rays of light are joyously welcomed. Those rays bounce off the surface of the water and start to dance and sparkle, providing much needed warmth to your body. While other seasons provide the senses with various degrees of stimulus, the arrival of the salmon in the fall is most memorable.

For me, while fishing for salmon was the ultimate goal of these trips, there was so much more to these times on the river. The most important was being with family. It was during these times with my father that he taught me so much about the world. He showed me how

to place palm sized rocks close to the fire so that they would take in and store the heat of the fire. After they had sat close to the fire for several minutes I would take them and place them in my pockets and they would keep my hands warm. The two of us would also go for long walks, while my uncles watched after our fishing rods, and my father would point things out to me. Whether it was showing me where the river runs fast, where it creates back eddies, or pointing out wildlife, he was always showing me something new. He still does. My friends are always in awe by how much I notice when we go for hikes, little do they know that I am an amateur in comparison to my father.

One of the best things we did while on our river walks was look for small rocks called agates. These were usually found among the smaller sized gravel sections of the river. It was not until I was older that I learned about how these stones are formed and why they can be found along the Fraser River. Back then, I just thought they were beautiful; a bright orange stone amongst a sea of gray and tan rocks. The light that shone through the semi-transparent surface made them even more breathtaking. I still have a collection of some of my favorites, a reminder of the times my father and I spent together.

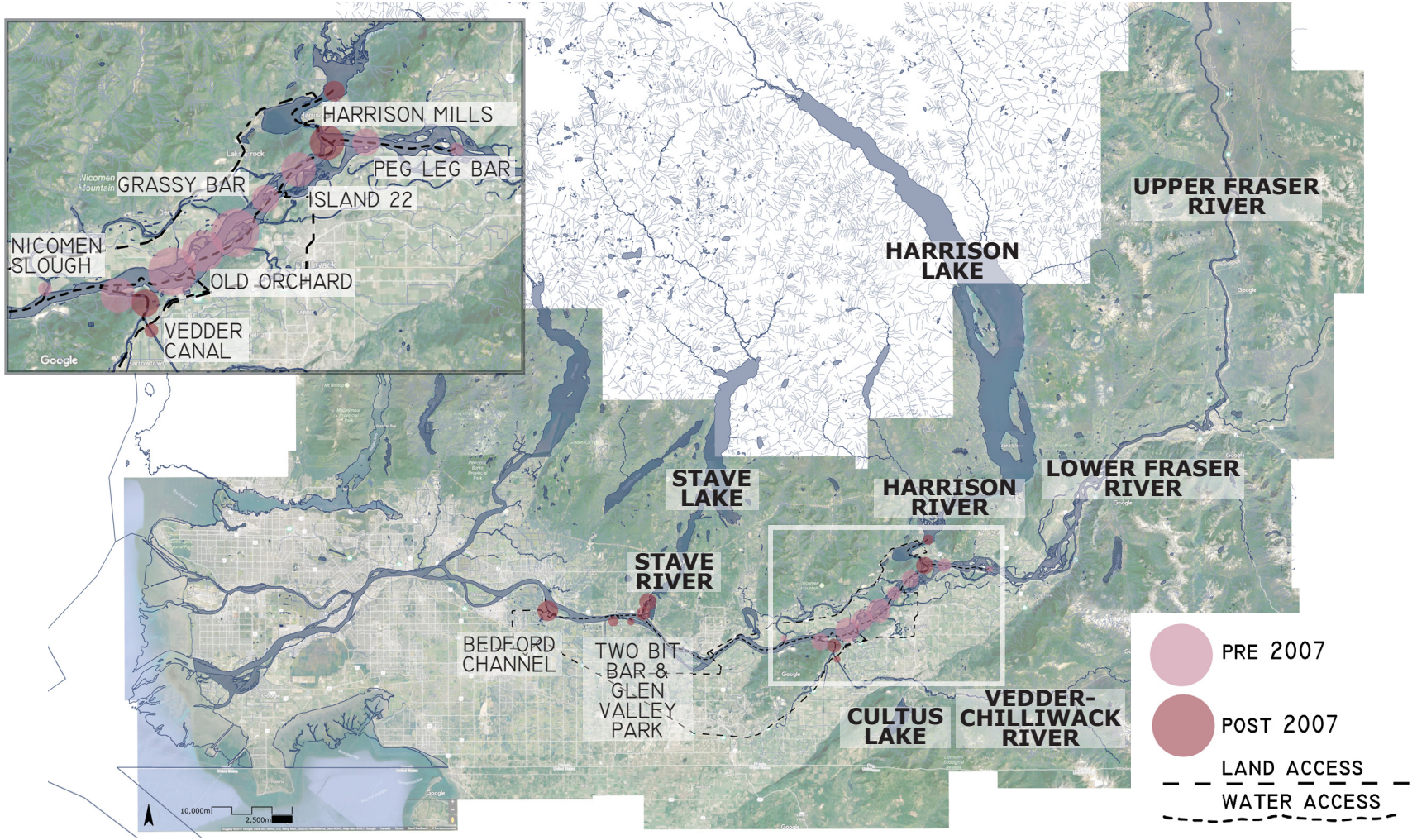
I learned so much by being on the water and experiencing the environment. I learned about how the color, clarity, and current of the water would change with the seasons. I learned how to identify the species of fish caught, how to identify if the fish was wild or hatchery, how to choose what gear to use and where to place it in the water depending on the fish we were targeting. I learned how to determine where a fish was by the sound of the splash it made as it surfaced. I learned how to kill a fish quickly and efficiently and how to clean it. I learned about how many species rely on salmon to survive and at times had to deal with birds or seals stealing my catch. When I was younger I was enamored by the internal structure and organs of the fish. In particular, I was fascinated by the heart of a salmon that could beat for several minutes after the fish had been cleaned, a testament to the salmon’s will to survive against all odds. We would unceremoniously throw the innards into the river and I could watch small fry and trout feast on them. The salmon’s eggs were kept in a bag to be preserved and used as bait for future fishing trips. Some consider fishing to be a brutal and bloody sport. I would argue otherwise. Only through catching and eating fish did I learn about them and learn to handle them with care and respect.

Other than the heat of the fire, the only thing that kept me warm was the rush of reeling in a salmon, knowing I was bringing home our dinner for the next four or five days. When I was little I remember the sounds of the bells would start at the bottom of the island and work their way up the river as large schools of salmon came through. Even now I can hear the ringing of the bells, a brilliant cacophony of sound only broken by the jubilant yells and whoops of fishers declaring “Fish on!”. These are the sounds I most miss. As the years have passed those bells have made less noise as less fish make their way up the river. Now that fishing spot is rarely used. If it is, we go there more to reminisce, than to catch anything. While we have found new fishing spots along the river, including at the confluence of the Vedder River, the number of fish we catch has never met the number we used to catch at Old Orchard.

People ask why I care about salmon. They ask why I would focus an architectural thesis on a fish. The experiences I had fishing on the Fraser River with my father are the only reasons I need. My only hope is for my future children, and my children’s children to be able to have similar experiences. I didn’t just learn about salmon, I learned about the world, and I learned a lot about myself. More importantly, I did all this alongside someone I love. If I have to give up the remainder of my experiences on the river fishing for salmon in order for future generations to be able to have the opportunity to fish for salmon I would. Sadly, the answer is not that simple.

## Background

While the lessons I have learned growing up on the Fraser River have influenced my perception of the world, I still live in a world that undervalues salmon and the environment. For example, it is clear that the prevailing Western-European practices have laid the groundwork for environmental destruction at the larger scale. At a smaller scale it has resulted in salmon fatality along the Fraser River. As we continue to grow as a society we put more and more pressure on salmon and their habitat. Yet, society as a whole is unwilling or slow to change these practices. After all, it is just a fish. Many do not perceive the interconnection between us and the environment, including the waterways and salmon ecosystems.




"Salmon symbolize nature in the Pacific Northwest; the experience of taking them has become a quintessential Northwest experience. Salmon are not just fish... they are tokens of a way of life" (White. *The Organic Machine: The Remaking of the Columbia River,* 91). Map of the places I have fished for salmon and the routes to get there. Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.

With this in mind, this thesis will explore the question: Through examining key relationships along the river how can we balance the needs of both salmon and people in order to facilitate a change in how we perceive of the environment and salmon? In particular, this thesis will focus on the relationships between salmon, the individual, the collective, and the environment, all of which are inextricably linked. By establishing a salmon eco-park and knowledge collective along the banks of the Chilliwack-Vedder River[2] these relationships can be fostered while also providing additional protected habitat for salmon. Furthermore, the park can provide opportunities for participating in sustainable harvesting practices, as well as places for collaborative learning about our connection to salmon and the environment.[3] Finally, through the enhancement of select sensorial experiences and the interplay of ecological edges and thresholds of human interaction this project will address the perceptual disconnect between individuals and the environment. In so doing, the thesis can address the problem at hand, which is how society perceives of the world.

2 The Chilliwack-Vedder River is a major tributary of the Lower Fraser River.

3 It is important to note that this thesis is not the first to propose this collaboration, in fact, the Stó:lo Nation have advocated for their participation in addressing the wild salmon issue for a long time. See Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada's Pacific Coast History*, 172-179.

# CHAPTER 2: PERCEPTIONS OF THE ENVIRONMENT AND NATURE

How cultures view nature and the environment can be very telling. These views shape how we dwell and grow in the environment. While some consider nature and environment as interchangeable words, Ingold argues that in fact they describe two different perspectives. Nature considers a world separate from humans. In comparison, the environment includes beings within a world.[4] It can be argued that nature is a concept born from European[5] science and philosophy. Current scientific endeavors focus on abstract and compartmentalized study as a way to understand the larger whole and the world around us.[6] This can tie back to the concept of the rational mind which separates the human mind from the world of objects thus placing humans above all else.[7] As argued by Ingold and McHarg, the past and present capitalist and industrial practices where human "seeks not unity with nature but conquest"[8] highlight that belief where humans have dominion over nature.[9] Whether unknowingly or not, much of contemporary society still ascribes to this notion, which in-turn, allows for uncontrolled development to continue. As McHarg states, "Give us your beautiful rivers and valleys, and we will destroy them."[10] Therefore, if we cannot re-examine our perceptions and the way we inhabit nature this development will

4 Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill* (New York: Routledge, 2000), 20.

5 Throughout the thesis Western and European knowledge, views, and culture are discussed. This vocabulary provides a challenge in that it is difficult to determine what is meant by European or Western. At times it is used to discuss the perceptions of capitalism and industrialism, at other times it is used to discuss the perceptions of science from the point of view of the Western-European tradition. As Ingold notes, there is clearly a problem with using these terms. Often they are used as a foil to compare with an indigenous point of view, yet even this is not appropriate as there is no pure European or Western point of view. Therefore, there is no escaping the challenges of using such vocabulary. Yet Ingold goes on to explain that academics have still been unable to determine more appropriate terminology. So in following his lead, I too will utilize these terms. See, Ibid., 6-7.

6 Gregory Cajete, *Native Science: Natural Laws of Interdependence* (Santa Fe: Clear Light Publishers, 2000), 22; and Anne Mead, "Working with Aboriginal Worldviews," Kimberley Student Services TEm. Rcebourne Primary School, http://www.donpugh.com/Psych%20 Interests/ABORIGINES/SIX%20DIFFERENCES%20BETWEEN%20ABORIGINAL%20 and%20%60WESTERN'%20WORLD%20VIEWS-,.pdf.

7 David Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World* (New York: Vintage Books, 1997), 48.

8 Ian L. McHarg, *Design with Nature* (New York: Natural History Press, 1969), 24.

9 Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, 10; and Ian L. McHarg, *Design with Nature* (New York: Natural History Press, 1969), 24.

10 McHarg, *Design with Nature,* 31.

continue to go unchecked. This is particularly devastating within the sensitive ecosystems salmon inhabit. Yet, how then can we change this? Has society always viewed the world this way, and if not where did we change course?

According to Abram, the current perceptions of nature were the result of a perceptual shift brought on by the evolution from a traditionally oral based society to an optic lead society. In particular, this change was brought about through the introduction of the phonetic alphabet which led to a sensorial separation between humans and the world around them through the use of the written word.[11] This opinion is supported by Pallasmaa who argues that an optically dominated society results in a diminished connection between the individual and the environment. Pallasmaa states that "The gradually growing hegemony of the eye seems to be parallel with development of Western ego-consciousness... [which] separates us from the world whereas the other sense unite us with it."[12] Pallasmaa goes on to state that "Instead of experiencing our being in the world, we behold it from outside as spectators of images..."[13] This results in the concept of nature as separate from humans rather than the traditional belief of environment where everything is connected. It also results in a de-empathizing of what occurs in the world around us. This in turn has led to science and technology over-running the sensorial world[14] while industrial practices are destroying the environment.

As Jeremy Hayward notes, current scientific thought and practice "leaves out so much- it leaves out the sacredness, the livingness, the of the world..."[15] In comparison, other cultures have avoided this separational and compartmentalized view of the world. The view of the environment, or beings within a world, still exists within certain hunter-gatherer and Indigenous[16] communities. These views of the environment are based on trust

11 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 93-135.

12 Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses* (Chichester: John Wiley & Sons, 2005), 25.

13 Ibid., 30.

14 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 41.

15 Cajete, *Native Science: Natural Laws of Interdependence*, ix-x.

16 The term Indigenous will be utilized to describe the knowledge, views, and culture of peoples who have inhabited certain environments since time immemorial. While the main focus of this thesis is on the Stó:lo Nations of British Columbia, at times the ideas being discussed reference sources that did not focus specifically on the Stó:lo Nations, rather, they utilized the Indigenous

and agreements with the land and all that relates to the land.[17] Cajete argues that this world view focuses less on the parts and more on a holistic system of connections and interconnected relationships between all beings.[18] For example, Maracle states that in an indigenous world view everything is connected. There is no 'natural' landscape and 'human' landscape, rather one single environment or habitat. Furthermore, humans are not above other beings, when something happens to one being or to the habitat every other being feels the effect.[19] Abram and Pallasmaa argue that these views are tied to the connection many of these cultures have to the sensuous world. Whereas Western-European cultures perceive the world with the eyes, indigenous cultures perceive the world with their whole body and with every sense. Subsequently, this leads to a perception of reciprocity within the environment.[20] This results in practices that work with the environments pre-existing flows, rather than in conflict with or against these flows.[21]

Western cultures cannot revert back to traditional practices and return to the time before this perceptual shift occurred, our populations are far too large to accommodate, and our culture and needs have changed. We also cannot keep moving forward with the current model of dwelling and seeing the world as this method has destroyed ecological habitats through fragmentation, pollution, and over-extraction, all in the name of efficiency. This is also not to say that we must eliminate scientific thought and theory entirely. Rather, we must utilize the knowledge we have gained through the scientific process in tandem with the knowledge we can gain in coming to know that humans are indeed part and parcel of the environment and that what we do, and what others do affects everyone and everything. As Abram states,

> It is surely not a matter of 'going back,' but rather of coming full circle, uniting our capacity for cool reason with those more sensorial and mimetic ways of knowing, letting the vision of a common world root itself in our direct, participatory engagement with the local and the particular.[22]

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terminology. In those cases I will follow suit.

17 Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, 10; and Lee Maracle, *Memory Serves: Oratories* (Edmonton: NeWest Press, 2015), 59.

18 Cajete, *Native Science: Natural Laws of Interdependence*, 66.

19 Maracle, *Memory Serves: Oratories*, 53-59.

20 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 52, 65, 153; and Pallasmaa, *The Eyes of the Skin: Architecture and the Senses,* 26.

21 Cajete, *Native Science: Natural Laws of Interdependence*, 66.

22 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,*

Cajete echoes this sentiment and argues that while we cannot go back to the hunter-gatherer societies, we must carry the wisdom of the ancestors into the future in order to discover a new way of living.[23] In this way we can move towards the next perceptual shift which will "give rise to a participatory and empathetic gaze"[24] and thus result in a change in how we dwell in the environment. Only through this systematic shift can we ensure that we do not repeat the mistakes we have made and ensure that the current development practices do not go unchecked in the future.

## Changing Systems and Changing Perceptions

As mentioned previously, the concept of environment implies an interconnected system. This idea of an interconnected system is especially important to consider when examining salmon habitat. The theory of systematic change and systems thinking has slowly made its way into certain European schools of thought and is discussed by Meadows in *Thinking in Systems: A Primer*. The key to this way of thinking is recognizing that systems are complex and unpredictable. There is only so much control that can be placed upon a system.[25] Thus it is important to allow for this unpredictability. This focus on systems theory has also made its way into dwelling and development practices. Projects like the Pontine Marshes Machines by P-Rex Lab, the Lower Don Lands by StossLU, and FreshKills Park by Field Operations are working to restore damaged and corrupted ecosystems by thinking long-term and systematically. In addition, these projects recognize the unpredictable nature of the environment through flexible and resilient designs.[26] Yet these projects are still contending with development that puts pressure on the existing environmental systems by continuing to follow compartmentalized processes that do not grasp their negative effects on the environment. This will continue to be a problem until we evaluate the role of perception.

The need for a change in perception in order for society to recognize its connection to

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23 Cajete, *Native Science: Natural Laws of Interdependence*, 23.

24 Pallasmaa, *The Eyes of the Skin: Architecture and the Senses,* 36.

25 Donella H. Meadows, *Thinking in Systems: A Primer* (White River Junction: Chelsea Green Pub, 2008), 166-168.

26 Alan Berger, *Systematic Design Can Change the World* (Amsterdam: Uitgeverij Boom, 2010), 14, 80-81; and Charles Waldheim, *Landscape as Urbanism: A General Theory* (Princeton: Princeton University Press, 2016), 25.

this environment needs to also be considered. Einstein states, “We can’t solve problems by using the same kind of thinking we used when we created them.”[27] Meadows also recognized this when quoting Pirsig, who noted, “If a revolution destroys a government, but the systematic pattern of thought that produced the government are left intact, then those patterns will repeat themselves...”[28] Thus, we must address that there is still a systematic problem with how we view nature. Corner recognizes this and argues that there is a need for design to recognize a relationship between ecology and creativity. He believes that “ecology and landscape architectural design might invent alternative forms of relationships between people, place, and cosmos.” [29]

In order to address the salmon problem, these alternative relationships, or rather, this perceptual shift in how society views the world and how we go about starting this shift need to be considered from both the point of view of the individual and the collective community. Pallasmaa and Abram discuss this from the point of view of the senses, which is an individual experience that can produce feelings of community and solidarity.[30] As Abram notes, “Humans are tuned for relationship.”[31] The eyes, ears, nostrils, tongue, and skin allow for these relationships to occur. While we associate seeing with the optical sense, we can also see through the other senses. The act of hearing can perceive and situate us within a volume of space, thus seeing the world in all directions. The act of smelling can trigger both the imagination and memories, thus willing the brain to see. The act of touching can perceive of an element’s texture, temperature, and weight, Pallasmaa’s book, *The Eyes of the Skin*, is evidence to this. In using all the senses we learn to see from multiple perspectives.[32]

In addition, through opening ourselves up to all the sensorial experiences we participate with the environment and establish reciprocal relationships and connections with it. As

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27 Robert T. Lackey, Denise H. Lach, and Sally L. Duncan, ed., *Salmon 2100: The Future of Wild Pacific Salmon* (Bathesda: American Fisheries Society, 2006), 151.

28 Donella H. Meadows, *Thinking in Systems: A Primer* (White River Junction: Chelsea Green Pub., 2008), xv.

29 James Corner and Alison Bick Hirsch, ed., *The Landscape Imagination: Collected Essays of James Corner, 1990-2010* (New York: Princeton Architectural Press, 2014), 34, 257-279.

30 Pallasmaa, *The Eyes of the Skin: Architecture and the Senses,* 50.

31 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* ix.

32 Pallasmaa, *The Eyes of the Skin: Architecture and the Senses,* 41, 49, 54, 56.

Abram argues, in sensing the world around us, the world is also sensing us. To touch an element is to also have that element touch you. To see something is to also have that thing see you.[33] This leads to empathy for the environment and allows us to better respond to the world around us.[34] It is through the unique and personal experiences of the individual with the environment that a feeling of collectiveness occurs. While some may share experiences no two individuals are alike in the knowledge they gain from these experiences. Therefore it is equally important to not only open oneself to the world of the senses, it is also equally important to open oneself to different perspectives and new knowledge. In this way we foster relationships between individuals.

Elder Albert Marshall has coined the term "Two-Eyed Seeing" to describe a form of collaboration and co-learning. "Two-eyed Seeing [is]… learning to see from one eye with the strengths of indigenous knowledges and ways of knowing, and from the other eye with the strengths of western knowledges and ways of knowing…and learning to use both these eyes together, for the benefit of all."[35] This guiding principle is founded on the idea of mutual transcultural collaboration that recognizes our differences and highlights our strengths and the common ground we share.[36] As Marshall notes, the more eyes the better, thus there can be many-eyed seeing cultural exchanges which can also establish strong relationships.[37] While this concept pertains specifically to the Mi'kmaw Nation, the idea of collaboration and knowledge sharing is important in all societies if we are to imagine a new way of dwelling in the environment that benefits both humans and salmon. Additionally, if this new way of dwelling is to benefit salmon, then it is also important to consider the salmon's perspective too. In this way, salmon add an additional eye, or viewpoint to the thesis. As noted by Frank, "If the salmon could speak, he would ask us to help him survive. This is something we must tackle together."[38]

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33 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 153.

34 Ibid., 69, 153, 266-268.

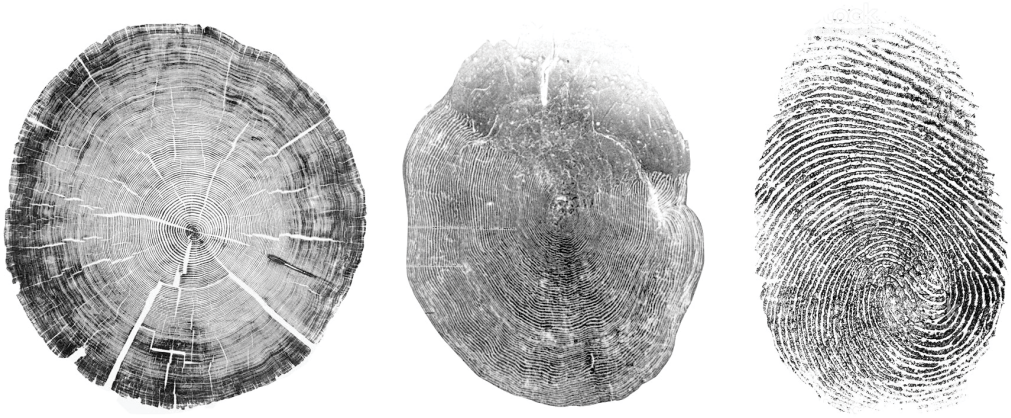
35 Cape Breton University, "Two-Eyed Seeing," Institute for Integrative Science & Health, accessed November 28, 2016, http://www.integrativescience.ca/Principles/TwoEyedSeeing/.

36 Rebecca Thomas, "Etuaptmumk: Two-Eyed Seeing," May 2016. Youtube video, 14:22. Posted June 13, 2016. From TEDx NSCC Waterfront. https://www.youtube.com/watch?v=bA9EwcFbVfg.

37 Cape Breton University, "Two-Eyed Seeing."

38 David R. Montgomery, *King of Fish: The Thousand-year Run of Salmon* (Boulder: Westview Press, 2003), 39.

# CHAPTER 3: PERCEPTIONS OF SALMON AND ECOLOGY



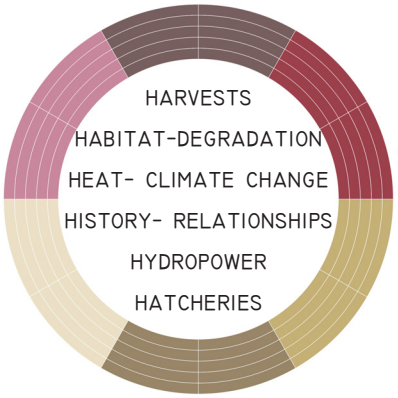
Establishing connections. Tree ring print (left), salmon scale (center), and finger print (right). Images from Bryan Bash Gill, “Cedar Pole,” 2013, Paper print, 38 7/8 x 30 1/4 in; George Houghton Clark, “Photograph of a scale (sample 6721),” 1919, 86cm; and Andrey Kuzmin, “Fingerprint isolated on white,” 2013, 300 dpi.

On the Pacific Northwest coast, there are five species of salmon. While each species has varying degrees of importance to select cultures, as a whole Pacific salmon are integral to both the culture and environment. As Montgomery notes, “The topography and the salmon of the Pacific Northwest share a common history. Salmon evolved with the region. They are as much a part of the landscape as they are a symbol of the Northwest’s natural splendor.”[39]

Salmon are anadromous fish, meaning they spend part of their lives in freshwater and saltwater. This behaviour results in salmon migrating across a large area in the Pacific Ocean and adjacent freshwater systems. According to Johnson, salmon habitat can span across at least four-million square-kilometres. Due to this large range of distribution, salmon are categorized as a keystone species as they are a key food source for many predators and scavengers. They also provide nutrients to the habitats they spawn in.[40]

39 Montgomery, *King of Fish: The Thousand-year Run of Salmon,* 2.

40 David H. Johnson and Thomas A. O’Neil, ed., *Wildlife Habitat Relationships in Oregon and Washington* (Corvallis: Oregon State University, 2001), 365-366, 628; and Dale Stokes, *The Fish in the Forest: Salmon and the Web of Life*, Stephen Bechtel Fund Imprint in Ecology and the Environment (Berkeley: University of California Press, 2014), 110, 127.




6 H's; Causes of salmon population decline.

As White notes, salmon "bring energy garnered from outside the river back to the river."[41] Their death sustains life, be that the life of trees, vegetation, animals, insects, or humans. Salmon, additionally, provide a clear marker in determining the health of our fresh and saltwater ecosystems. If salmon suffer it means that our environment is suffering. Furthermore, as Maracle argues, if salmon are suffering so too are humans suffering.[42]

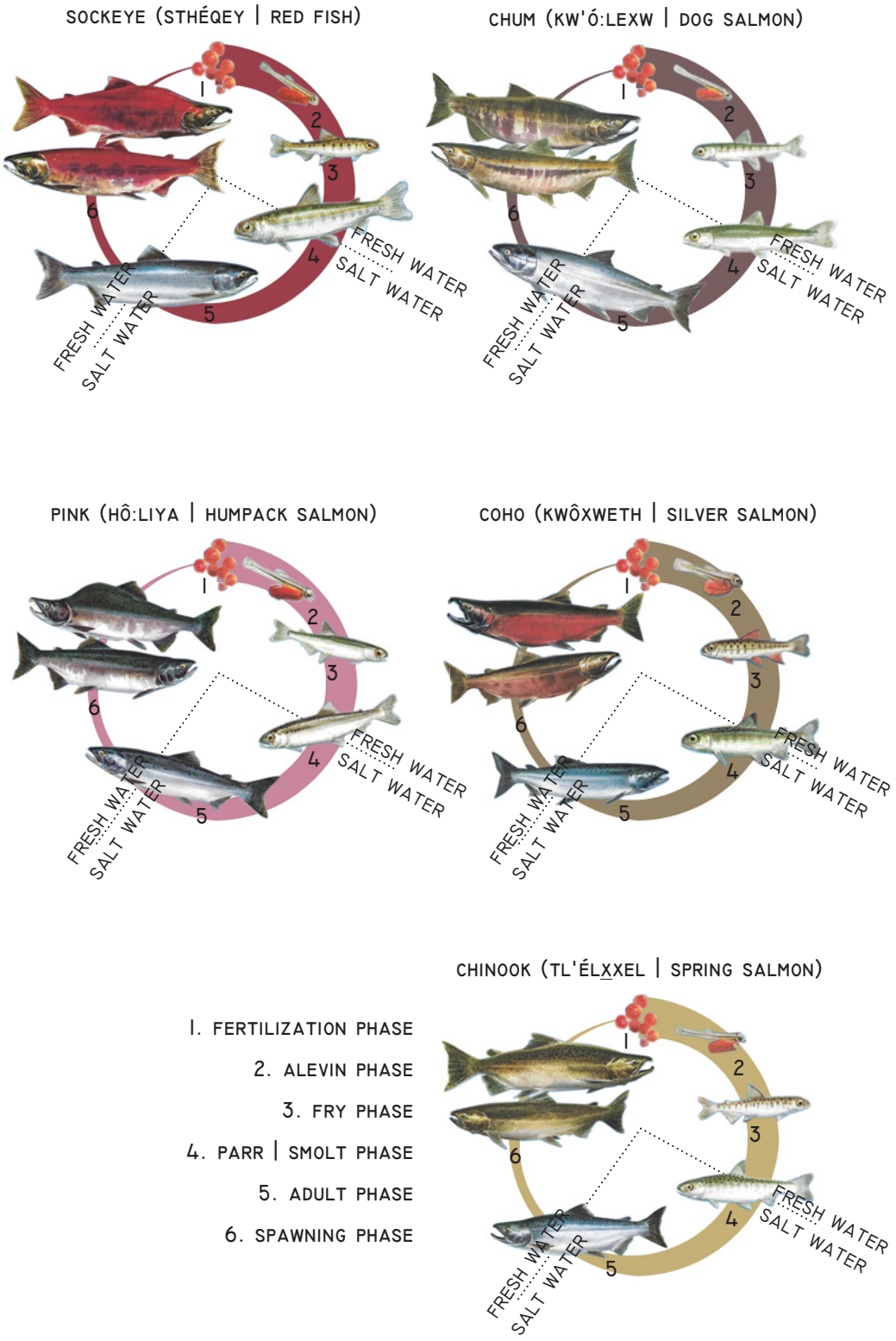
At each stage of life salmon encounter a barrage of challenges that threaten their existence, which is why their survival rates are so low. However, even with these challenges wild salmon have been able to survive in abundance for over millions of years. In the last few centuries this has changed. Every year the wild salmon populations have been in steady decline across the globe and many river systems no longer receive any salmon.[43] If this trend continues and the wild salmon dwindle to extinction there will be widespread repercussions. This population decline can be attributed to the '6 H's', as noted by Montgomery and Levy.[44] Most notably, many scientists agree that in addition to climate change and current harvesting practices, habitat loss from development is the most significant problem facing the salmon population today. This development includes

41 Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995),15.

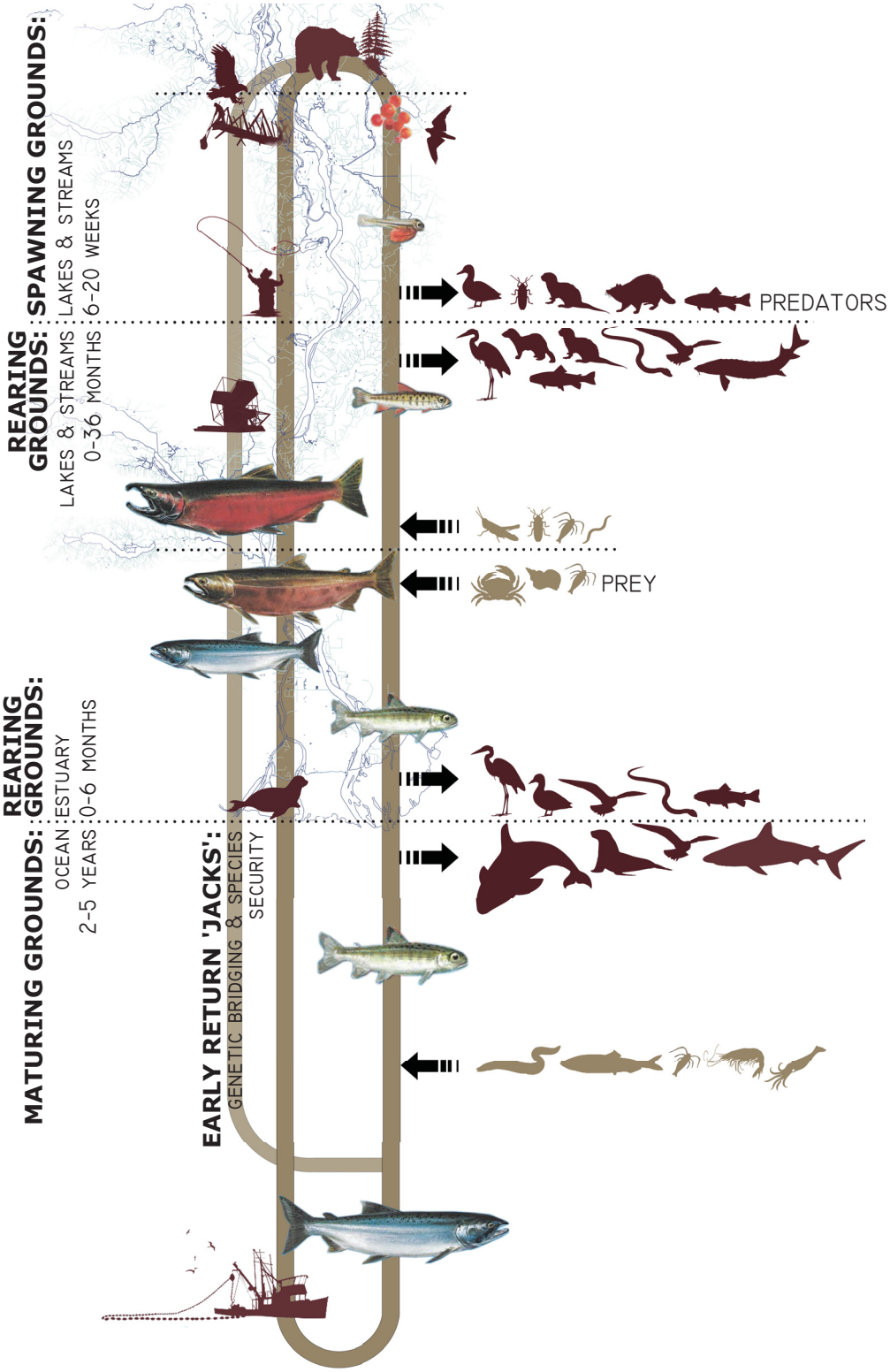
42 Maracle, *Memory Serves: Oratories*, 58-60.

43 E.E. Knudsen, et.al., ed., *Sustainable Fisheries Management: Pacific Salmon* (Boca Raton: Lewis Publishers, 2000), 3.

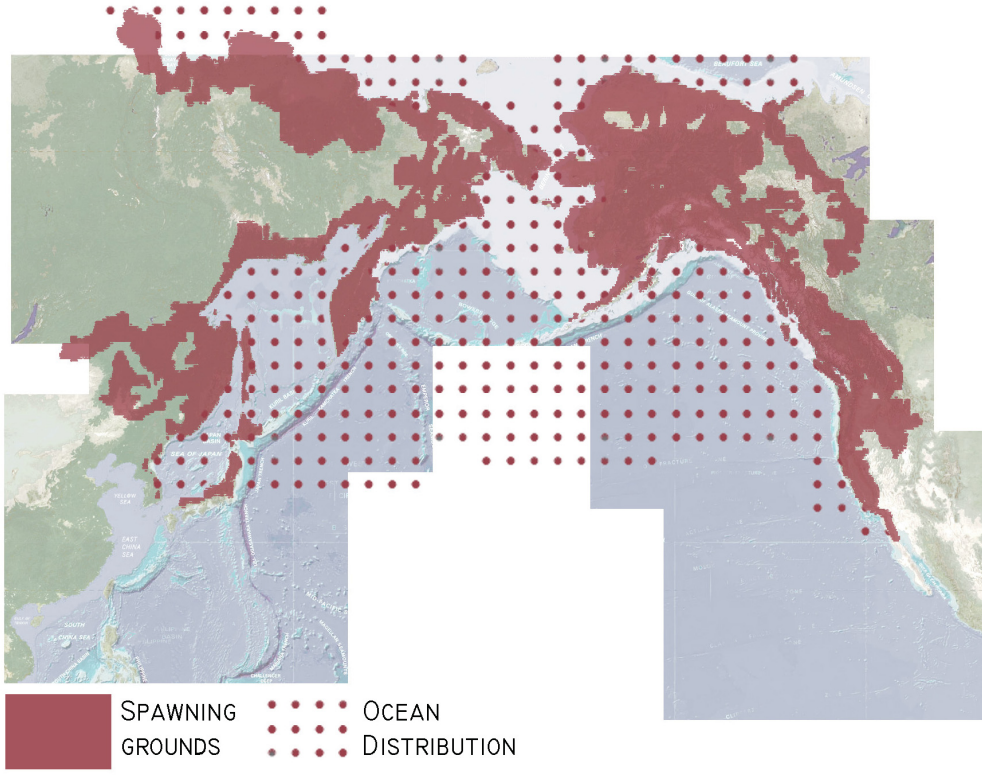
44 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 5; and, D.A. Levy, *Potential Impacts of Global Warming on Salmon Production in the Fraser River Watershed*, Canadian Technical Report of Fisheries and Aquatic Sciences 1889 (Vancouver: Department of Fisheries and Oceans Fraser River Environmentally Sustainable Task Force, 1992).



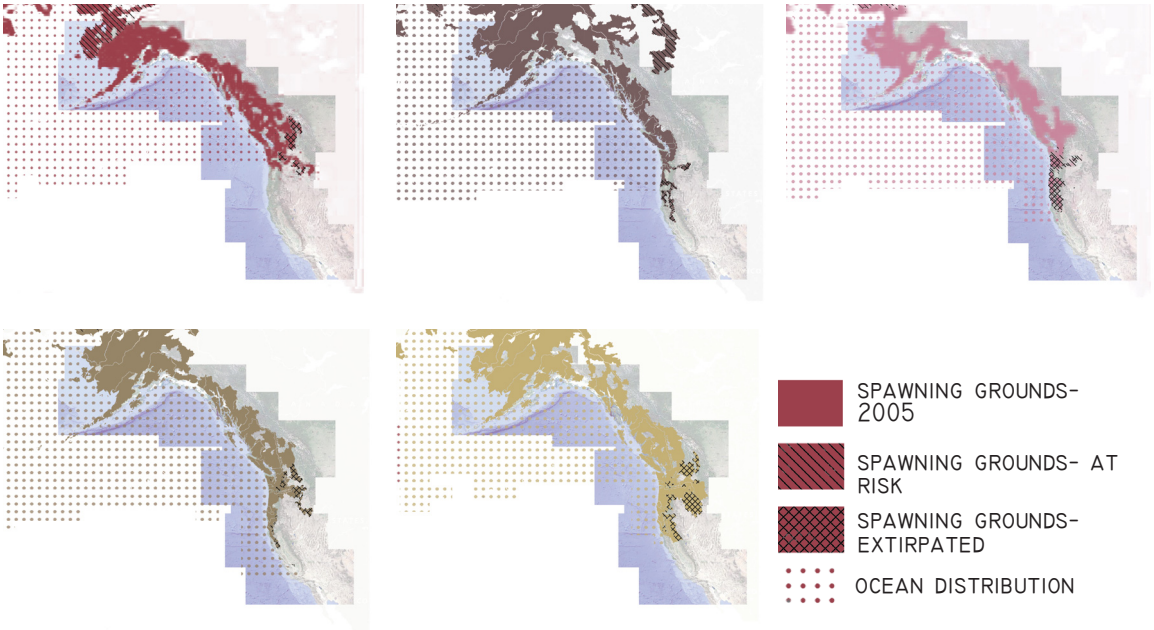

Five species of pacific salmon and their life cycles diagram. Unlike other anadromous species, salmon perish upon returning to their place of birth soon after spawning. Data extrapolated from Groot and Margolis, *Pacific Salmon Life Histories*. Salmon paintings by H. Heine from Groot and Margolis, *Pacific Salmon Life Histories*.



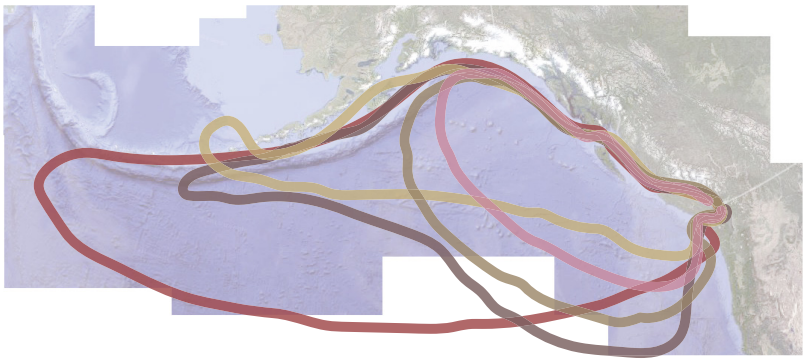

Salmon lifecycle inlcuding predators and prey. Data extrapolated from Department of Ecology. “Salmon Species & Estuary Use.”, Ocean Wise Conservation Association, “Salmon: Questions & Answers.”, Fisheries and Oceans Canada, “Salmon facts- Pacific Salmon.”, and Bureau of Land Management Oregon, “What Salmon Eat and What Eats Salmon.” Salmon paintings by H. Heine from Groot and Margolis, *Pacific Salmon Life Histories*.



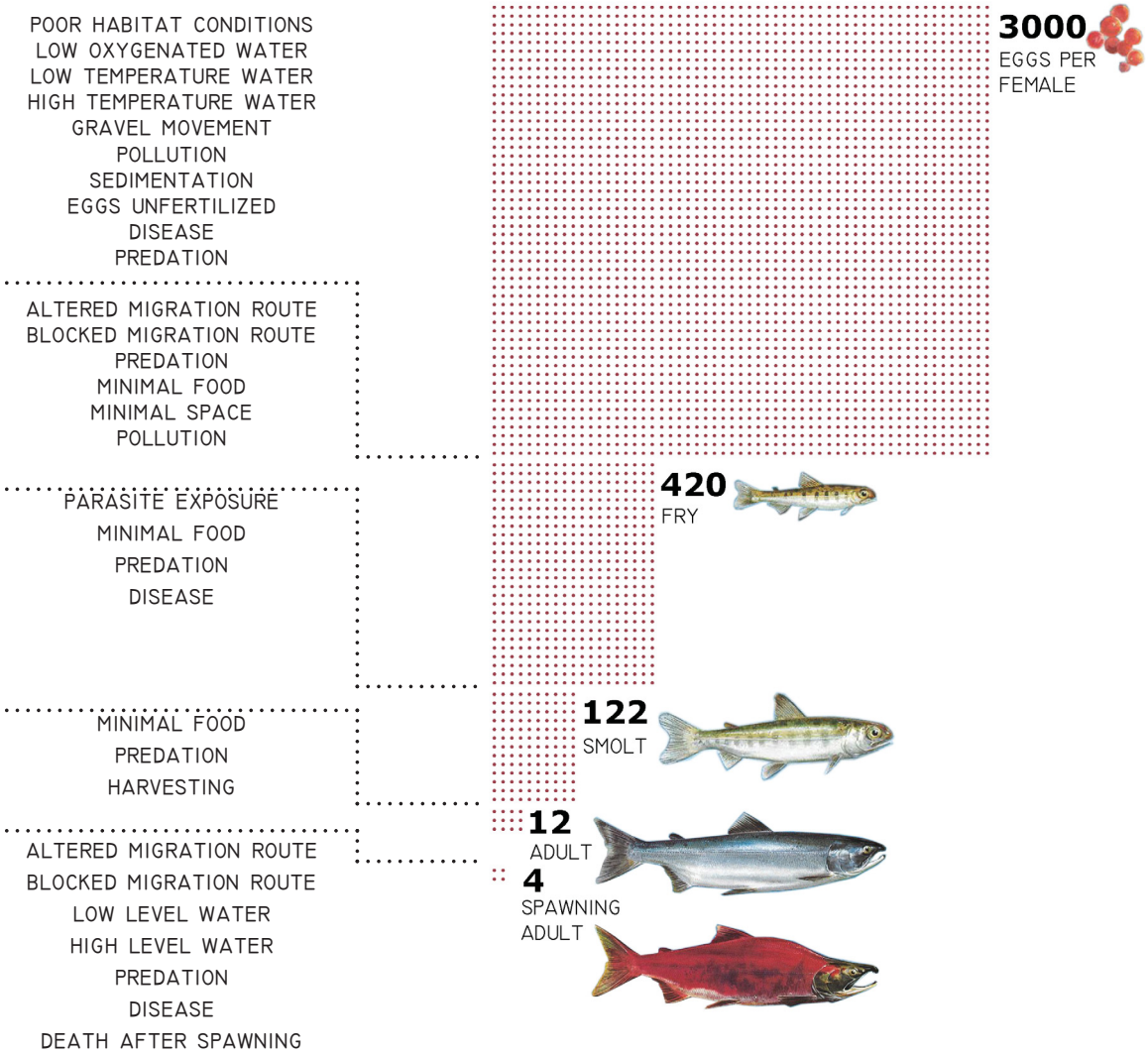

Pacific salmon distribution map. Data extrapolated from Wild Salmon Center and Ecotrust, “Original Distribution of Genus *Oncorhynchus* (Pacific Salmon)” and Fisheries and Oceans Canada, “Salmon facts- Pacific Salmon”. Base map images from ReBRN and Google Maps.




Pacific salmon ocean distribution maps by species. Data extraoplated from Wild Salmon Center and Ecotrust, “Original Distribution of Genus *Oncorhynchus* (Pacific Salmon)”. Base map image from Google Maps.



Fraser River salmon ocean migration routes by species. Data extrapolated from Fisheries and Oceans Canada, “Salmon facts- Pacific Salmon”. Base map images from ReBRN and Google Maps.




Salmon survival rates and causes of death at each life stage. Data extrapolated from Cohen, Bruce “The Uncertain Future of Fraser River Sockeye” and Aquacase “What’s the Salmon Survival Rate at Each Life Stage?” Salmon paintings by H. Heine from Groot and Margolis, *Pacific Salmon Life Histories*.

hydropower damming, resource extracting, farming, flood protection measures, and urbanization.[45] There is no clear answer on how we can save wild salmon as the problem is so complex. Yet all of these issues can be linked back to how society views nature and how we grow and inhabit the environment.

While it is not possible for us to understand the ideologies and thoughts a salmon may have, this process must always come back to try and determine what is best for fish. Nicholas argues that "[w]hat [we]…need to survive…[is] also what salmon need to survive…What if we were to think like wild salmon? By borrowing wisdom from the very species so many are seeking to save, we may illuminate the problem from a fresh perspective."[46] As Abram suggests, while we cannot truly experience life from the point of reference of a salmon, through careful observation we can better understand them and "glean clues regarding how to strengthen our own dwellings..."[47] This can only be done by opening ourselves up to a new way of viewing the world and by participating with salmon in a meaningful way.

One of the key issues is that the only time society takes notice of salmon is when they re-enter the river systems to spawn. This season is when they are most visible and when they are the easiest to catch.[48] Following the spawning season they are no longer visible and are not part of our consciousness. However, just because we cannot see the salmon in the river does not mean they are not there. Once salmon spawn the fertilized eggs can incubate for extended periods. Then, once the salmon hatch they will rear in the small tributaries for various lengths of time, dependent on species.[49] The total time each

45 Johnson and O'Neil, *Wildlife Habitat Relationships in Oregon and Washington,* 628; and Ron Crouse, "Salmon Decline and Recovery," *Water Encyclopedia: Science and Issues*, accessed November 3, 2016, http://www.waterencyclopedia.com/Re-St/Salmon-Decline-and-Recovery.html.

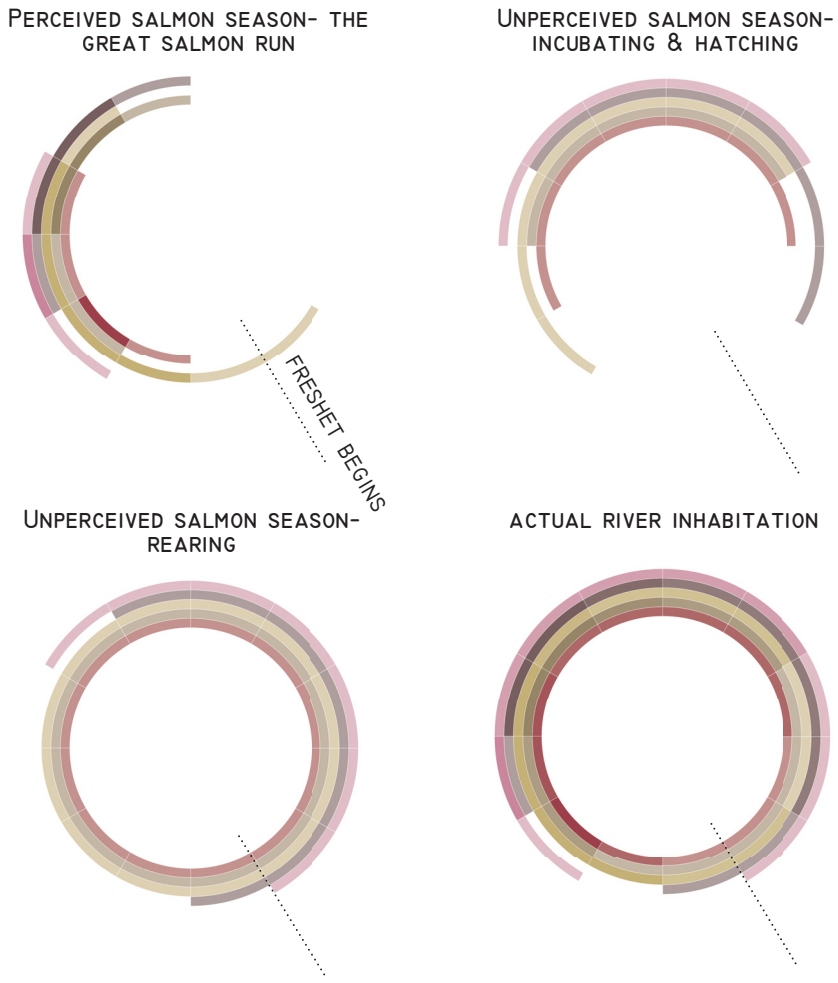
46 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 445.

47 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 14.

48 Department of Fisheries and Ocean, *Where & When to See Salmon*, accessed October 28, 2017, http://www.pac.dfo-mpo.gc.ca/publications/pdfs/wherewhen_to_see_e.PDF; National Geographic, "Sockeye Salmon", Animals Reference, accessed October 20, 2017, https://www.nationalgeographic.com/animals/fish/s/sockeye-salmon/; and Todd Martin, "Todd Martin explains a B.C. fishery that delivers trophy fishing year round!", BC Sportfishing Group, May 27, 2013, https://www.bcsportfishinggroup.com/bcfraserriver/.

49 Department of Ecology, "Salmon Species & Estuary Use," *Puget Sounds Shorelines*, accessed October 3, 2017, http://www.ecy.wa.gov/programs/sea/pugetsound/species/salmon_est.html; United States Fish & Wildlife Service, "Life Cycle of Salmon," Togiak National Wildlife Refuge, December 10, 2013, https://www.fws.gov/refuge/Togiak/wildlife_and_habitat/fish/salmon_

species spends in the river varies too, but what is most important is that by looking at these different life stages it is evident that salmon inhabit the rivers all year round. Thus we must consider every season as salmon season and invite participation and observation of them all year round and at all stages of their life-cycle in order to change how we perceive of them and the environment. As Nicholas states, “When humans know us [salmon] throughout the year... they may choose to save us.”[50] The challenge is how can we invite this participation in order to facilitate this perceptual shift without subsequently destroying these sensitive environments?




Salmon river inhabitation by life stage. Data extrapolated from United States Fish & Wildlife Service, “Life Cycle of Salmon.”

lifecycle.html; and North Pacific Anadromous Fish Commission, “Species,” Scientific Research, accessed October 3, 2017, http://www.npafc.org/new/science_species.html.

50 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon,* 452.

# CHAPTER 4: HARVESTING AND DEVELOPMENT PRACTICES ALONG THE FRASER RIVER

From an environmental perspective, the Fraser River is still considered to be one of the world's most productive salmon bearing rivers. Nicholas notes, while many of the great salmon rivers no longer exist, "we have the most hope for [salmon]…survival in the Fraser."[51] The river provides an interesting counterpoint to many salmon rivers in the area, like the Columbia, that were severely altered by the development of hydroelectric dams. Unlike these other rivers, the Fraser River's main stem was never dammed thus leading Evenden to state; "The river plays host to dreams, but not to large dams."[52] At the same time, the Fraser River watershed has still experienced dramatic alterations within the tributaries that flow into the Fraser River, including tributary damming, dredging, and diking, which has had an effect on the salmon populations. British Columbia's current trajectory of uncontrolled growth within this watershed is a key factor in salmon habitat destruction. In addition, the salmon harvesting practices that have been established in the area have had a major impact on salmon populations, especially those populations that are already in danger. These practices tie back to our perception of both the environment and salmon. The belief that salmon are merely a resource to be extracted and the dramatic decline in salmon from post-contact to the present are evidence of this.

Prior to European contact the Coast Salish developed thriving and sustainable communities that evolved around the salmon. The relationship between salmon and the Coast Salish was one of respect and it was more environmentally secure. For example, Montgomery argues that due to a lack of preservation techniques that allowed for salmon exportation, "fishing intensity matched the modest needs of local consumption"[53] which provided an ecological defense against over consumption. Both in the past and presently, the death of the salmon results in the death of much of their culture. Salmon not only provide nutrients and sustenance, they shape the tools, art, ceremonies, and stories of the Coast Salish people.[54] The tools each nation utilized to catch, clean, preserve, and store salmon were

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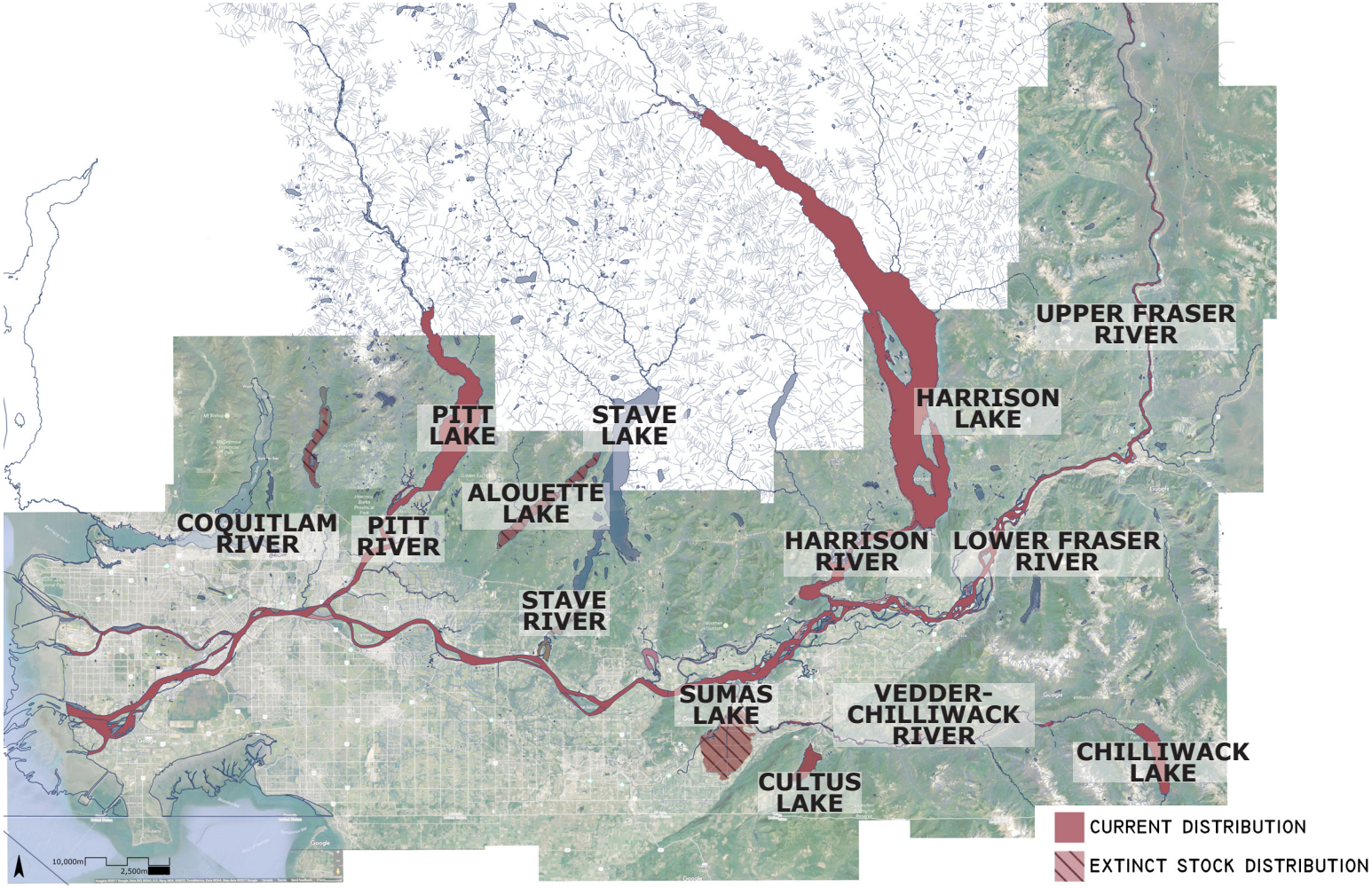
51 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon,* 459.

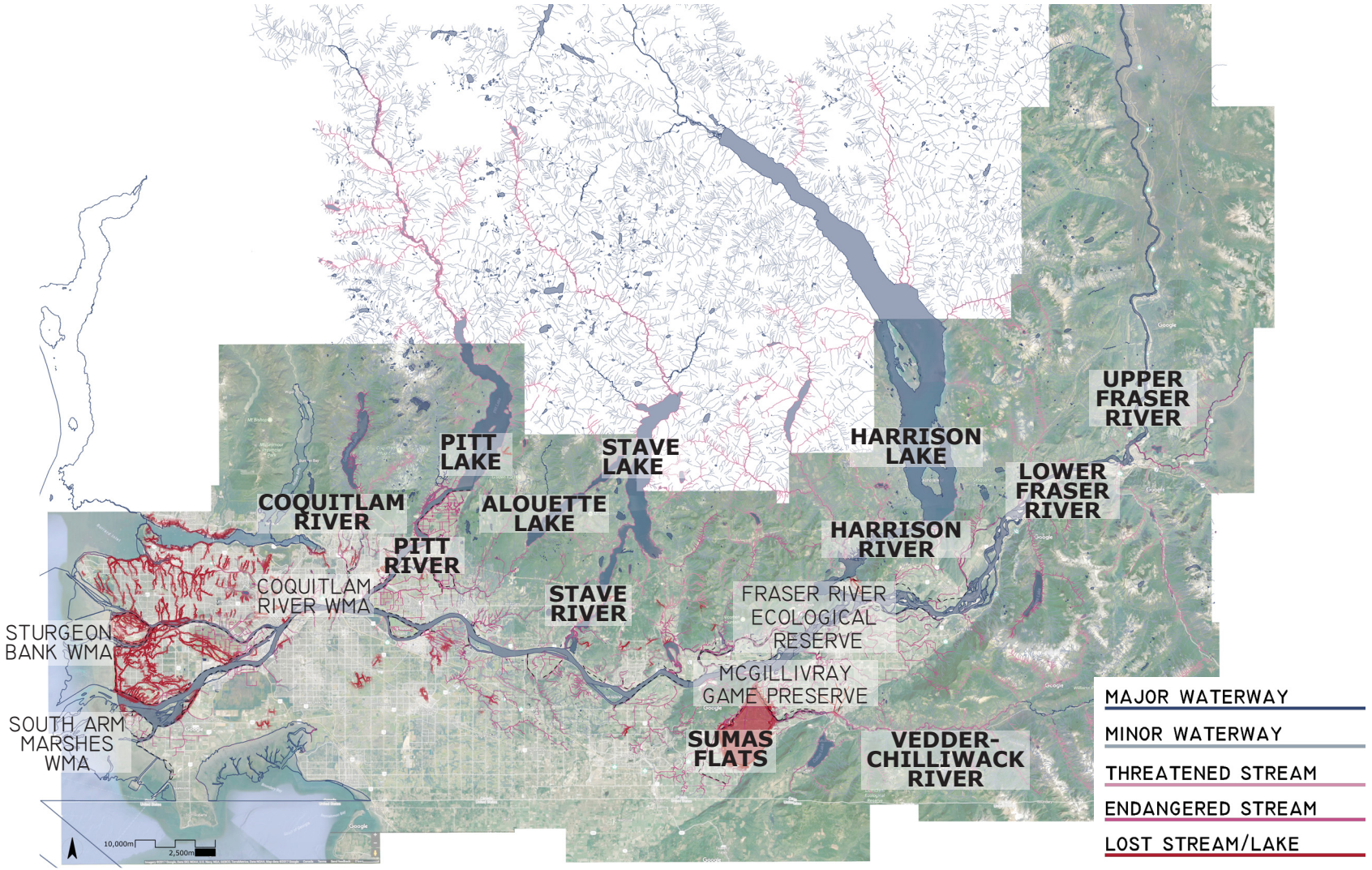
52 Evenden, *Fish versus Power: An Environmental History of the Fraser River*, 267.

53 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 228.

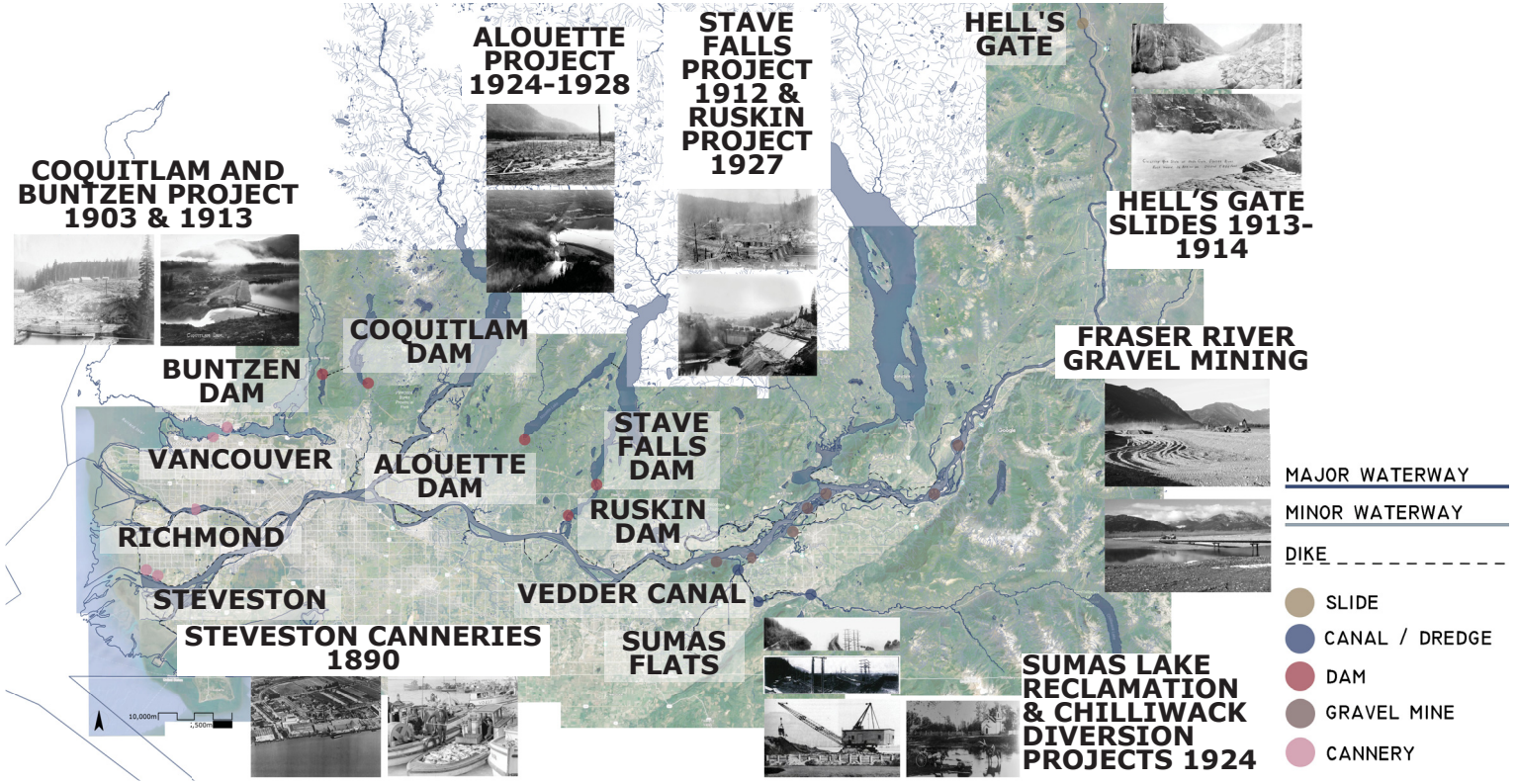
54 Hilary Stewart, *Looking at Indian Art of the Northwest Coast* (Seattle: University of Washington, 1979), 15.



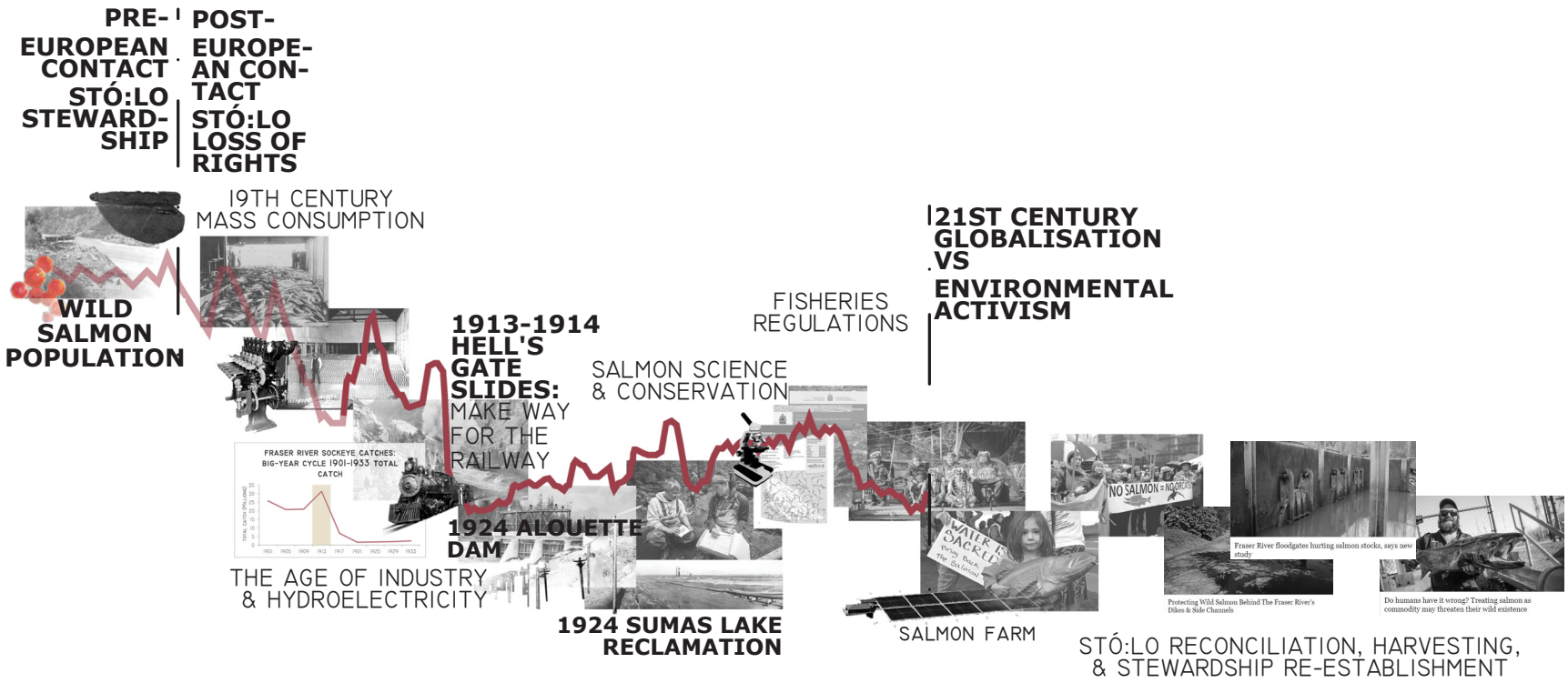

A map of salmon distribution in the lower Fraser River watershed and the waterways that no longer receive any salmon. Data extrapolated from Groot and Margolis, *Pacific Salmon Life Histories*, Fisheries and Oceans Canada, "Salmon facts- Pacific Salmon", and Watershed Watch Salmon Society. "The Fraser Basin LiveMap: An Interactive Salmon and Water Atlas." Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.




At risk, threatened, and lost waterways. Data from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas.* Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.




Historical waterway infrastructure projects and resource extraction sites that altered salmon habitat and migration routes. Data extrapolated from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas;* Evenden, *Fish versus Power: An Environmental History of the Fraser River;* British Columbia Ministry of Agriculture, "Provincially Licensed Fish Receivers Pursuant to the BC Fish and Seafood Act as of 28-Feb-18"; Uechi, "Sturgeon anglers despair over mining of the Fraser River."; Uechi, "Province approves controversial Fraser River gravel mining project"; Fraser Riverkeeper, "Mining the Heart of the Fraser"; Pollon, "Salmon Kills and the Politics of Mining the Fraser." Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines. Images from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas;* Harder, Peter, "Why & How the Vedder Canal Was Built"; Unkown, "Sumas Lake as seen from the B.C. Electric substation on Vedder Mountain, ca. 1916", "Sumas Prairie, also from the substation, ca. 1926", and "Rock Slide, Fraser River At Hell's Gate"; Gadsden, "Harrison bar mining"; Williams, 'Salmon fishing- gillnetter [loaded with fish]"; Matthews, "Coquitlam Dam site", "Coquitlam Dam", and "Clearing rock slide at Hell's Gate, Fraser River"; Maple Ridge Museum, "The Alouette Dam and the Flood of '55"; Clark, "Photograph No. 361...", and "General view from above dam..."; BCRobyn Blog, "Steveston Historic Photos"; Wright, 'Gravel mining site near Seabird Bar B along the Fraser River".




Salmon population and perceptions over time. Data extrapolated from Watershed Watch Salmon Society, “Sockeye Graph: Fraser Sockeye Recruits per spawner.” 2011. Images from Hales, “Who is Protecting Wild Salmon Behind the Fraser River’s Dikes & Side Channels?”; Moore, “A new study out of SFU has found floodgates, like this one along Mclean Creek...”; Barker, “Everything we’re doing to replace vanishing salmon might be killing them off faster”; Steel, “No salmon = no orcas”; McLeod, “A young Winnemem Wintu tribe member shows his support for salmon restoration”; Matthews, “Clearing rock slide at Hell’s Gate, Fraser River”; Banfield, “The trip to Alouet Lake: The gates in the dam”; Clark, “West Vedder dike showing suction dredge, Sumas Project”; Goodrich, “...members of the Haida tribe in Alaska, work with the Nature Conservancy...”; The Canadian Press, “Protestors gather at the Marine Harvest fish farm on Swanson Island”; Bailey Bros, “Anglo-B.C. Packing Co., Part of Evening Catch, Phoenix Cannery, Fraser River” and “Anglo/BC Packing Company Salmon Pack, Phoenix Cannery, Fraser River”; and Unknown, “Siwash Indians salmon fishing, Fraser River, BC.”

highly specialized. The fishing location, fish species, and season all determined the various methods and tools utilized in the fish harvest. As Stewart notes, these tools were the result of accumulated knowledge that spanned generations.[55] These tools and the community involvement in the harvest, that required full participation with one another as well as the salmon helped establish ecological empathy, as described by Cajete.[56] Finally, the salmon are so important to the Coast Salish people that they celebrate and give thanks to the fish each year during the 'First Fish' ceremonies known as Thehitem, or looking after the fish.[57] As Maracle notes, "Salmon is at the hub of our memory wheel."[58] Countless Salish stories are told about the salmon, both to instruct and to provide metaphors and warnings that if we do not take care they will be lost forever.[59]

The coming of the salmon likewise shaped the spaces along the river throughout history. In British Columbia, the Coast Salish people along the Fraser River are also called the Stó:lo. This is the name given to the Fraser River, also referred to as the 'river of rivers'. Thus the Stó:lo are the people of the river.[60] Prior to European contact the Fraser River was considered a shared river, while other tributaries along it were controlled by specific nations and communities. There were also salmon-fishing sites that were owned and accessed by specific families during the salmon runs.[61] Thus relationships between nations and families were important to maintain and establish in order to ensure access to the rivers and the bounty of fish. As Richard White states, "salmon fisheries formed a basic node where lines of human relationships intersected."[62] These relationships were severely altered following European contact. For example, many traditional fishing grounds are no longer in use, either because the families and nations have been forced out due to Western-European interference, or because there are simply not enough fish

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55 Hilary Stewart, *Indian Fishing: Early Methods on the Northwest Coast* (Seattle: University of Washington, 1977), 9.

56 Cajete, *Native Science: Natural Laws of Interdependence*, 40.

57 Judith Roche and Meg McHutchinson, ed., *First Fish, First People: Salmon Tales of the North Pacific Rim* (Vancouver: UBC Press, 1998), 12; Keith Carlson, Albert Jules McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas* (Vancouver: Douglas & McIntyre, 2001), 62; and Cajete, *Native Science: Natural Laws of Interdependence*, 164-165.

58 Maracle, *Memory Serves: Oratories*, 58.

59 Ibid., 51.

60 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 24.

61 Ibid., 24-27; and Stewart, *Indian Fishing: Early Methods on the Northwest Coast*, 19-20.

62 White, *The Organic Machine: The Remaking of the Columbia River,* 21.

to catch anymore.

During the late 1800s there was a period of mass consumption when resources were believed to be unlimited. Commercial practices setup canneries and harvest stations close to the ocean, near the river mouth, ensuring the efficient global commodification of the resource. At the same time, advancements in technologies brought about mechanized forms of harvesting, including fish wheels and industrial cleaning and canning machines. This made the act of harvesting impersonal and automatic. Harvesting salmon was now part of an industrial production line instead of a communal act. This mechanization severed the relationship between harvester and salmon and furthered the mentality that humans dominated over all species.[63] These practices and the introduction of the railroad furthered the global demand for resources such as salmon, while also destroying salmon habitat in the process.[64] Menzies even argues that the construction of the railroad was the cause of the most acute destruction.[65] For example, between 1913 and 1914 at Hells Gate, the construction of the railway caused a severe rock slide that blocked the main flow of the Fraser River. This slide resulted in the most dramatic drop in salmon populations from a single event to date.[66] Following this, the period of dam construction on the river's tributaries along with overfishing began. At the same time agricultural, forestry, and mining practices increased. As noted by Bisbal, it was during this time that "salmon abundance records revealed the first symptoms of decline."[67]

This decline resulted in salmon farms and salmon hatcheries that were a mechanical solution to an ecological problem and did nothing to stop the decline of wild salmon. They also further spurred on development along the rivers with hatcheries becoming the offsetting response to mitigating the problem.[68] While this notion that everything could be solved through mechanically engineered means became a dominant force in Western perception, a different view was also gaining ground. The idea that resources

63 Ibid., 33.

64 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 155-156.

65 Charles R. Menzies, *Traditional Ecological Knowledge and Natural Resource Management. (*Lincoln University of Nebraska Press, 2006), 113.

66 Matthew D. Evenden, *Fish versus Power: An Environmental History of the Fraser River* (New York: Cambridge University Press, 2004), 46-52.

67 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 157.

68 White, *The Organic Machine: The Remaking of the Columbia River,* 95-97.

should be preserved was advocated by conservationists in the 1900s. This movement involved several levels of government and resulted in various Fisheries Management commissions. This also resulted in an advance in salmon science.[69] However, as White notes, “Our knowledge of the dangers we pose to salmon is now a half a century old; our knowledge has ultimately made little difference.”[70] While science is still working to fully understand the salmon problem, since the 1960s onward there has been a reliance on legislation as a means to protect salmon, but it has not been effective. Rather, the legislation and regulations heavily affect anyone harvesting fish in the rivers, with fisheries closures becoming the norm. At the same time, development along these rivers is still able to continue, just with some minor regulations to uphold.[71]

As mentioned previously, current harvesting practices, including overfishing, has been cited as a key issue in the wild salmon problem. The commodification and increased global demand for salmon along with the types of harvesting methods used has resulted in this dilemma. While some argue that we must stop harvesting salmon altogether, this is both unrealistic and insensitive to the Coast Salish nations who rely on salmon to maintain their culture. This proposed measure also does not fully address all the issues that face wild salmon populations. Montgomery argues that a total ban on harvesting would not be enough to restore salmon populations, most notably while society continues to destroy and remove vital salmon habitat.[72] Rather, it is more imperative to address the methods of harvesting and how certain practices can minimize the impact on specific salmon stocks. The Watershed Watch Salmon Society, the Skeena Wild Conservation Trust, and Buchal all examine these methods.

As our marine technology has improved more harvesting has been undertaken out in the ocean. This extends the salmon harvesting season which used to take place in the late summer and fall, to a year round practice. It also results in mixed-stock fishing which is indiscriminate of species and stocks at risk that cannot handle the harvesting pressures. While the practice does require that endangered species be returned to the water, most

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69 Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 157-160.

70 White, *The Organic Machine: The Remaking of the Columbia River,* 90.

71 Ibid., 92-93, 98, 101-102; and Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 160-162.

72 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 241.

often these fish perish before being released. This can eliminate the species diversity and result in weaker salmon. It also attributes to the uncertainty in salmon stock assessments which predict how many fish will return to the river systems and therefore determine the regulations that are placed on in-river harvesting. [73]

In comparison, Stó:lo communal practices primarily involve fishing within the river systems or close to shore in the ocean. This in-river and terminal practice allows for more selective methods of harvesting as it allows endangered stocks to be protected. Using specific traps, weirs, or netting can also target specific species. It is also easier to return endangered fish back into the river when required. Additionally, these methods usually involve community participation which strengthens the society's awareness of the fish.[74] First Fish ceremonies provide further awareness as well as provide time for salmon to move safely up the river while the ceremonies are being performed.[75]

Yet as a society we do not perceive or recognize the negative effects these ocean practices are having, rather we have a negative bias towards land-based fishing practices. This in particular is evident in regards to Stó:lo fishing practices. Unlike in the ocean, we are able see the practices taking place on the rivers and argue that it is the indigenous river harvesting that must be controlled. This is then further enforced through regulation and licensing. White describes this in detail, with particular emphasis on the exclusion of indigenous people from harvesting practices and the subsequent salmon wars that ensued.[76]

To complicate the salmon harvesting discussion further, many recreational fishermen also participate in both ocean and river practices.[77] British Columbia waterways have also become popular spots for tourists who hire local guides to take them fishing for various

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73 Gideon Flitt, "Saving Wild Salmon by Changing the Way We Fish," (video), 16:48, From Watershed Watch, published on July 16, 2014. https://www.watershed-watch.org/resources/video-saving-wild-salmon-by-changing-the-way-we-fish/; and Lackey, et.al., *Salmon 2100: The Future of Wild Pacific Salmon*, 200.

74 Ibid.; ibid., 200; Stewart, *Indian Fishing: Early Methods on the Northwest Coast*.

75 Stewart, *Indian Fishing: Early Methods on the Northwest Coast*, 162-163.

76 White, *The Organic Machine: The Remaking of the Columbia River*, 39-48, 91-92.

77 According to statistics more local anglers participate in freshwater fisheries while non-residents and foreign anglers participate more in tidal based fisheries. See Fisheries and Oceans Canada. 2010 Angler Survey Results. http://www.dfo-mpo.gc.ca/stats/rec/can/2010/section4-eng.htm.

fish species, most notably the salmon. Between 2000 and 2010 an average of 400,000 residents participated in fishing in British Columbia and the main species being caught were salmon and trout.[78] However, the fishing methods used are very different from those practiced by First Nations and commercial fisheries. While recreational fisheries is given the last priority in regards to salmon fishing, it is still important to note that many recreational fishers participate in selective harvesting methods too.

Presently the Stó:lo try to maintain some of their cultural practices on the river, while local recreational fishermen attempt to catch various salmon species and some select commercial fisheries harvest fish at the mouth of the rivers. Traditionally, these three groups have been pitted against one another.[79] While conflicts between these groups arise, it is important to note that everyone is united in their need to harvest salmon. For example, in 2016 all salmon fishing was banned on the lower Fraser River and the tributaries. Guides protested the closure, recreational fishers protested the closure, and several First Nations groups protested the closure.

As noted previously, conflicts between various fishing groups have occurred throughout history. These conflicts even occur between recreational fishers who utilize different methods of fishing. This is still an issue along the Fraser River where individuals fight amongst one another for access to select fishing spots. For example, in 2009 there was physical dispute that resulted in the creation of the Fraser River Peacemakers, a not-for-profit group of Lower Fraser First Nations and sports-fishers that collaborate on ways that we can all access the river without incident.[80] This highlights the need for everyone to come together in order to discover a lasting solution to the salmon problem, which hopefully results in less blanket salmon closures as more fish return to the rivers. Furthermore, only through providing opportunities for people to participate and learn about these more selective in-river methods can we change public perception and hopefully reduce the reliance on commercial ocean fisheries.[81]

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78 Ibid.

79 Menzies, *Traditional Ecological Knowledge and Natural Resource Management,* 120.

80 Fraser River Peacemakers, “Background + History,” accessed December 1, 2017, http://fraserriverpeacemakers.ca/who-we-are/background-history/; and Fraser River Peacemakers, “Who We Are,” accessed December 1, 2017, http://fraserriverpeacemakers.ca/who-we-are/.

81 Flitt, “Saving Wild Salmon by Changing the Way We Fish.”

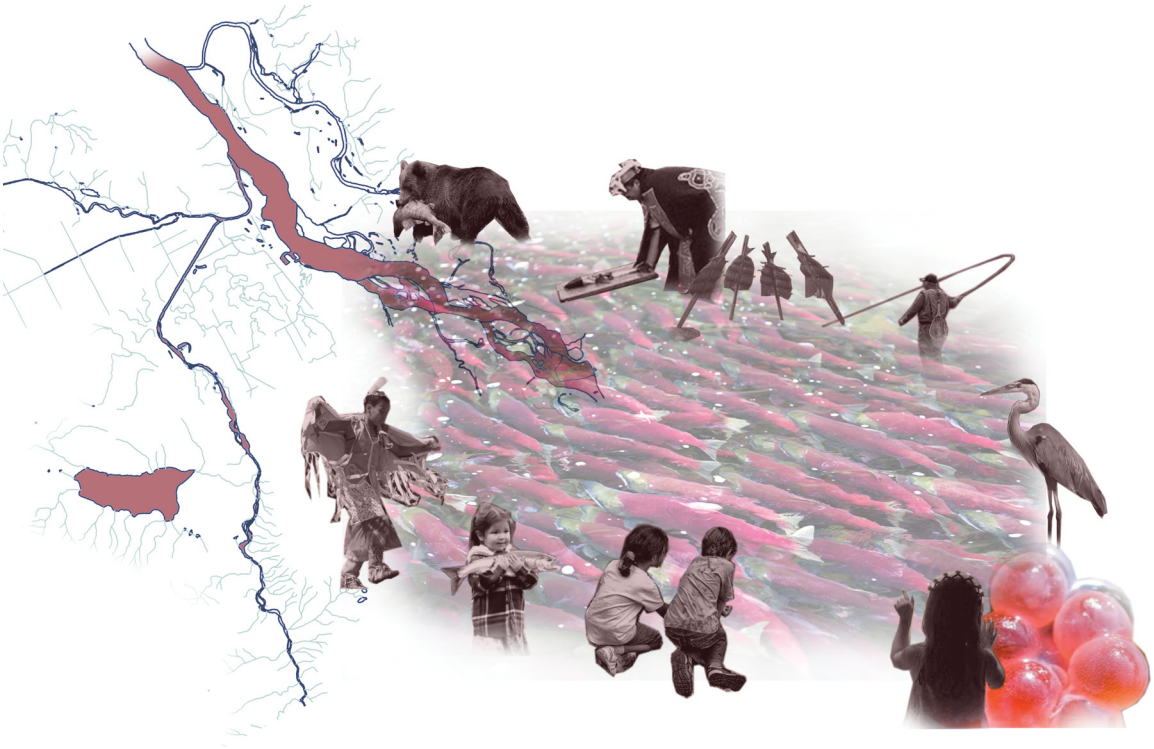
An example of reintroducing traditional selective fishing practices occurred in 2008 when the Cowichan Tribes on Vancouver Island re-established a fishing weir with both traditional and nontraditional methods. While the Cowichan were not given permission to use the weir for fishing they still used the weir as a fish counter and knowledge sharing post. The information the Cowichan Tribes collected then supplemented the data collected by the Department of Fisheries and Ocean creating a clearer picture of the Cowichan River salmon.[82] As noted by Dale and Natcher, "By incorporating the technologies and supporting knowledge systems of Aboriginal peoples into contemporary management regimes, the sustainability of the world's fishery is more likely achieved..."[83]

82 Chelsea Dale and David C. Natcher, "What is old is new again: The reintroduction of indigenous fishing technologies in British Columbia," *Local Environment* 20, no. 11 (2014), 1315-1317.

83 Ibid., 1319.

# CHAPTER 5: PROGRAM

## The Salmon Eco-Park and Knowledge Collective



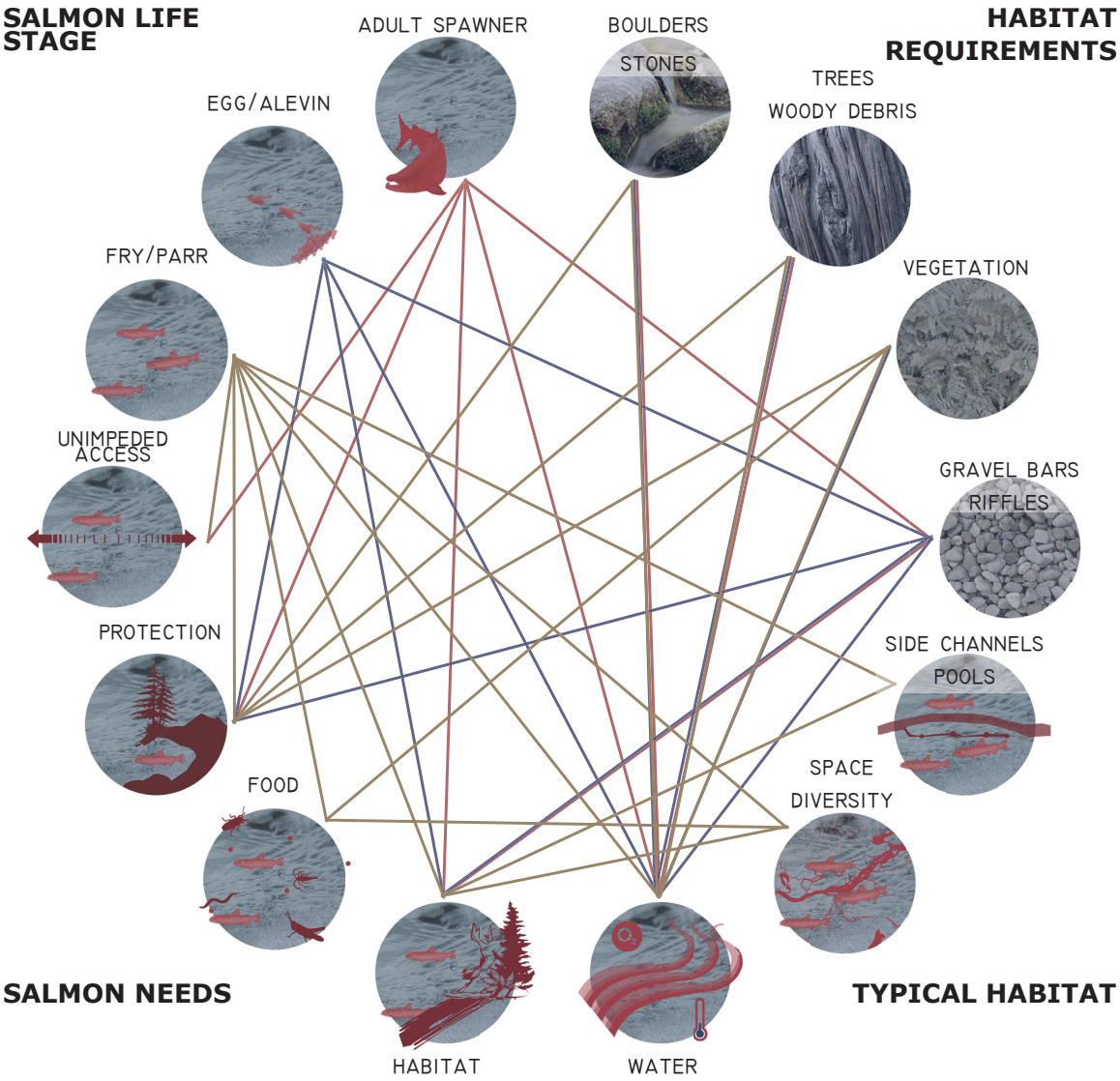
Program wish image. Gis & Map base image from British Columbia Regional Water Bodies and Water Lines. Images from Wright, “Spawning salmon”; Dunn-Jones, “Show Kinder Morgan your Food Fish!”; Joseph, “Salmon is smoked over an open fire outdoors”; Unknown, “Great Blue Heron, Ft. De Soto”; Suncor Energy Fluvarium, “Life is different...up close”; The Valley Voice, “Cultural Centre: New Spirit of the People location a good fit for powwow say organizers”; Cumbrianwa, “Atlantic Salmon Spawning Again In River Lyvennet”; deBruyn, “Grizzly with chum”; Kwakiulth Museum, “Salmon ceremony: Cape Mudge”; and Unknown, “Salmon eggs.”

### The Park

First and foremost, this thesis must address the needs of salmon as the primary stakeholder. “Human indifference to the needs of the fish played a leading role”[84] in the endangered stocks we see today. It is time for that to change.

Salmon require a variety of diverse habitats depending on their stage of life and are most vulnerable to habitat degradation in their first stages of life which occur in freshwater systems. Most importantly, salmon require clean and cool oxygenated-water, access to food, protections from predators and extreme flood and storm water flows, as well as

84 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 3.




Salmon and their ideal habitat relationship diagram. Data extrapolated from Department of Fisheries and Ocean, "Habitat Requirements for Coastal Coho Salmon Populations."

unimpeded access to migration routes and suitable habitat.[85] Montgomery argues that the best way to provide for these needs is to establish vegetated riparian corridors and salmon sanctuaries along river valleys and floodplains.[86]

Both continuous riparian corridors and larger wetlands provide numerous benefits to salmon including controlling the rate of flow of water and subsequent bank erosion,

85 Department of Fisheries and Ocean, "Habitat Requirements for Coastal Coho Salmon Populations," accessed October 3, 2017, http://pacgis01.dfo-mpo.gc.ca/documentsforwebaccess/wildsalmonpolicydocuments/Life_History_Habitat_Requirement_Information/Coastal_Coho_Life_History_Strategy/Habitat_Requirements_For_Coastal_Coho_Salmon.doc, 2-3.

86 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 234-238.

providing absorption and adsorption of water and pollutants, regulating the temperature of the water, as well as offering microclimates that support salmon prey and provide protection from salmon predators.[87]

This would require either a setback or removal of current flood protection measures in order to provide salmon access to side-channels and wetlands. It would also allow for the river to re-establish diverse habitats. Montgomery notes, “Although letting rivers and floodplains revert to a more dynamic state may sound radical, it is worth noting that historically these very same areas were nature’s ‘salmon factories’...”[88]

Currently, floodplains are being developed heavily and are used for various forms of agriculture which requires extensive flood protection measures. Furthermore, due to development practices most riparian corridors are fragmented, channelized, and have become homogenous habitats that do not support salmon.[89] Equally alarming, large vegetated patches and parks are also at risk as we develop more heavily along the river.[90] Additionally, Stokes argues that it is not only the quality of habitat that is important but also the quantity if we want to ensure that wild salmon can thrive. Certain habitats can only support a certain number of fish.[91] Thus the establishment of a salmon eco-park is only the first step in reversing the negative environmental legacy society has created and can be seen as a test for future habitat restoration projects.

In addition to helping salmon by providing them with space and creating a vegetated buffer these refuges and corridors provide benefits to humans too. These spaces not only provide for public recreation, they also provide protection from flooding as they can absorb water and then slowly release it. This form of flood-protection does not rely on expensive dike systems and pumps, rather on natural processes. These floods also benefit salmon as they create diverse micro-habitats.[92] Thus, the eco-park helps to educate society on

87 Richard T. T. Forman, *Land Mosaics: The Ecology of Landscapes and Regions* (New York: Cambridge University Press, 1995), 229-234.

88 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 238.

89 Forman, *Land Mosaics: The Ecology of Landscapes and Regions*, 227; and Richard T. T. Forman, *Urban Regions: Ecology and Planning Beyond the City* (Cambridge: Cambridge University Press, 2008), 95, 109.

90 Forman, *Land Mosaics: The Ecology of Landscapes and Regions*, 213.

91 Stokes, *The Fish in the Forest: Salmon and the Web of Life,* 32.

92 .Ibid., 32.

alternative forms of flood protection that benefit both humans and salmon.

## The Collective

There are many people who stake a claim to salmon and their habitat. More importantly, there are many people who are invested in trying to restore both the salmon and their habitat. Together we are all a collective with various perspectives and experiences that can positively contribute to the wild salmon problem. What is important to understand is that historically there has been an imbalance of power between these various perspectives and how they have been involved with salmon throughout history. If we want to meaningfully address the wild salmon problems we need to be able to participate with other points of view and traditions.

Thus, the architectural response must provide spaces for collaboration and observation of other practices. As Cajete notes, education is an important part of any solution.[93] However, Maracle argues that the current education system is uneven because it belittles those whose "systems of knowledge acquisition are different."[94] While educators like Snively have worked towards incorporating traditional knowledge into science curriculums[95], more must be done with a focus on salmon based knowledge sharing. Therefore, this thesis considers opportunities for inclusive collaboration and knowledge sharing. This knowledge collective can promote different methods of knowledge acquisition in the fields of salmon and habitat data collection, habitat restoration strategies, flood provision strategies, sustainable harvesting methods, and food preservation methods. Spaces should facilitate education and sharing through storytelling, and participation in key activities.

These spaces must include direct participation with salmon in the forms of fishing, harvesting, cleaning, and preparing fish. As argued by White, "People still desire salmon. Salmon symbolize nature in the Pacific Northwest; the experience of taking them has become a quintessential Northwest experience."[96] This is something everyone shares. It is therefore imperative to provide opportunities for harvesting salmon that promotes sustainable practices and cross-cultural exchange.

93 Cajete, *Native Science: Natural Laws of Interdependence*, 63.

94 Maracle, *Memory Serves: Oratories*, 70.

95 Snively and Williams, *Knowing Home: Braiding Indigenous Science with Western Science*.

96 White, *The Organic Machine: The Remaking of the Columbia River*, 90-91.

This reintroduction has already slowly begun. In 1999 the Sumas First Nation received funding “for a fish wheel modification and beach seine project.”[97] However, much more can be done. It is equally important to note that this reintroduction is not merely duplicating traditional practices. As mentioned in Menzies, “local knowledge often becomes ‘hybridized’ with non-local knowledge, and that new knowledge is constantly added in response to change.”[98] Through collaboration, existing sustainable methods can be further scrutinized and improved upon, resulting in improved salmon stocks and increased populations.

Carlson notes that, “a healthy understanding about the place where we live involves opening ourselves to diverse ways of comprehending history and geography.”[99] Additionally, supplementary spaces within the eco-park that provide moments for sensorial observation and participation with salmon and the environment as well as spaces that facilitate reflection can aid in this perceptual transformation. A concept that Ingold and Cajete share is that moments such as these provide knowledge of our environment and are integral to how we perceive this environment[100]. These programs will tie into existing trail networks along the river further emphasizing the importance of the interconnections of the environment.

Furthermore, it is imperative that a collective such as this promote local connections over global practices. Carlson discusses this when describing Stó:lo resource management models which emphasize local knowledge and local control. This contrasts the current practices where “Decisions about what happens in and around local communities are often made in provincial and federal capitals, located hundreds of kilometres away.”[101] As Abram notes, these top down approaches to restoration and protection do not work in comparison to community led initiatives that utilize local knowledge and engagement.[102] Therefore, the program must also promote and establish local resource management.

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97 Menzies, *Traditional Ecological Knowledge and Natural Resource Management*, 61.

98 Ibid., 109.

99 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 172.

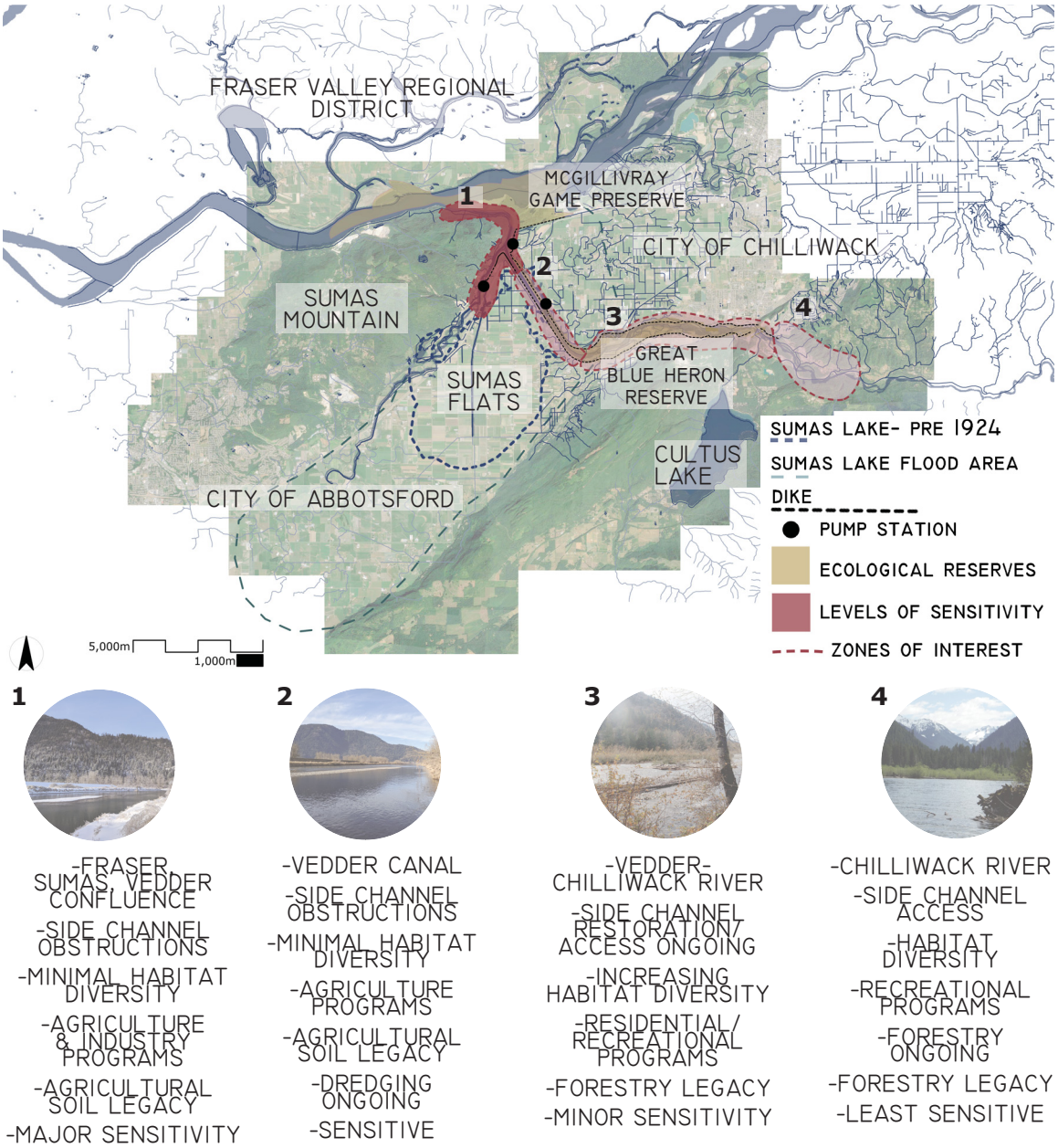
100 Cajete, *Native Science: Natural Laws of Interdependence*, 20-22, 66; and Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, 20.

101 Ibid., 179.

102 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 268-270.

# CHAPTER 6: ARCHITECTURAL FRAMEWORK

## Site Strategy Framework




Vedder-Chilliwack sensitivity zones. Data extrapolated from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas* and Google Maps.Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.

## Macro Scale Systems and Ecological Phasing

In establishing a clear site and design strategy it is imperative not to lose sight of the

larger macro-scaled system as the micro-scales become more defined and focused. This is especially important when dealing with salmon, as they encompass so much space and affect so many other species and habitats in their lifetime. In order to improve and change the current salmon system this thesis will focus on selecting key points within the larger system. As noted by Meadows, these activation points are "places in the system where a small change could lead to a large shift in behaviour."[103] After making a change in these points it is always crucial to come back to the larger system and see how those changes affect the whole. This scale change is important because as Meadows argues, most often when a change occurs it can move the system in the wrong direction.[104]

When considering large scale systems and processes such as those involved with salmon habitat any viable response must be adaptable and take a phase based approach. Systems are very complex and intertwined. If a design response is too rigid the system will need constant maintenance. Berger argues that, "design is more intelligent if the landscape systems are retrofitted with a robust plasticity."[105] Corner also discusses this in the context of landscape urbanism. He argues that design must be open-ended and allow for incremental change due to the complexity of ecological systems and in order to respond to changing needs.[106] Downsview Park, FreshKills, by Field Operations and the Lower Don Lands by StossLU are examples of these applied theories.[107] In this manner, the architectural response provides a framework, or scaffold, at the selected activation points. This strategy also allows for the design to be considered as the first test in a series of potential future projects, similar to P-Rex Lab's Pontine Marshes Wetland Machine.

This method could thus be utilized to open up the existing development patterns and flood measures that contain and restrict salmon habitat and allow for a re-introduction of wetlands. As noted previously, these wetlands provide ecological benefits to salmon and the environment while also providing opportunities for re-establishing societies' relationships with the environment.

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103 Meadows, *Thinking in Systems: A Primer*, 146.

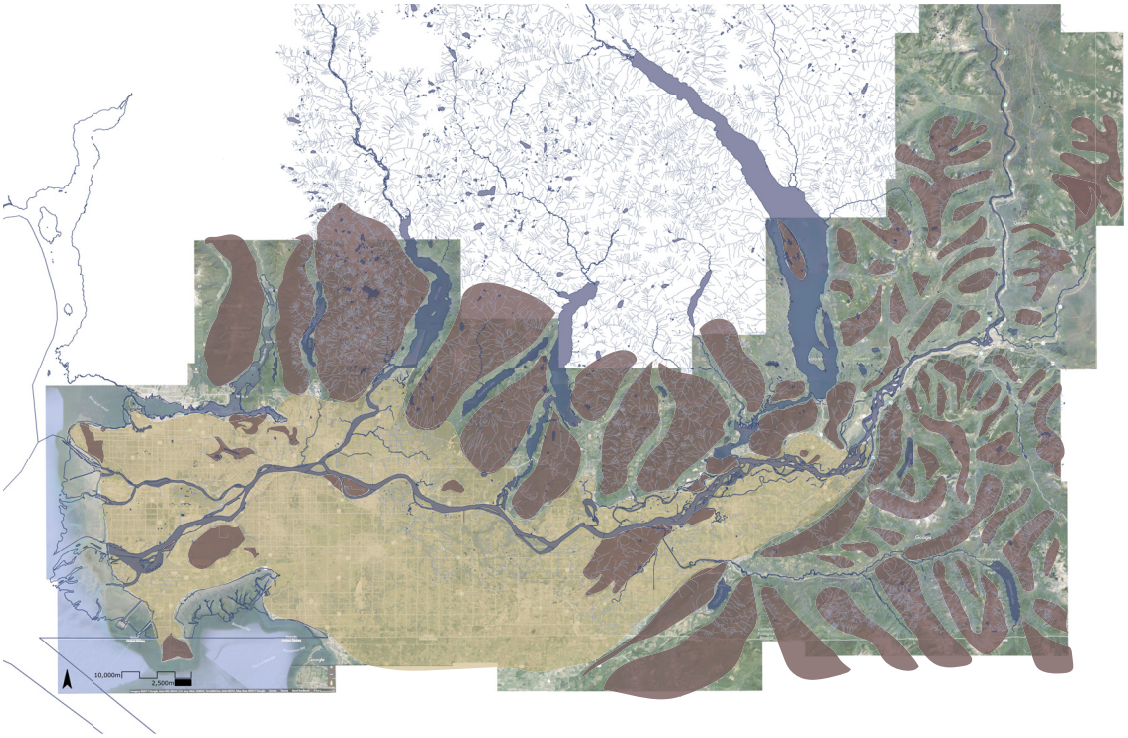
104 Ibid., 146.

105 Berger, Systematic Design Can Change the World, 24.

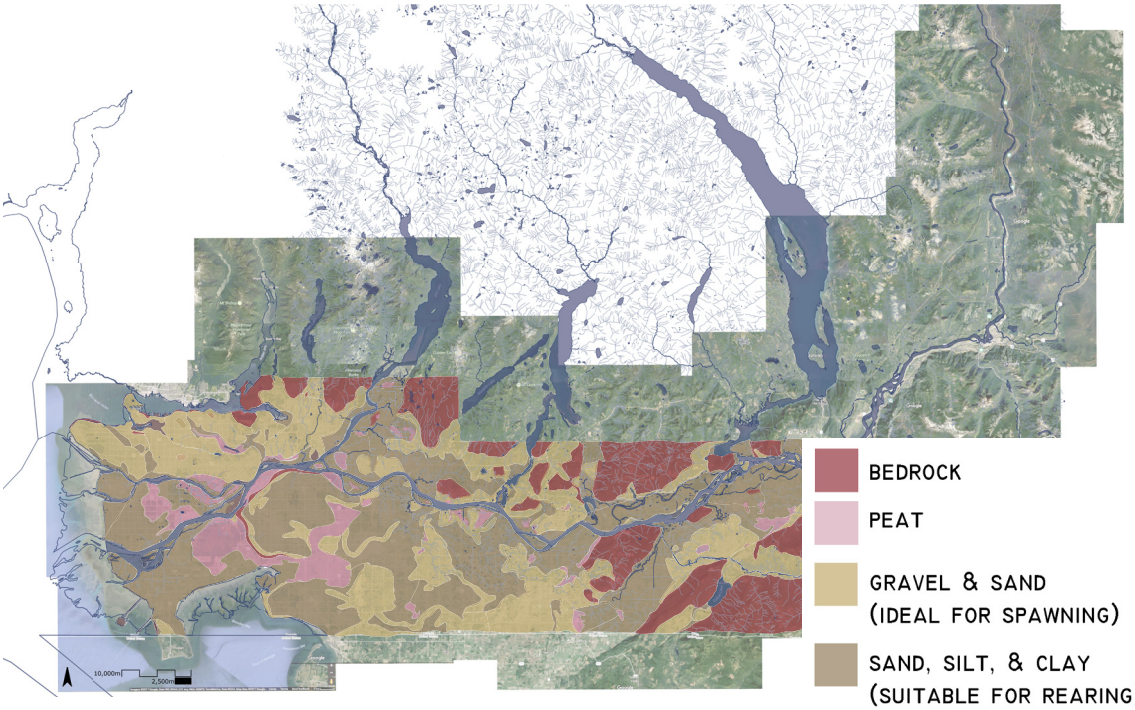
106 James Corner, "Terra Fluxus," in *The Landscape Urbanism Reader*, ed. Charles Waldheim, 21-33 (New York: Princeton Architectural Press, 2006), 29.

107 Waldheim, Landscape as Urbanism: A General Theory, 25-28.

## Ecological Patterns, Zones, and Levels of Sensitivity



Mountain and floodplain patterns. Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.




Geology patterns.Data extrapolated from Canadian Geoscience Education Network, “Vancouver-Geomap.” Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.

In selecting a site it will be important to identify zones within rearing or spawning grounds that are in danger from fragmented riparian corridors, channelization, and minimized vegetated patches, as this is when salmon are most sensitive. These zones are the most sensitive and will become the focus of study. By identifying existing ecological patterns within these zones and the areas around them, the places in need of change and the required activation points to start this change will become evident. In this way the patterns will also give clues as to what initial changes must be implemented that may work with or go against these existing patterns. As Foreman states, “A... plan which provides an adaptable pattern to anticipate and respond to changes... with only spots designed in detail is more likely to be a successful long-term plan.”[108]

## Design Framework

### Routes and Roots

Throughout a salmon’s long journey they utilize many hydrologic routes and inhabit many different spaces. However, Lichatowich argues that while a salmon’s life includes constant migration, they are really place-based animals rooted in the river they were born.[109] This is because a “salmon’s annual return to the rivers is a place-defining event...”[110] and the “salmon’s attachment to place is the source of their biological diversity.”[111] The same can be said for humans. We can learn much about space through movement, for example topography.[112] In comparison, by rooting ourselves in one spot we situate ourselves in the environment and learn more about a place. Abram promotes the importance of local experiences as a means to open ourselves out to sensuous world around us.[113] In this way we can meaningfully participate with a place and all those that inhabit that place. Considering this, while this thesis will utilize both routes and roots in order to promote perceptual learning, the spaces that root us will be the main focus.

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108 Forman, *Land Mosaics: The Ecology of Landscapes and Regions*, 241.

109 Jim Lichatowich, *Salmon, People, and Place: A Biologist’s Search for Salmon Recovery* (Corvallis: Oregon State University Press, 2013), 165.

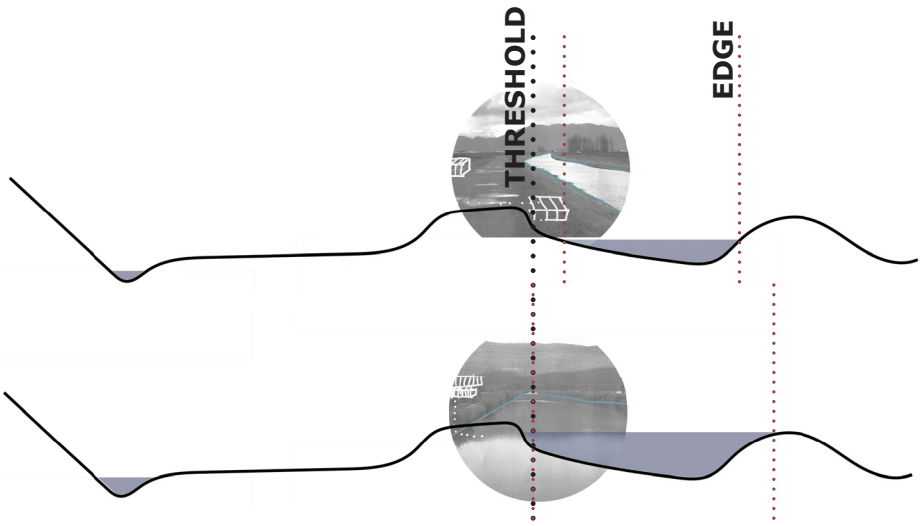
110 Ibid., 191.

111 Ibid., 165.

112 Till Boettger, *Threshold Spaces: Transitions in Architecture Analysis and Design Tools* (Basel: Birkhauser, 2014), 17-19.

113 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 268.

## Thresholds and Edges



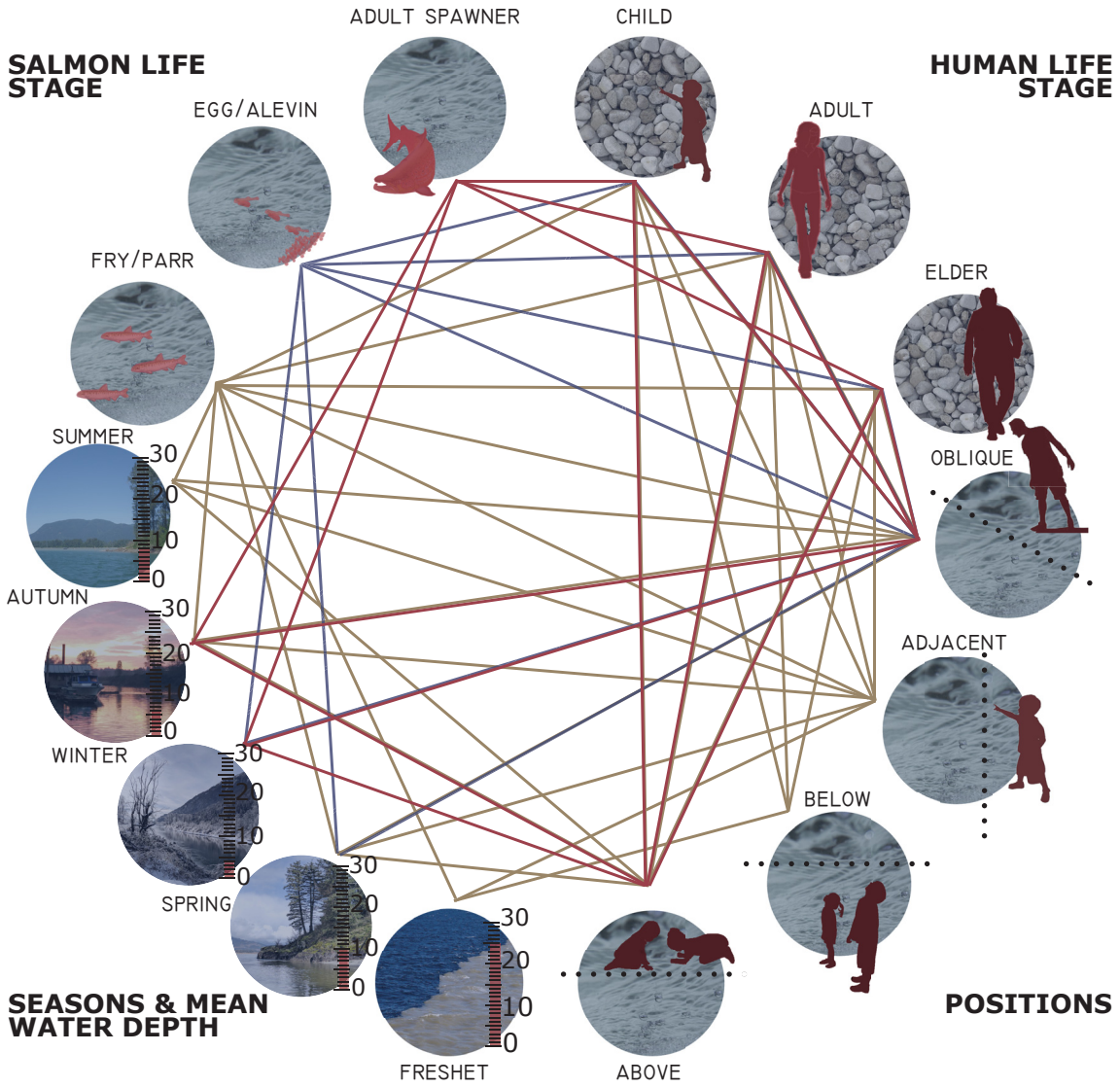

Edges being activated by thresholds depending on time, with a focus on season, water depth, and salmon life cycle.

Along a river the 'edge' of the water is always changing. Meyer discusses the idea of a traditional edge which implies a line and containment. He argues that we need to consider the conceptual edge which allows for changes and implies an area.[114] This thesis will work within ecological edges that consider the conceptual edge and therefore imply an area in constant flux. These edges will be activated by thresholds that provide an interface between the active routes and the rooted places of rest and sensory experiences. Thresholds can be expressed as a point, a line, or an area. According to Boettger, thresholds can provide focus and announce a change from one space to another.[115] They prepare us for this change and allow for an opening of the senses in order to fully perceive the forthcoming space or place. These thresholds can be either fixed or moveable. In comparison, ecological edges are in constant flux. Adding to this, salmon inhabit different points of the river at different seasons and stages in their life cycle. These differences result in certain edges and thresholds only being activated at specific times and specific places. This also ensures that ecology and salmon play a part in providing the agency for perceptual change.

114 Christopher Meyer, "Terra Firma | Aqua Firma" (lecture, Dalhousie University, Halifax, NS, December 6, 2016).

115 Boettger, *Threshold Spaces: Transitions in Architecture Analysis and Design Tools,* 47-49.

## Position and Time




Potential relationships between salmon, humans, and habitat.

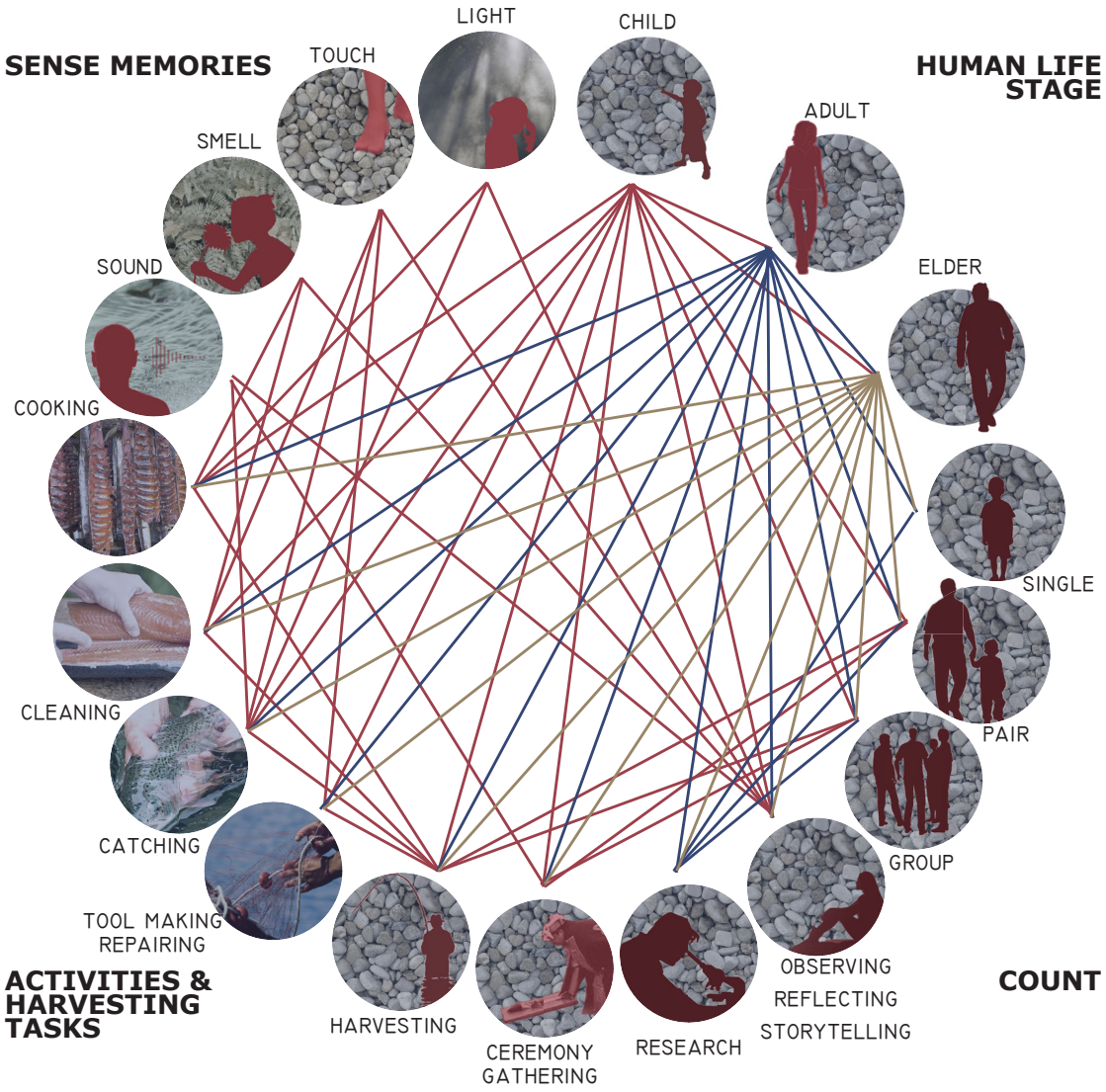
Position is a critical component in perception. Abram argues that perception is "necessarily relative to our own position or place..."[116] According to Ingold, Girot, and Boettger, a system of orientation or direction can open "up the world to perception of greater depth and clarity."[117] These positions can include above, below, adjacent, or oblique. As noted

116 Abram, *The Spell of the Sensuous: Perception and Language in a More-than-human World,* 32.

117 Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, 22; also see Christophe Girot, "Four Trace Concepts in Landscape Architecture," in Recovering Landscape: Essays in Contemporary Landscape Architecture, ed. James Corner, 59-67 (New York:Princeton Architectural Press, 1999); and Boettger, *Threshold Spaces: Transitions in*

previously, these positions are directly linked to both time and the seasons, as well as the salmon life cycle.

### Sense Memories, Atmosphere, and Knowledge




Relationship between humans and how we acquire knowledge.

As mentioned previously the utilization of thresholds will focus our perception by opening us up to various senses. Furthermore, some of these thresholds will only be activated at select moments by the changing conditions. Boettger describes a threshold as a moment of conscious perception where there is a clear atmospheric contrast. Where there is no contrast the threshold becomes ambiguous.[118] He goes on to suggest that “Places

*Architecture Analysis and Design Tools,* 17.

118 Boettger, *Threshold Spaces: Transitions in Architecture Analysis and Design Tools,* 50.

are usually associated with experiences that live on in memories and stories."[119] These memories can be directly linked to atmosphere.

As described in the Introduction, I situate myself in certain fishing locations by the atmospheric conditions I remember when thinking of those places. These atmospheric conditions are directly related to an assembly of sensorial experiences. For me the experiential components most associated with memory and therefore, place, are sound, smell, touch, and light. Pallasmaa discusses the importance of these senses within architecture in the Eyes of the Skin. Zumthor also describes these senses when recalling his aunt's garden.

> [L]ike a special sign of entry into a world of different moods and smells. I remember the sound of gravel under my feet... I can hear the heavy front door close behind me as I walk along the dark corridor and enter the kitchen, the only really bright lit room in the house...[120]

With this in mind, the thresholds will be used as a focus of specific sensual elements to establish strong memories and connections which will embed the place and the salmon within our perception while also promoting community engagement and cooperation.

For example, long before we could communicate, sound was used as a way to learn about our environment. Unlike any other sense, sound is a multidirectional experience and can provide use with spatial clues.[121] Sound also encourages and creates memories. As noted by Holl, "Anyone who has become entranced by the sound of water drops in the darkness...can attest to the extraordinary capacity of the ear to carve a volume into the void of darkness. The space traced by the ear becomes a cavity sculpted in the interior of the mind."[122] Furthermore, Pallasmaa goes on to argue that in comparison to sight, sounds connect us and create a feeling of solidarity[123] with both the environment and our community.

These sensorial experiences along with participation in salmon-based activities are

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119 Ibid., 57.

120 Peter Zumthor, *Thinking Architecture*, 3rd, expanded ed. (Basel: Birkhauser, 2010), 9.

121 Inner Space Center, "How do fish hear?", *Discovery of Sound in the Sea*, accessed November 29, 2017, http://dosits.org/animals/sound-reception/how-do-fish-hear/.

122 Steven Holl, Juhani Pallasmaa, and Alberto Perez Gomez, *Questions of Perception: Phenomenology of Architecture* (San Francisco: William Stout, 2006),

123 Pallasmaa, *The Eyes of the Skin: Architecture and the Senses,* 50.

integral to learning about the world around us. Menzies argues that “learning should be highly kinesthetic and activity oriented, using a variety of sensory modalities...”[124]Ingold describes these as two forms of learning. The first is social learning and involves an individual and a teacher instructing the individual on what to see, smell, hear, or feel. The second form is when the individual puts the social learning to use and applies it while participating in the environment. This is particularly evident when examining how hunters and fishers acquire their skills.[125] White argues this when discussing how for First Nations “through labor the river was tactilely known”[126] Only through participating in this form of knowledge acquisition can we come to better understand salmon and the environment. Providing the tools for harvesting salmon is useless if an individual is not shown how to use them. As White states, “the knowledge of how and where to use the boats was as important as the boats themselves.”[127]

124 Menzies, *Traditional Ecological Knowledge and Natural Resource Management*, 219.

125 Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, 21, 25, 36-37.

126 White, *The Organic Machine: The Remaking of the Columbia River*, 60.

127 Ibid., 9.

# CHAPTER 7: SITE

## The Lower Fraser Valley

While all of the Fraser Watershed is integral salmon habitat the Lower Fraser Valley is an ideal area to focus the thesis research. When examining the Lower Fraser River watershed it becomes clear that salmon inhabit the majority of the waterways. It is also evident that in many instances so do humans. According to Carlson, “the lower Fraser Valley is experiencing unprecedented population growth at a faster rate than the more dense urban centers around Vancouver.”[128] It is also one of the fastest growing regions in North America.[129] This has resulted in extirpated salmon stocks and waterways that have been both lost and severely damaged.

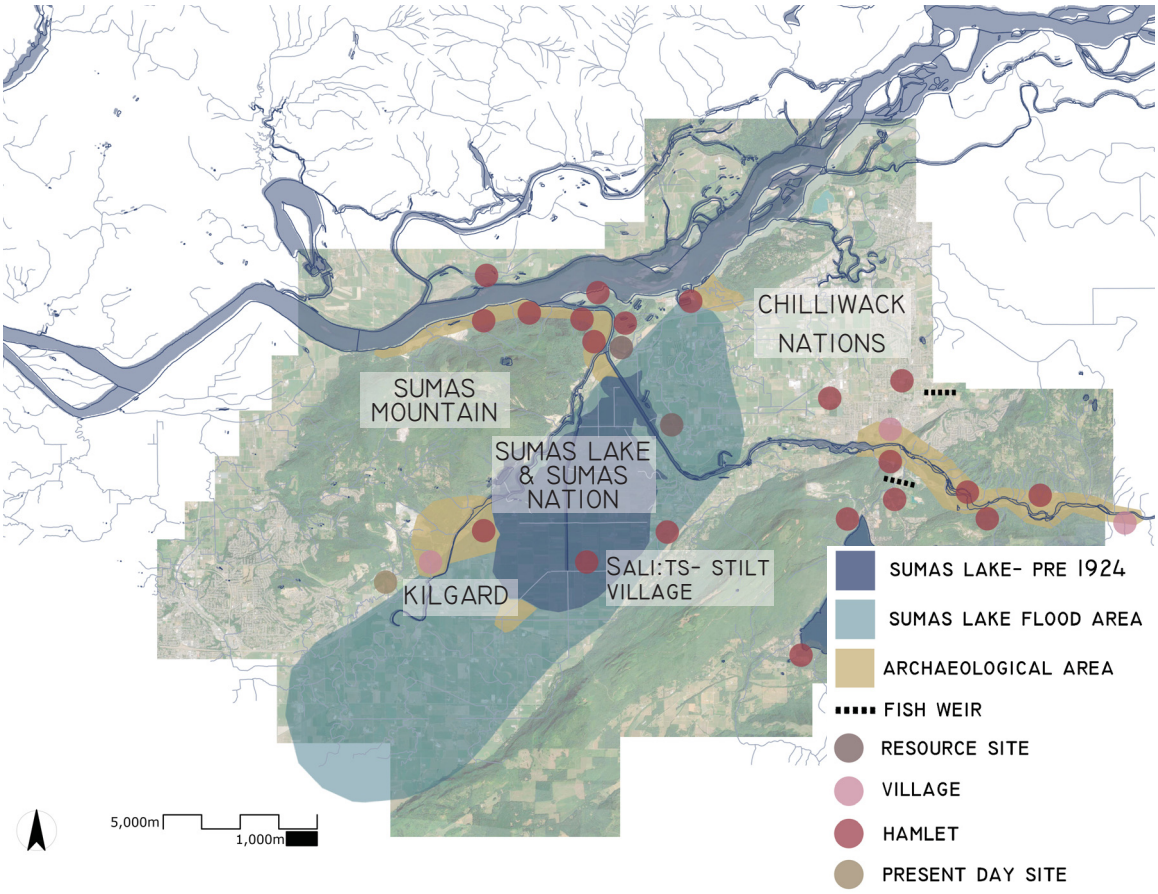
Additionally, since post-contact settlement began, the Lower Fraser Valley has both consciously and unconsciously worked towards creating an environment not suitable for wild salmon. This has been done through excessive harvesting, tributary hydropower development, and habitat destruction caused by forestry, agriculture, mining, road and rail infrastructure and urbanization. Most notably, the Lower Fraser Valley is a relatively large and flat floodplain that begins near Chilliwack and Agassiz and continues west to the ocean. This has led to increasing flood prevention measures that have both destroyed and decreased access to viable salmon habitat. Measures to reverse this development legacy are currently ongoing. However, there is still a reliance on mitigating these problems with the introduction of salmon hatcheries.

## The Vedder-Chilliwack, Sumas, and Fraser Rivers

The Lower Fraser Valley encompasses a vast area with many watersheds that feed into it. Two such waterways are the Vedder-Chilliwack River and the Sumas River, formerly known as the Sumas Lake. Both rivers are considered amoung the larger tributaries in the area and meet at the base of Sumas Mountain before quickly depositing into the Fraser River. This point marks the location where the Fraser River changes. Downstream the river becomes deeper whereas upstream the river is much shallower with braided gravel

128 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 166.

129 Knudsen, *Sustainable Fisheries Management: Pacific Salmon,* 351.




Map of the Sumas Lake and Vedder-Chilliwack River area and the Stó:lo sites connected to these waterways. Data extrapolated from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*. Gis & Map base image from Google Maps, and British Columbia Regional Water Bodies and Water Lines.

bed channels that provide ideal spawning habitat.[130] The Vedder-Chilliwack River also marks the divide between the Fraser Valley Regional District, the City of Abbotsford, and the City of Chilliwack, all of which share a border along the river.

Additionally, this area is where the Stó:lo language, known as Halkomelem shifted from the Downriver dialect to the Upriver dialect.[131] Currently, the Stó:lo First Nation, a political amalgamation of various First Nations groups, has approximately 5,000 people who primarily live near the Fraser River between Mission and Hope.[132] Many of these nations have overlapping territories, however, only three of which will be discussed. On

130 Michael K. Rousseau, ed., "Lower Fraser River Region Landscapes," Chap. 1 in *Archaeology of the Lower Fraser River Region*, 1-12. (Burnaby: Simon Fraser University Department of Archaeology, SFU Faculty Publication, and Archaeology Press, 2017), 6-7.

131 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 22-23.

132 Menzies, *Traditional Ecological Knowledge and Natural Resource Management*, 111-112.

the north side of the Fraser River there was the Leqa:mel First Nation. Leqa:mel translates to the “level place” and was an important gathering place.[133] To the south of the Fraser River there were the Sumas (Sema:th) First Nation and the Chilliwack (Tselxweyeqw) First Nations. The Chilliwack First Nations migrated along the various rivers to the east of the current Vedder-Chilliwack River which is why Chilliwack translates to “going back upstream”[134], or “valley of many streams”[135]. In comparison, the Sumas, which translates to “level place lake”[136], resided to the west of the current Vedder-Chilliwack River both on and around the Sumas Lake, which is now known as the Sumas Prairies or Sumas Flats.

## Historical Harvesting Methods

Both the lake and rivers in the area provided habitat for various land-based and aquatic wildlife, most notable sturgeon, eulachon, and salmon. The First Nations in the area utilized various methods to catch these fish including, dip netting, raking, and weirs. Chiefly, the Stó:lo Nations utilized fish weirs to catch both salmon and sturgeon. There was a salmon weir located at Sweltzer Creek and the Tzeachten First Nation, who reside in Chilliwack near the Vedder River lived in ‘the place of the fish weir’[137] which was used to catch salmon. The 200 foot wide and 20 foot deep weir constructed by the Sumas First Nation at the mouth of Sumas Lake was primarily used to catch large sturgeon.[138] Dip nets could also be used at fishing weirs and traps as a way to selectively harvest fish from each trap.[139] At the confluence between the Vedder-Chilliwack, Sumas, and Fraser the Stó:lo established pit houses, resource settlements and camps[140] as well as a major intercommunity gathering town.[141]

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133 Ibid., 142.

134 Ibid., 25, 151.

135 British Columbia Geographical Names Office, “Chilliwack River,” *BC Geographical Names*, accessed February 1, 2018, https://apps.gov.bc.ca/pub/bcgnws/names/38642.html.

136 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 146.

137 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 198.

138 Archer, “Sumas Lake”.

139 Menzies, *Traditional Ecological Knowledge and Natural Resource Management*, 56.

140 The settlements and camps were used for catching sturgeon, salmon, and eulachon. Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas,* 25, 61.

141 Ibid., 25, 47, 61.

## Sumas Lake

Sumas Lake pre-reclamation. Image from, Unknown. “Sumas Lake, as seen from the B.C. Electric substation on Vedder Mountain, ca. 1916.” MSA Museum Archive.

During low water seasons Sumas Lake would average 3 metres in depth, 10 kilometres long, and 6 kilometres wide. The lake was unique in that it was subject to both tidal changes and to flood changes. During the annual freshet the Sumas River would reverse its flow as the Fraser River fed into the lake. This flooding increased the size and depth of the lake to 10 metres deep and a length that could span up to 25 kilometres.[142] It was during this time that the lake could cover 30,000 acres.[143] It is also why no maps have a consistent shape for the lake because the lakes shape and size were heavily dependent on the Fraser River. Additionally, the Fraser River would have eventually made the lake into land through the buildup of nutrient rich deposited sediment.[144]

As noted by Forman, wetlands, like those surrounding the Sumas Lake provide important habitat for a diverse range of plant and animal species.[145] This is supported by Carlson who notes that wetlands “help to sustain the earth’s biological diversity.... [and] vegetation all specially adapted to flood cycles, support and shelter a complex web of animal and insect life.”[146] This habitat could also support numerous species of fish including salmon. The British Columbia Institute of Technology Commons states that during the flooding

142 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 172.

143 British Columbia Institute of Technology, “1920-24: Sumas Lake was drained to create 30,000 acres of farmland,” *Commons: Explore the Fraser*, accessed October 28, 2017, https://commons.bcit.ca/explorethefraser/content/people_river/1920s_p1.html.

144 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 172.

145 Forman, Land Mosaics: *The Ecology of Landscapes and Regions*, 237-239.

146 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 172

season the Sumas Lake would support approximately “12,000 hectares of rearing habitat for juvenile salmon.”[147]

The lake was an integral part of the Sumas way of life. As Sumas Chief Silver states, “Basically ever[y] species of fish was there in the lake and it was our main fishing spot.”[148] The lake was also used as a respite from mosquitos that plagued the area. The Sumas understood that mosquitos would not fly into the middle of the lake so they established a village on stilts there known as Sali:ts[149]. This village was constructed of “quaint-looking scaffolding, scattered over the lake... [with] fleets of canoes...moored to the poles...”[150] However, post-contact settlers were less interested in responding to the environment and “sought to domesticate the lands they occupied.”[151] First, many rivers in Chilliwack were diverted into the main stem of the Vedder-Chilliwack River. Then talks began regarding what should be done about Sumas Lake.

In the 1800s wetlands were perceived as breeding grounds for mosquitos, vermin, and disease and were thought of as more of a nuisance than an important area to protect. Furthermore, the lake bottom was also considered to be ideal for farming with highly nutrient soils. Most importantly, the annual flooding was providing immense challenges to settlement around the lake. Anyone wanting to live in the area had to build on high ground or be subject to inundation. This was a particular problem for the railway which would become inaccessible during these floods. This also meant that the city of Chilliwack was stranded and unable to access important resources from Metro Vancouver. The lake was therefore seen as a deterrent for growth and development. It was with these perceptions in mind that talks about draining the lake began.[152]

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147 British Columbia Institute of Technology, “1920-24: Sumas Lake was drained to create 30,000 acres of farmland.”

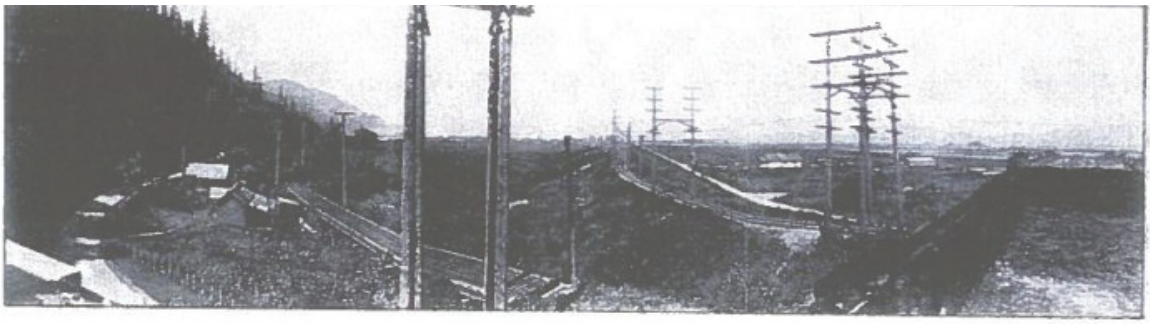
148 Kevin Mills, “Sumas First Nation explores compensation claim for loss of Sumas Lake,” *The Abbotsford News*, May 1, 2013, http://www.abbynews.com/news/sumas-first-nation-explores-compensation-claim-for-loss-of-sumas-lake/.

149 Sali:ts translates to houses on stilts. Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 146.

150 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 175.

151 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 106.

152 J.D. Archer, “Sumas Lake,” *Vancouver Traces*, accessed October 28, 2017, http://vancouvertraces.weebly.com/sumas-lake.html



Sumas Flats post-reclamation. Image from Unknown. “Sumas Prairie, also from the substation, ca. 1926.” MSA Museum Archive.

Finally, in 1924 engineers completed the channelization of the Vedder and Chilliwack rivers and dredged up Sumas Lake as part of the Sumas Reclamation Project.[153] As Carlson argues, “the draining of the lake can also be seen as the greatest single loss of a productive waterway in Solh Temexw [Stó:lo territory].”[154] When the lake was drained the already reduced Sumas territory was halved and the Sumas were forced to move to Kilgard[155] so that the land could be sold to farmers.[156] According to Sumas Elder Silver, “That’s when the sorrow and the heartbreak started.”[157] Above all, this reclamation project severely decreased the quantity and quality of spawning and rearing habitats for salmon and marked the start of continued intensive flood prevention measures.

## Flood Prevention

The two communities that border the Vedder-Chilliwack River near Sumas Mountain are called Barrowtown and Greendale. These two communities provide for much of the agricultural produce grown in the area. Both communities are also bisected by the main highway that connects British Columbia to the rest of Canada. Even after the Sumas Reclamation Project there have been several major floods that have inundated both

153 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 104-107; Archer, “Sumas Lake,”; and British Columbia Institute of Technology, “1920-24: Sumas Lake was drained to create 30,000 acres of farmland.”

154 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 104.

155 Kilgard translates to “fish heads sticking out” which is in reference to the sturgeon who died when the Sumas Lake was drained. British Columbia Institute of Technology, “1920-24: Sumas Lake was drained to create 30,000 acres of farmland.”

156 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada’s Pacific Coast History*, 178.

157 Emma Smith and Katelyn Verstraten, “Sumas First Nation seeks compensation for its lost lake,” *The Vancouver Sun*, May 6, 2013, http://www.vancouversun.com/life/sumas+first+nation+seeks+compensation+lost+lake/8307346/story.html.

communities and have threatened the highway. After each flood the current infrastructure is examined and usually increased to prevent further floods. This infrastructure includes setback dikes, relief wells, and pump stations that work in conjunction with annual channel dredging as a means to control the amount of water accessing these two communities. There are three pump stations straddling these communities along the dikes. The Collinson and McGillivray pump stations service the Greendale area, while the Barrowtown pump station services Barrowtown and is the primary station holding back the lake. Since 1924 pumps have been continually running to ensure that Sumas Lake does not return. At the time of its construction it was the largest pump in Canada.[158] In the 1980s the old pump was replaced by the current Barrowtown pump station, which is the "second-busiest pump station in North America."[159] [160] Currently, the McGillivray pump station is receiving upgrades in order to increase its pumping capacity.[161] This provides an opportunity for the thesis to utilize this station as a way to provide additional salmon habitat while also providing for moments of interaction between salmon and society.

Barrowtown Pump Station (left), Collinson Pump Station (center), McGillivray Pump Station (right).

## Salmon Preservation and Restoration

As mentioned previously, the historical legacy of development along the Vedder-Chilliwack River has led to reduced salmon returning to the river to spawn. There have been efforts to combat this through both habitat preservation and restoration projects. In particular, the Chilliwack-Vedder Canal is bookended by two such initiatives. The Great Blue Heron

158 British Columbia Institute of Technology, "1920-24: Sumas Lake was drained to create 30,000 acres of farmland."

159 Tyler Olsen, "Keeping the lake at bay in Abbotsford," *The Abbotsford News*, November 19, 2016, http://www.abbynews.com/news/keeping-the-lake-at-bay-in-abbotsford/.

160 The 1980 replacement was built by Van Construction, which included my Opa and his brothers.

161 City of Chilliwack, "McGillivray Pump Station Upgrade," *Bid/Tenders*, accessed January 20, 2018, https://www.chilliwack.com/main/page.cfm?id=400&whattoshow=opportunity&bidID=697.

Reserve is 325 acres located south of the Vedder Canal. It is located within the secondary dike system that the city of Chilliwack established. This reserve was created as a restoration measure and provides wetland habitat to various species including salmon. The reserve also includes trails that connect to the greater dike and Rotary Trail system in the area.[162] In this same stretch of the river there is a continuous effort to make room for the river and salmon by opening up the primary dike to allow for additional off-channel spawning habitat. The secondary dike, which is only located in this portion of the river, then becomes the primary dike for flood protection.[163]

As restoration efforts are ongoing there is also continued effort in ensuring that existing habitat remains preserved. The 606 hectare McGillivray Game Preserve, partially established in 1925, protects a portion of the un-diked riparian corridor and wetland habitat that straddles the conflux of the Fraser and Vedder-Chilliwack Rivers, and preserves a portion of the Fraser River. It too was established in order to protect a great blue heron colony, which subsequently migrated to the Great Blue Heron Reserve, but additionally provides for rearing habitat. It is also the "largest block of undyked riparian forest remaining under Provincial Crown ownership in the Lower Fraser Valley."[164] The site is subject to annual flooding both in the winter and during freshet due to its low elevation and its poor draining floodplain soils. The McGillivray Preserve is an excellent example of highly productive wetlands that do not require any management. This is aided by the vegetation that grows on the site which includes black cottonwood, willow, salmonberry, as well as reed and sedge grasses.[165]

Unlike, the Great Blue Heron Reserve, there are no managed trail systems on the Preserve, but recreational fishers still access the site. It is estimated that 10,000 angler days are spent annually along the shorelines of the preserve, most often on the Vedder-Chilliwack River. According to the established management plan "Provision of nature interpretation

162 Great Blue Heron Nature Reserve Society, "Great Blue Heron Nature Reserve," accessed October 28, 2017, http://chilliwackblueheron.com/.

163 Fraser Valley Watersheds Coalition, "2017 Peach Creek, Vedder River Salmon Habitat Restoration," accessed January 5, 2018, http://fvwc.ca/what-we-do/habitat-restoration-compensation/2017-peach-creek-vedder-river-salmon-restoration/.

164 British Columbia Ministry of Environment, "McGillivray Slough Wildlife Management Area: Management Plan," December 31, 1997, www.env.gov.bc.ca/bcparks/planning/mgmtpln s/bertBrink/bertBrink.pdf, 1.

165 Ibid., 1,5, 7-8.

opportunities is feasible along the Chilliwack dyke, which may provide the only practical or desirable location for any formal public viewing"[166] of the various flora and fauna. This edge, between the Preserve and existing agricultural land is therefore another ideal location to test the thesis.

Finally, while this preservation project is important, it is also under threat from industrial zoning to the east and from erosion due to dikes altering the river flow.[167] Additionally, the railway bisects the preserve limiting the flow between both portions of the wetland. These factors further the need for the establishment of additional protected habitat for salmon. By focusing on the area between the both the McGillivray Game Preserve and the Great Blue Heron Reserve this thesis will fill in a fragment of the unprotected riparian corridor along the river and provide additional wetland habitat.

Great Blue Heron Reserve (left) and McGillivray Game Preserve (right).

## Fishing and Recreation

An additional salmon preservation method that has been utilized extensively along the Vedder-Chilliwack River is the introduction of hatcheries. As already stated, these hatcheries mitigate the decreased salmon populations but weaken the overall species and ignore the greater problems at hand. However, they too provide a legacy along the river. The Chilliwack River Hatchery, which was established in 1981, produces coho and chinook[168] that can be harvested by commercial, First Nations, and recreational

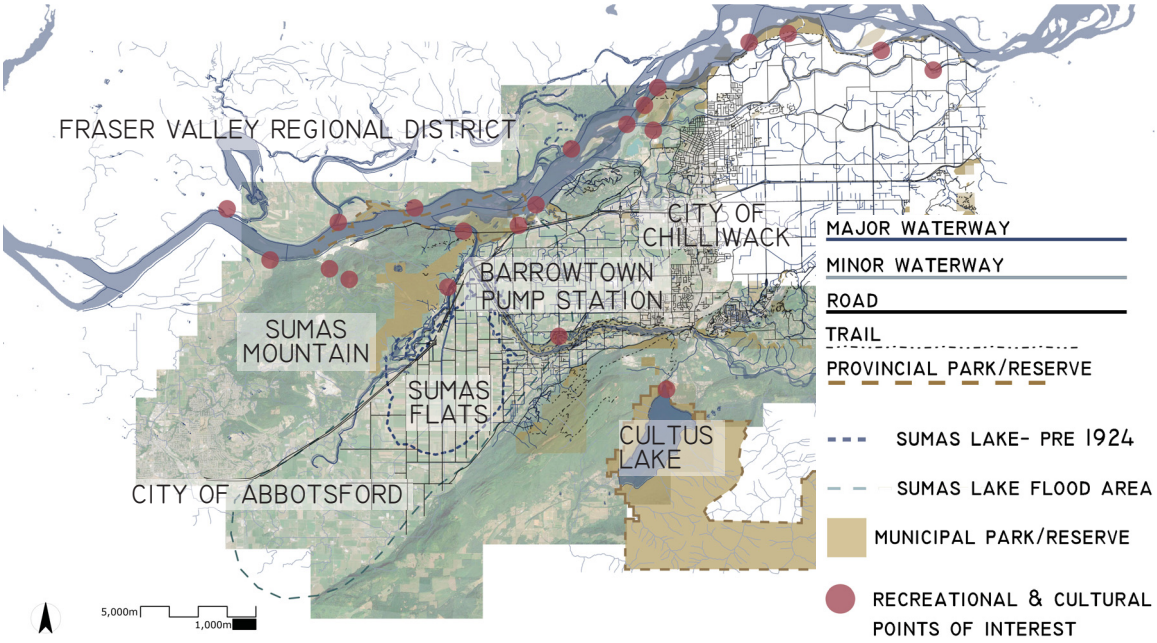
166 Ibid.,26.

167 Ibid.,1, 11.

168 Chinook are not a native salmon species to this river system. Without the hatchery the Chilliwack-Vedder run would not survive.

fisheries.[169] While the salmon are intended for everyone, after the Sumas Reclamation, "non-Aboriginal sports fishermen came to feel that the 'man-made' Chilliwack-Vedder river system was their exclusive domain."[170] It is still considered a largely recreational fishery.

Prior to the Sumas Reclamation, First Nations' salmon harvesting was severely hindered by government agencies. Traditional fishing practices were stopped when legislation was put in place that banned the weirs and other traditional harvesting methods both on Sumas Lake and in the surrounding area.[171] This included the removal of the sturgeon weir close to the Vedder-Chilliwack and Fraser River confluence. In recent years this has begun to change with environmentalists realizing the sustainable benefits to fish weirs. No weir has been re-constructed on the site as of today, but other traditional harvesting methods are slowly returning to the river. Thus the river can be both a recreational and a working river.




Map of the exisiting region and current recreational and cultural points of interest. Data extrapolated from Google Maps and Metro Vancouver, *Experience the Fraser: Lower Fraser River Corridor Project Concept Plan*. Gis & Map base image from Google Maps, British Columbia Regional Water Bodies and Water Lines, City of Chilliwack GIS Mapping, "Parks", "Park Trails Existing", "Roads", and "Watercourses"; City of Abbotsford, "Sumas Geomatics Data"; and Fraser Valley Regional District, "Regional Data.".

169 Fisheries and Oceans Canada, "Chilliwack River Hatchery," Major SEP Projects, accessed February 3, 2018, http://www.pac.dfo-mpo.gc.ca/sep-pmvs/projects-projets/chilliwack/chilliwack-eng.html.

170 Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas*, 106.

171 Carlson and Stó:lo Heritage Trust, *You Are Asked to Witness: The Stó:lo in Canada's Pacific Coast History*, 177.

At the same time, there is also a conscious effort being made to re-establish a societal connection to the entire Fraser River watershed. The current joint venture between districts has resulted in the recreational, cultural, and heritage initiative project that hopes to “connect communities and the places where Fraser River themes and stories can be experienced from canyon to coast.”[172] While this project focuses primarily on the Fraser River, the Vedder Canal and Sumas Mountain were also included within the scope of the plan. As noted in the plan, “Sumas Mountain is a dominant and unique landscape feature in the Fraser Valley... It holds special significance to First Nations, is popular with trail users and has high conservation values.”[173] One of the points of interest along this project includes the Barrowtown Pump-Station and the area surrounding it.[174] Thus this thesis can tie into the existing recreational and trail networks within the area and provide examples of sustainable harvesting practices.

172 Metro Vancouver, Experience the Fraser: Lower Fraser River Corridor Project Concept Plan, Parks Publications, accessed October 20, 2017, http://www.metrovancouver.org/services/parks/ParksPublications/ETFDraftConceptPlan.pdf, 9.

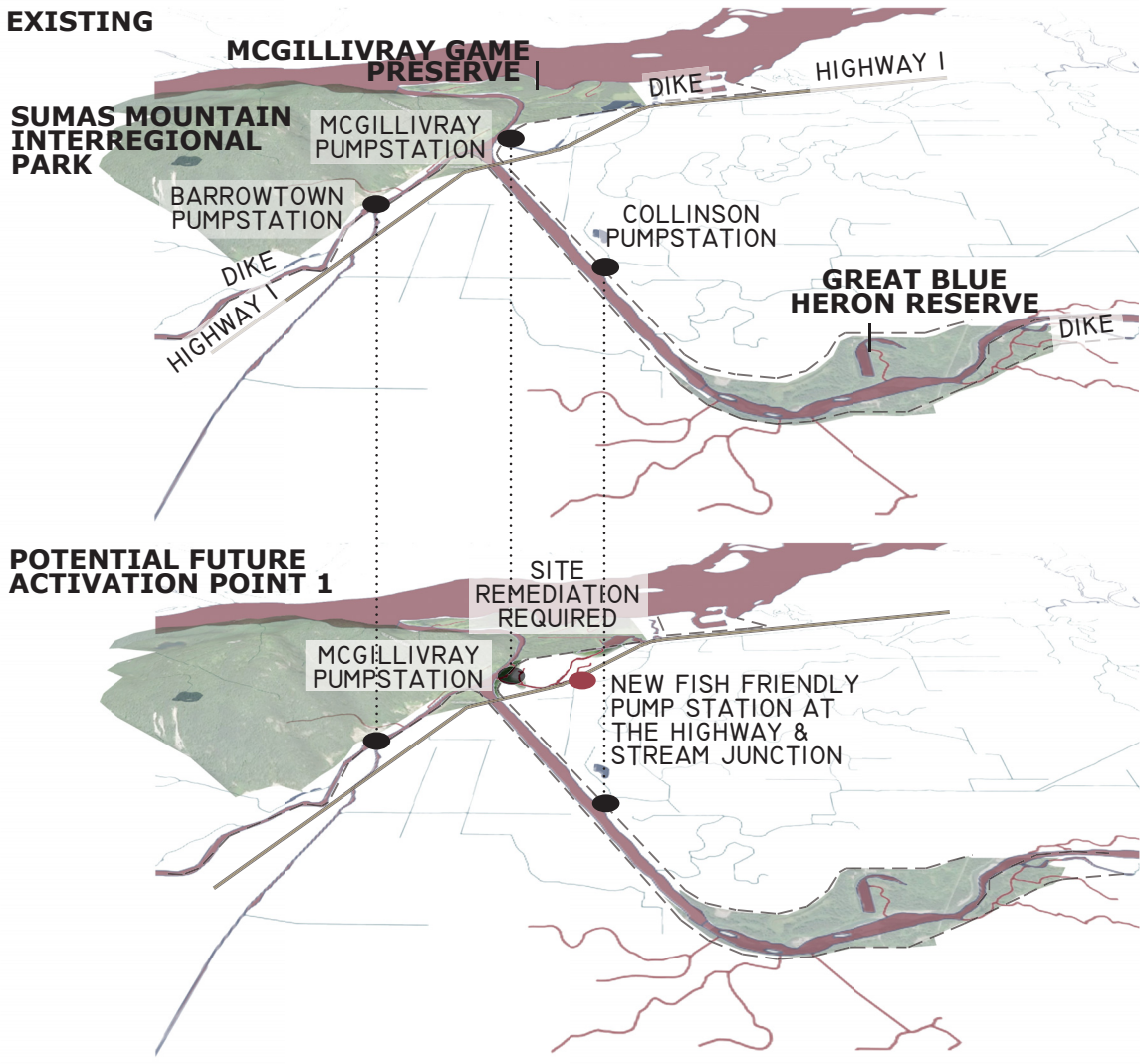
173 Ibid., 32.

174 Ibid., 38.

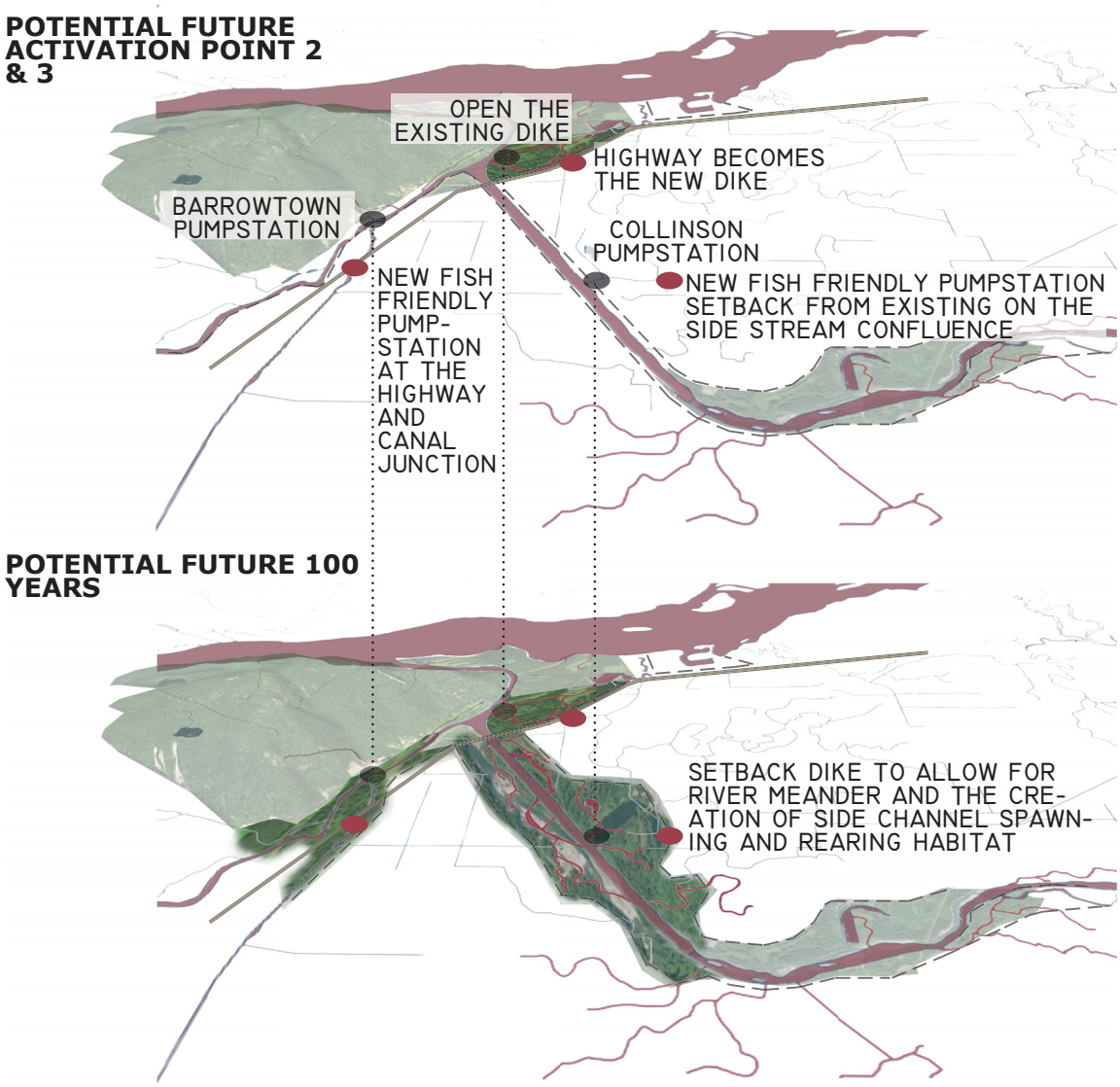
# CHAPTER 8: DESIGN

In establishing a site responsive design both the mapping analysis and relationship diagrams, shown previously, were used to inform the design process. These relationships include, the relationship between salmon and their ideal habitat conditions at each river-based life stage, the relationship between humans and how they acquire knowledge, as well as potential relationships between salmon, humans, and habitat.

## Designing for the Future




Vedder-Chilliwack tributary scale phasing of the existing flood infrastructure: Existing and activation point 1. Gis & Map base image from Google Maps, British Columbia Regional Water Bodies and Water Lines, City of Chilliwack GIS Mapping, City of Abbotsford, “Sumas Geomatics Data”; and Fraser Valley Regional District, “Regional Data.”




Vedder-Chilliwack tributary scale phasing of the existing flood infrastructure: Activation point 2 and 3 and 100 years. Gis & Map base image from Google Maps, British Columbia Regional Water Bodies and Water Lines. City of Chilliwack GIS Mapping, City of Abbotsford, “Sumas Geomatics Data”; and Fraser Valley Regional District, “Regional Data.”

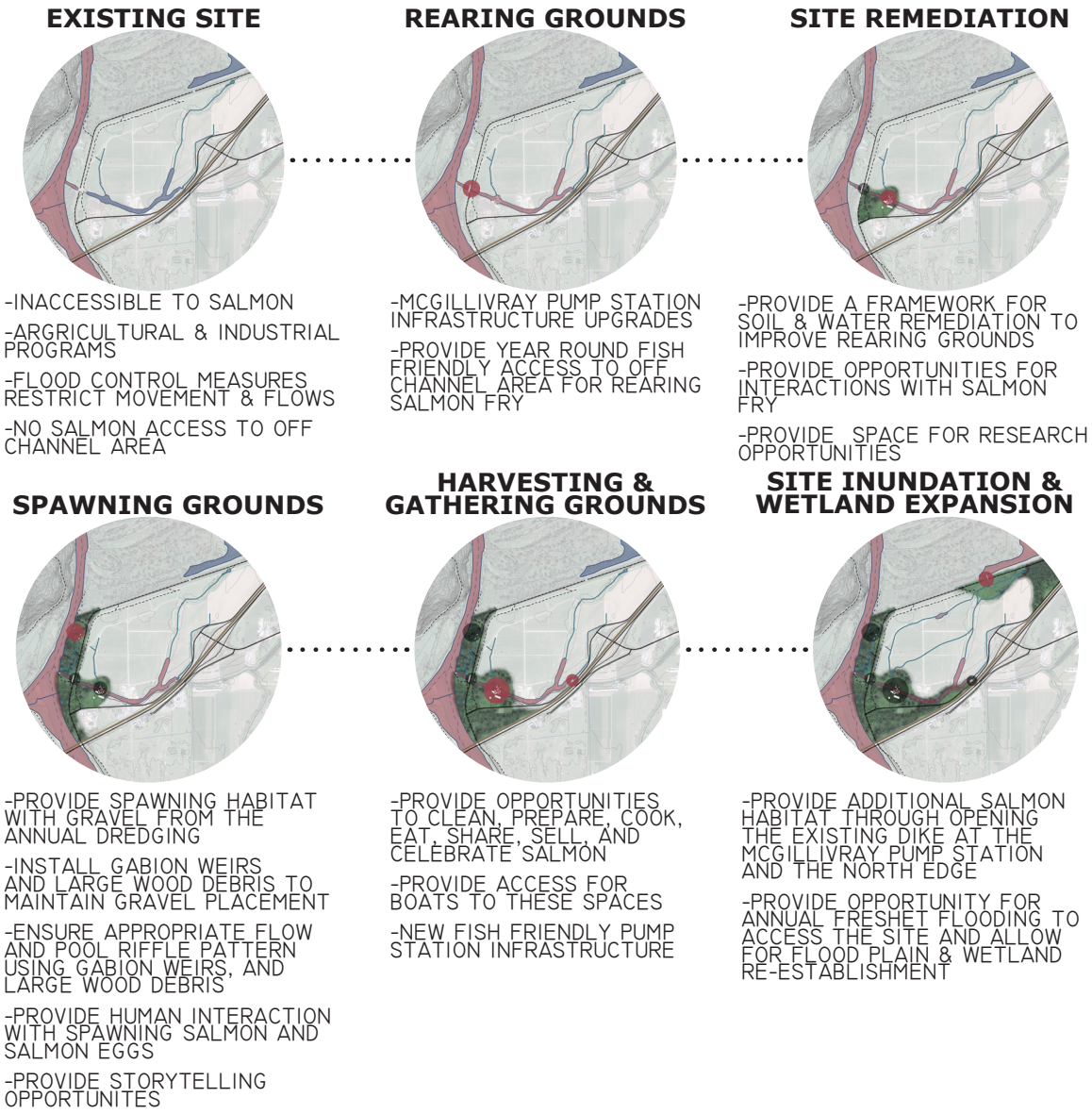
Having grown up fishing on the rivers in British Columbia I have seen firsthand the impacts that development, industry, and agriculture place upon salmon. This is particularly evident along the Vedder-Chilliwack River. Just like with the entire Lower Fraser, forestry practices, gravel mining, agriculture and, flood control have affected salmon and their habitat. However, as noted previously, the most devastating was the loss of 12,000 hectares of habitat when the Sumas Lake was dredged and drained in 1924 to make way for agricultural land[175]. All of these factors have created an environment not suitable for

175 British Columbia Institute of Technology, “1920-24: Sumas Lake was drained to create 30,000 acres of farmland.”

salmon. While wild salmon still access the river, their numbers are decreasing and are heavily supplemented by hatchery salmon. Therefore, the relationship between salmon and their habitat helped to identify the need for providing habitat for all in-river salmon life stages in this area. This was done through designing for a potential future and considering what could be in 100 years and working backwards from that time. This future includes a continuous riparian corridor that connects the McGillivray Game Preserve and Sumas Mountain Park at the Fraser-Vedder-Chilliwack confluence with the Great Blue Heron Reserve upriver from the Vedder canal. This corridor creates additional salmon habitat and recreational common space by activating the existing flood control measures, specifically the 3 pump stations that service the surrounding area, and by creating a new setback dike. In this way the river is given the opportunity to restore itself, thus providing more space for salmon and humans to interact in a sustainable way.

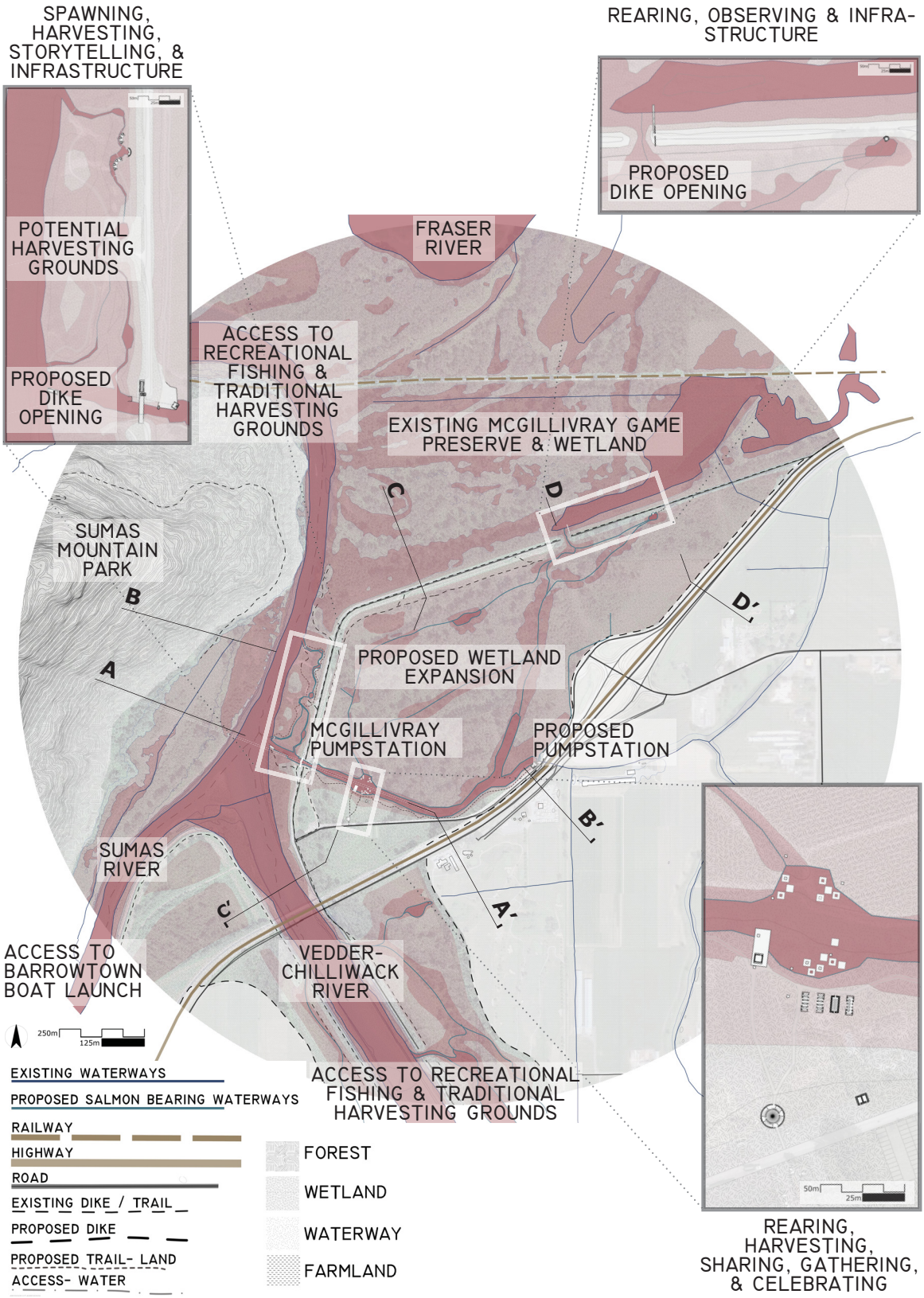
Looking closer at the 100 year stage and the area between the highway and the McGillivray Game Reserve the proposed methodology can be utilized more in depth to establish a salmon eco-park and knowledge collective that connects salmon and people through the use of areas of engagement in salmon habitat, or specific micro climates, that are situated along select ecological edges. These areas of engagement also connect to the greater trail networks in the surrounding region, including those that lead to salmon fishing and harvesting grounds along the main flow of the river. None of this would be possible however, without first opening up the McGillivray pump station and dike network to allow fish to access the site.

Currently the McGillivray pump station requires upgrades and these upgrades could include fish friendly accessible flood infrastructure which allows for additional off-channel rearing habitat. At this point a framework for soil remediation can be initiated. The next phase would include the introduction of additional spawning habitat through the creation of additional side channel gravel beds. Following this the design can provide a framework for opportunities for traditional harvesting practices and to improve access to existing fishing grounds. This includes access to places where salmon can be cleaned, prepared, cooked, eaten, shared, and sold on site. Finally, the opening up of the existing dike, the creation of a new fish friendly pump station, and the use of the highway as the new setback dike provide for additional boat access and allows annual freshet flooding to access the site

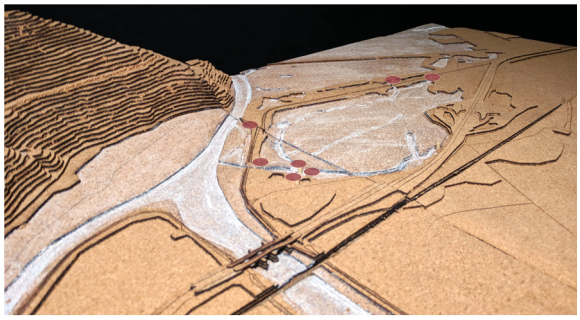


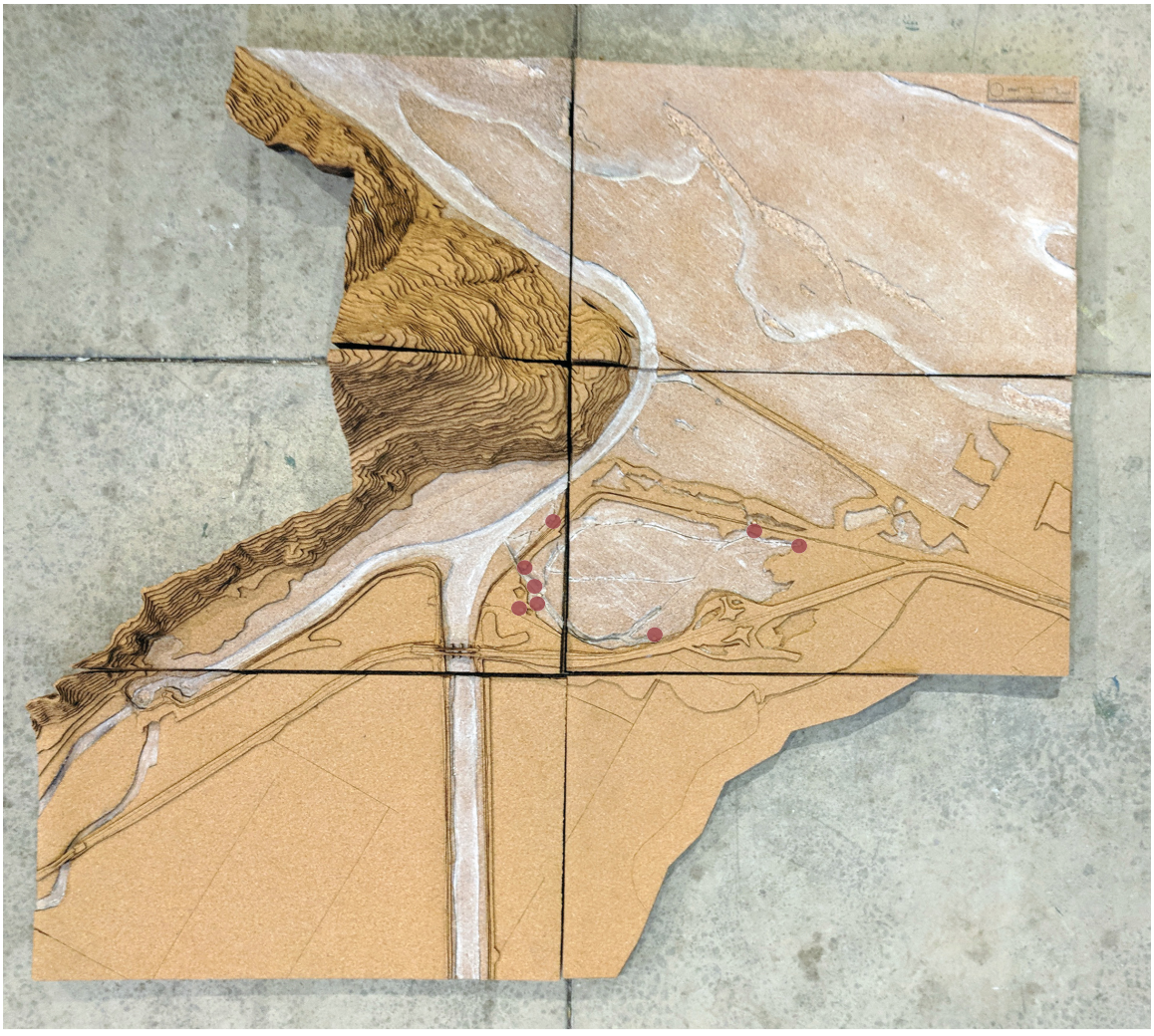

Site scale phasing diagrams. Gis & Map base image from Google Maps, British Columbia Regional Water Bodies and Water Lines., City of Chilliwack GIS Mapping, City of Abbotsford, “Sumas Geomatics Data”; and Fraser Valley Regional District, “Regional Data.”

for flood plain and wetland re-establishment. From this point the areas selected can then address salmon harvesting, including access to fishing sites, as well as access to post-catch opportunities. Most importantly, each area can address salmon and their habitat at specific stages of in-river life.




Site plan and areas of interest: 100 year phase. Gis & Map base image from Google Maps, British Columbia Regional Water Bodies and Water Lines., City of Chilliwack GIS Mapping, City of Abbotsford, “Sumas Geomatics Data”; and Fraser Valley Regional District, “Regional Data.”





Site model showing the proposed sites along the edges and their relation to the rivers, dikes, and mountain.

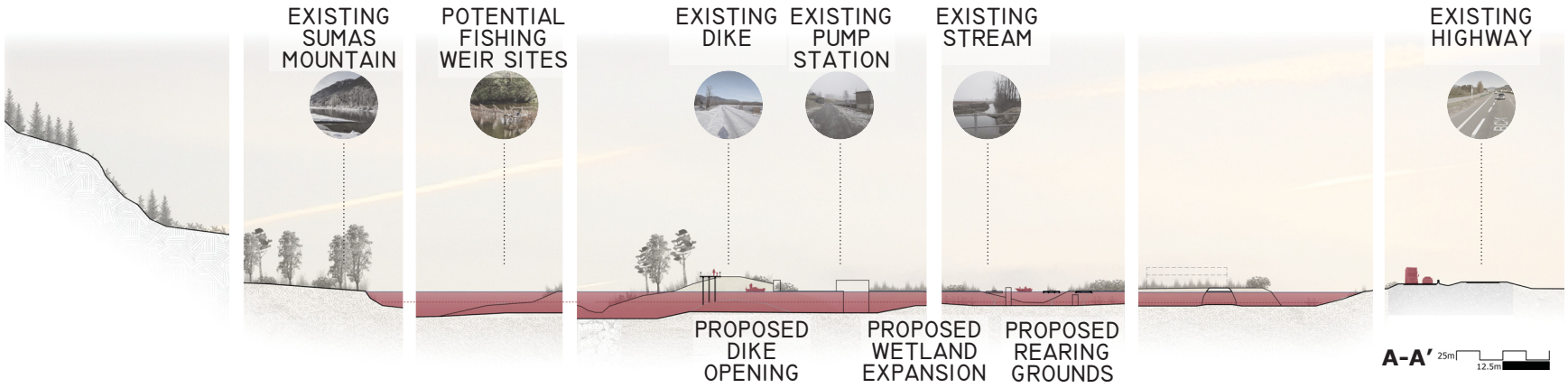
## Rearing and Observing Site


Area of interest and micro-site plan of the rearing and observing grounds.

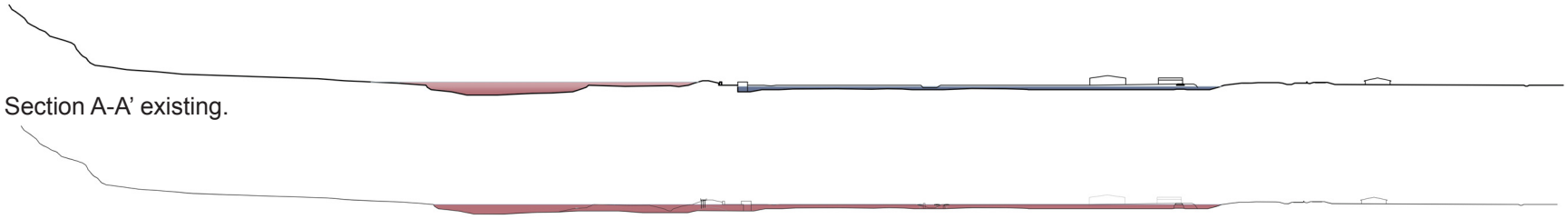
The need for salmon rearing grounds was examined first because additional spawning grounds are currently being restored upriver. This bio-habitat specifically addresses the issue of waterways at risk, zones of sensitivity, and limited access to habitat as part of the rearing and observing micro-environment. As Montgomery notes, salmon are very resilient and will rapidly colonize new habitat if given the opportunity.[176] While this is important, this wetland rearing habitat still requires phytoremediation due to the legacy that the agricultural and industrial programing has left on the soils. This remediation through a floating wetland system also provides protection from predation, habitat for salmon prey, and water temperature regulation. Additionally it creates a new form of interaction between humans and salmon during spring and freshet where children and adults can see salmon fry in their natural habitat just as I experienced while playing in the side channel pools and back-eddies as a child. This is in contrast to the current hatchery based experience where children see salmon fry in large holding tanks.

This type of remediation system can also be used as a testing ground for future remediation projects along the river. Dependent on the levels of soil and water remediation required the

176 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 230.

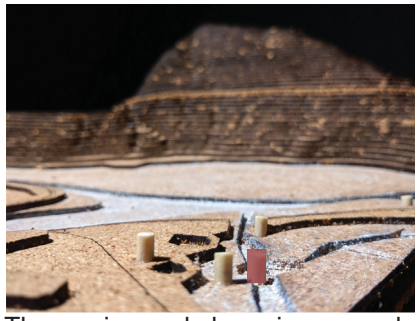



Section A-A' proposed landscape section details showing the relationship between the rearing micro-site, the highway, the dike, the river, and the mountain. Images from Google Street View and Callegari, "Building Koeye Weir."



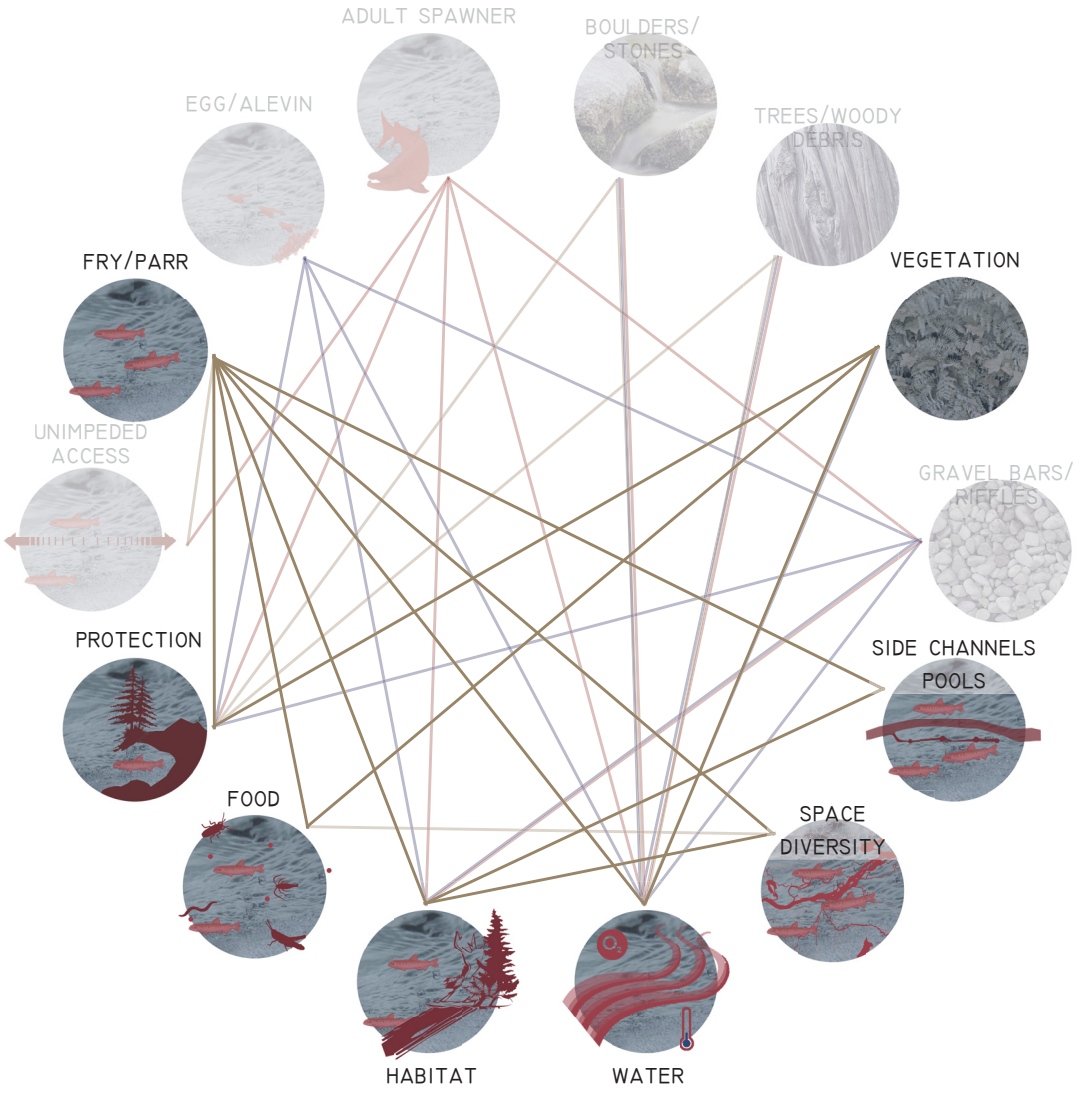
Section A-A' existing.

Section A-A' proposed.

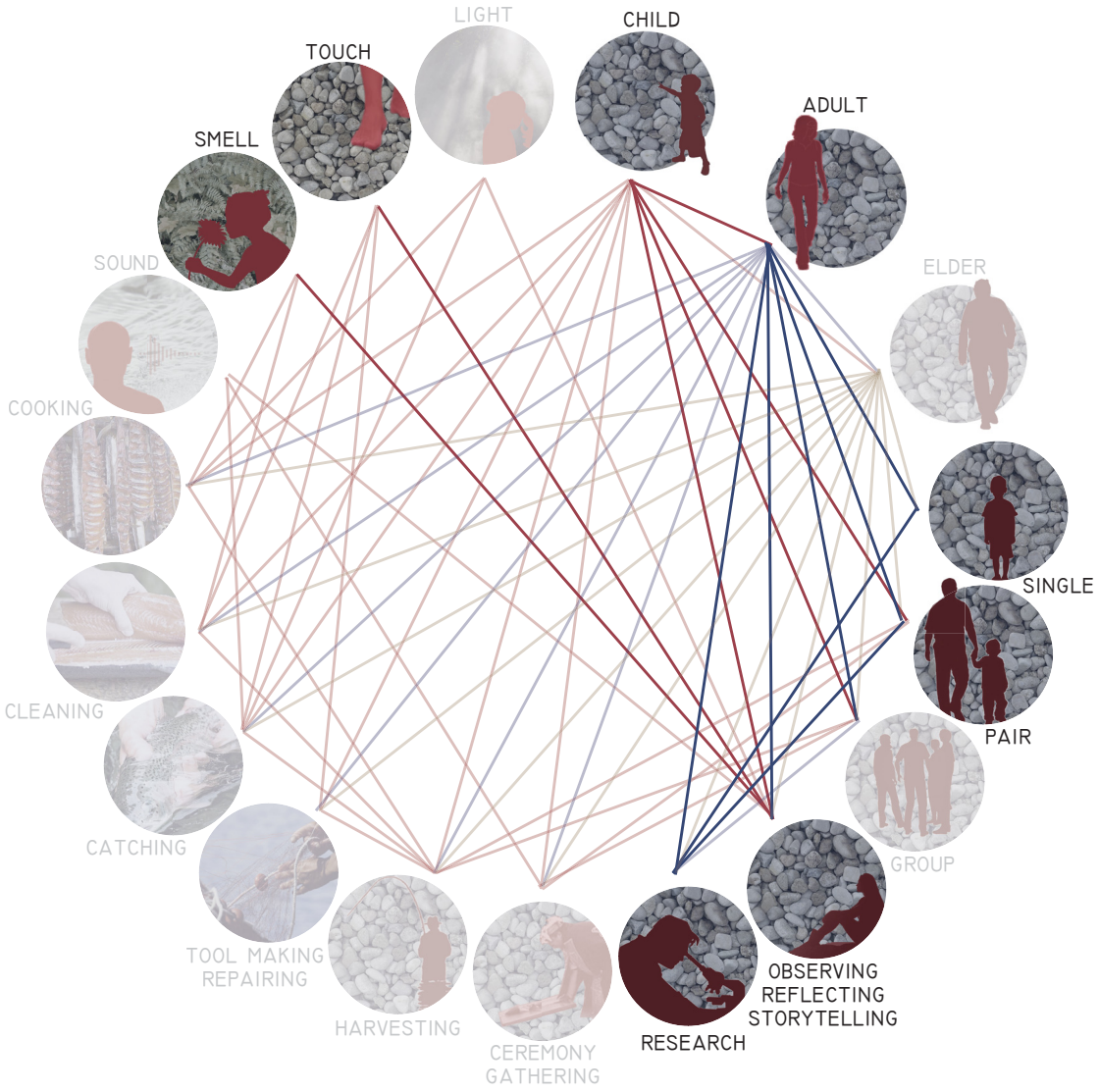


The rearing and observing grounds in context.

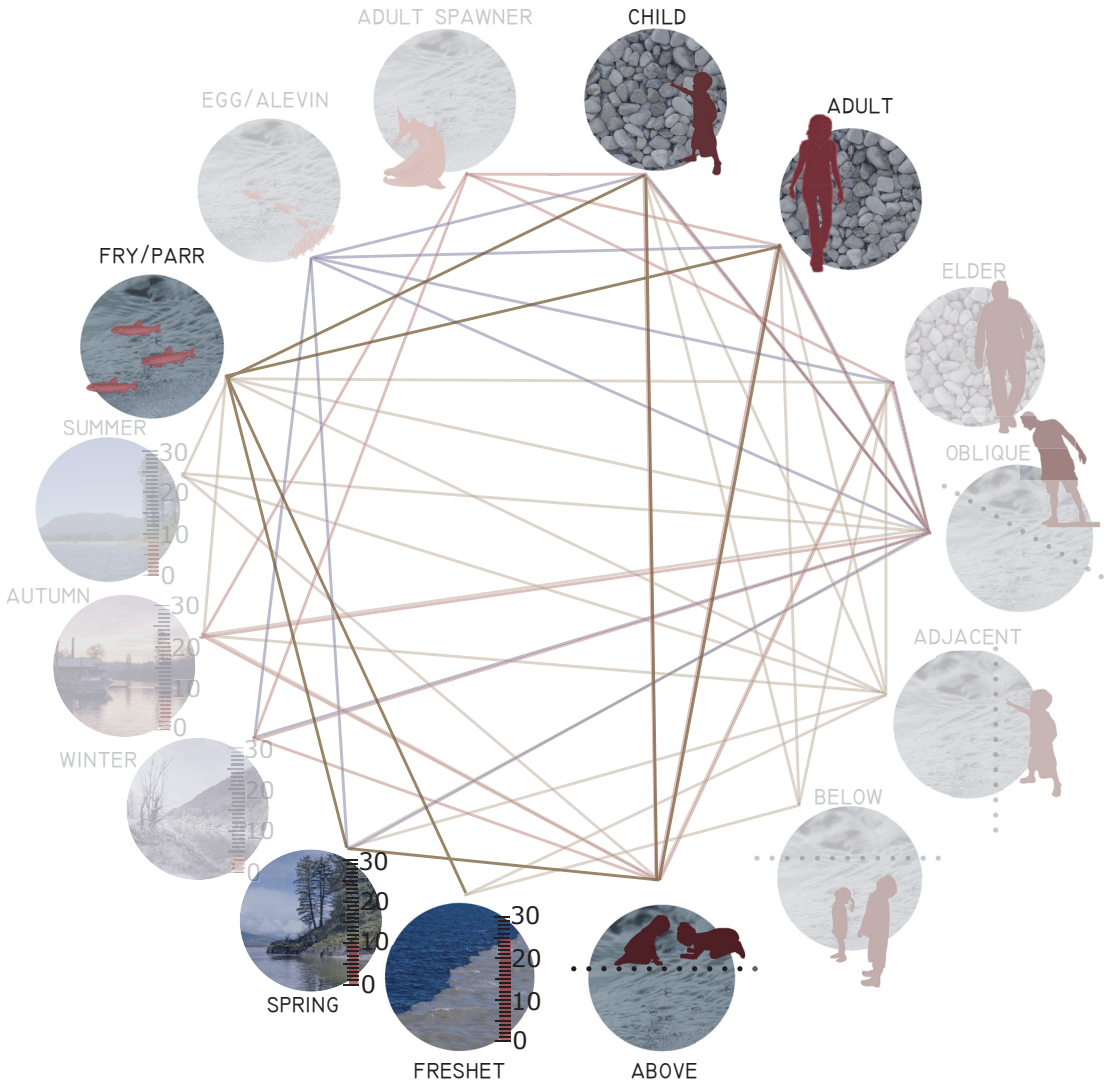
number of these floating constructed wetland docks can be adjusted. By grouping these docks and placing them in ideal salmon schooling locations it ensures that salmon fry schools receive optimal protection. The use of the gabions also allows for vegetation re-establishment and places for salmon to congregate. Furthermore, additional native shore plants, including cottonwoods, willows, and various grasses and brush, can be planted in order to increase and expedite the remediation process if needed.



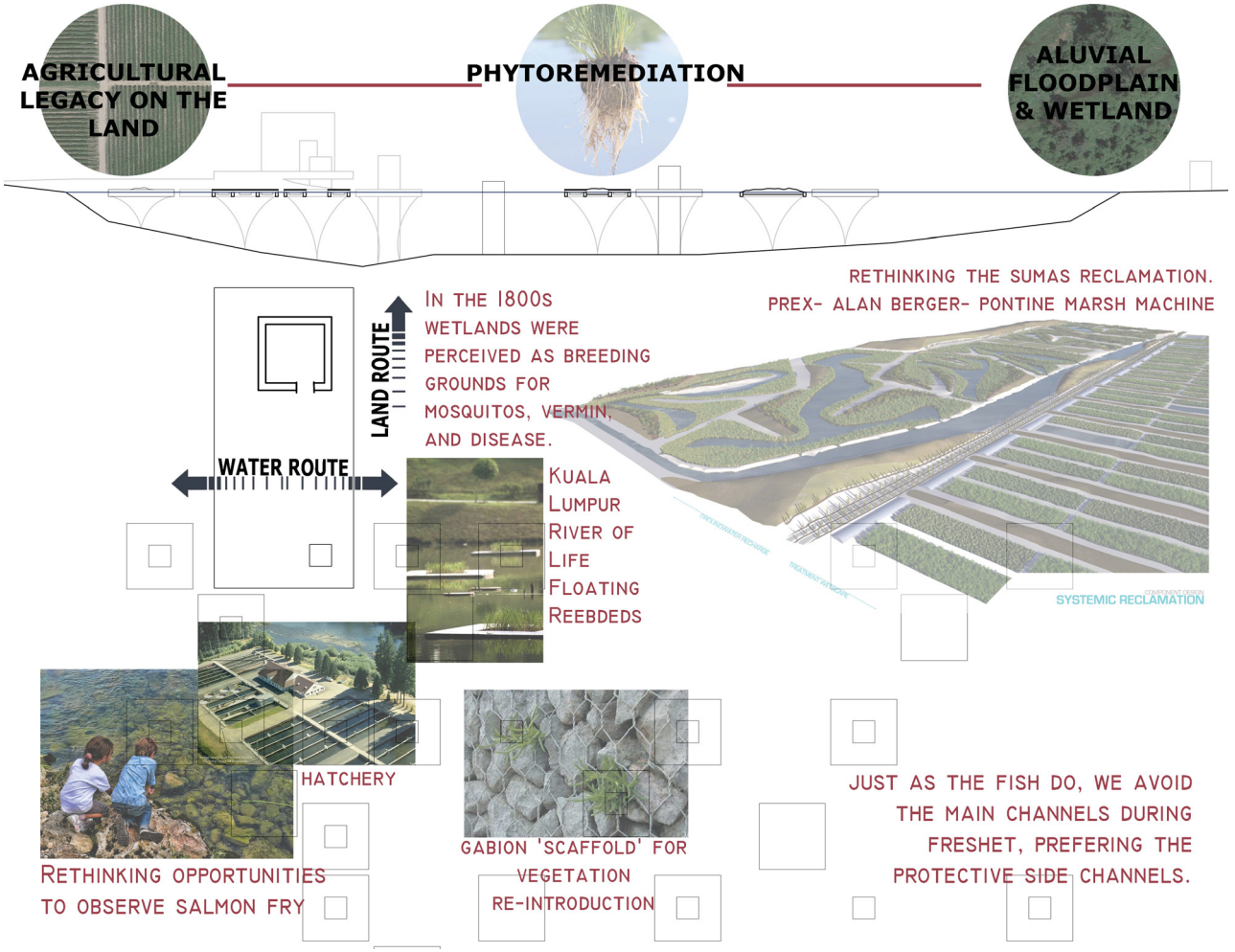

Proposed rearing ground salmon and habitat relationships.



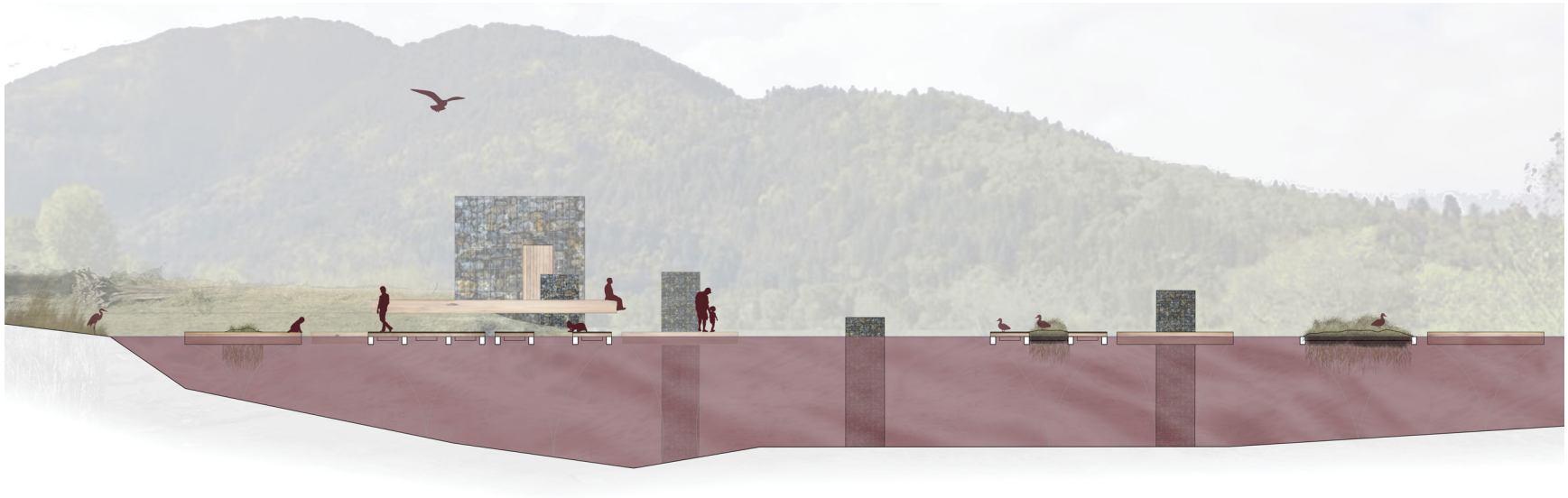

Proposed forms of knowledge acquisition in the rearing grounds.



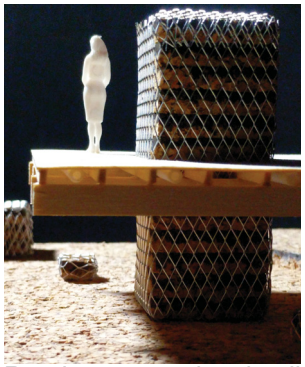

Proposed salmon, human, and habitat relationship opportunities.




Narrative description of the proposed rearing grounds. Images from Berger, *Systematic Design Can Change the World;* Cumbrianwa, “Atlantic Salmon Spawning Again In River Lyvennet”; AquaBiofilter, “Kuala Lumpur River of Life (RoL)”; Portland District- US Army Corps of Engineers, “Monterey Bay Hatcheries.”; Waterclean Technologies, “Symbiotic Relationship”; and Urban Habitat, “Gabion vegetation”.

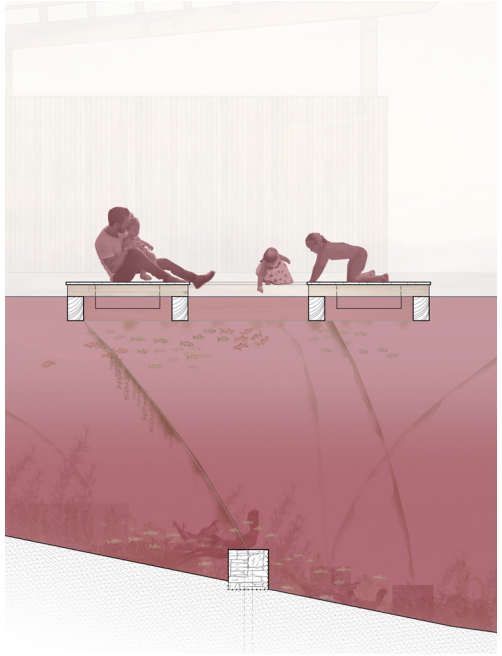


Rearing grounds preliminary section.



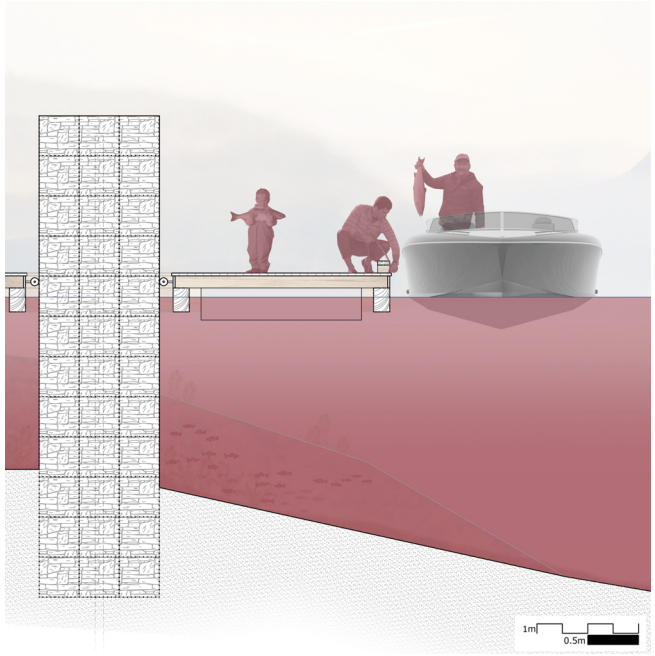
Rearing grounds detail model.

THE CHILD



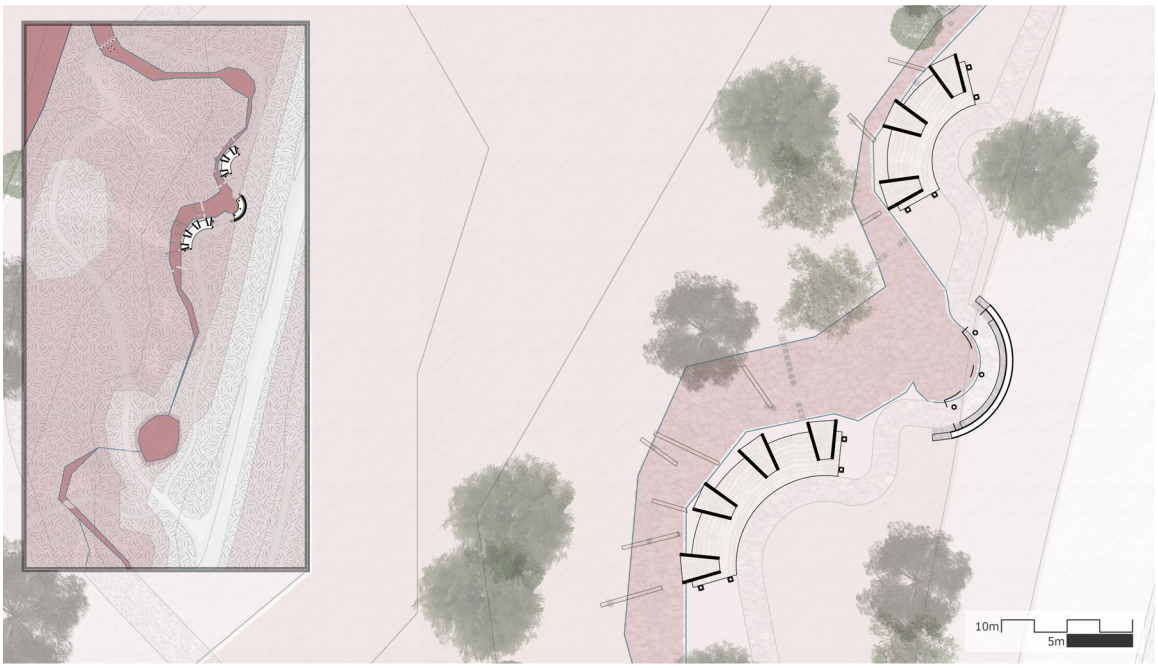
THE RESEARCHER

THE HARVESTER




Detail sections of the rearing grounds. Boat image from Brooklin Boat Yard, “60ft-Sport Boat Front View-R11.”

## Spawning and Storytelling Site

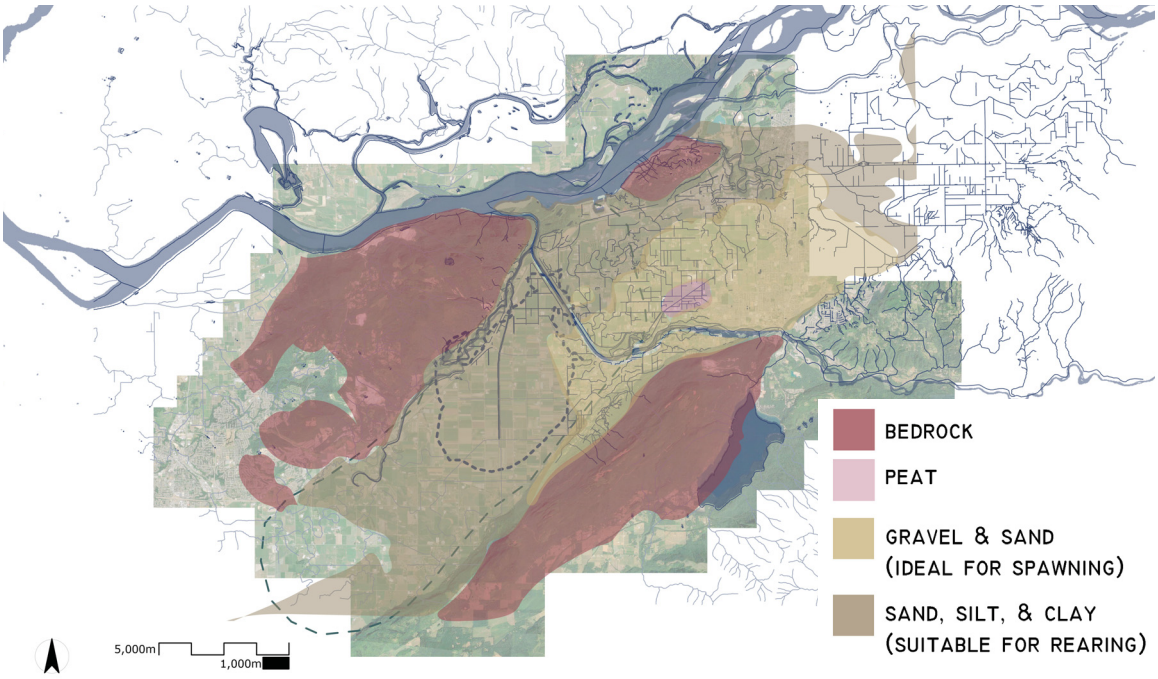



Area of interest and bio-habitat plan of the spawning and storytelling grounds.

While spawning grounds are currently being restored upriver, the spawning and storytelling micro-site addresses the need for additional spawning grounds that were lost after the Sumas Lake was drained and the rivers in Chilliwack were diverted. Currently the site has clay and silt soil types due to existing flood control measures. This is not suitable for spawning salmon. However, during each spring freshet or flood, the Vedder-Chilliwack River deposits large amounts of gravel in the Vedder Canal which is then dredged as part of the flood control practices. This dredged gravel could be utilized at the site and kept in place through the use of gabions and large wood debris to provide for suitable spawning habitat during the fall.

The gravel used aerates water, filters sediment, and protects salmon eggs from predators. Salmon are at their most venerable when they are eggs. Any gravel movement can destroy the eggs or leave them exposed to sediment deposits which choke them. By using sensorial clues we can provide awareness of salmon spawning grounds without subsequently disturbing the gravel through physical access to these areas.

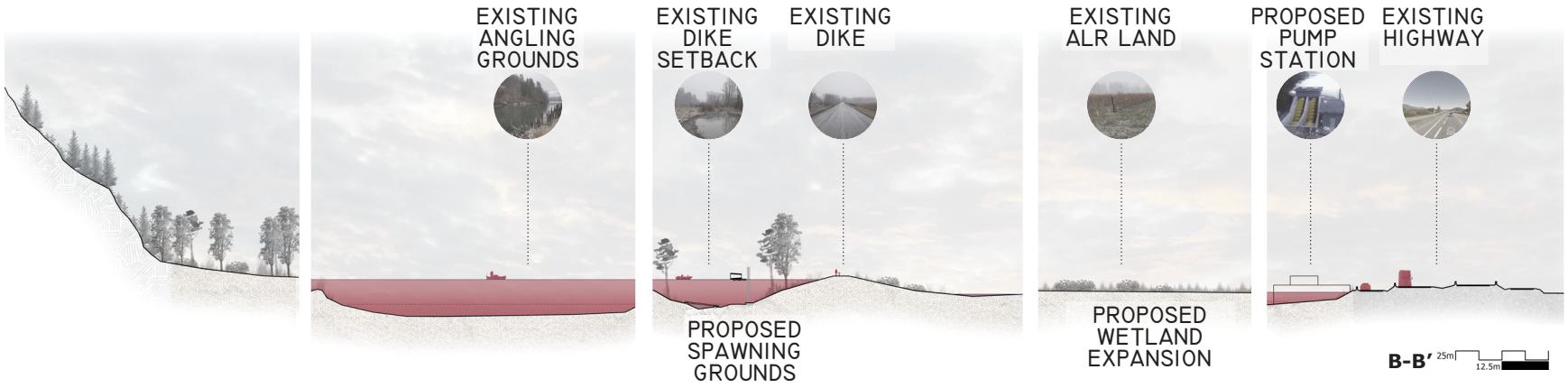
One of the strongest memories I have is the sounds of the river during spawning season. By placing small storytelling pods along the spawning grounds children and elders can




Chilliwack-Vedder River geology. Data extrapolated from Canadian Geoscience Education Network, “Vancouver-Geomap.” Gis & Map base image from Google Maps and British Columbia Regional Water Bodies and Water Lines.

experience the sounds of salmon splashing while they spawn. Additionally, placing the same spawning bed gravels along the path adjacent to these grounds creates a touch and sound connection to the river. Then during the winter and spring flood the pods can float which allow for a different relationship to the river and the salmon eggs that are in the gravel beds. In the same site there is also a larger storytelling chamber embedded within the dike which can be used for larger groups interested in visiting the site during spawning season. Unlike the pods, this chamber is inaccessible during flooding.

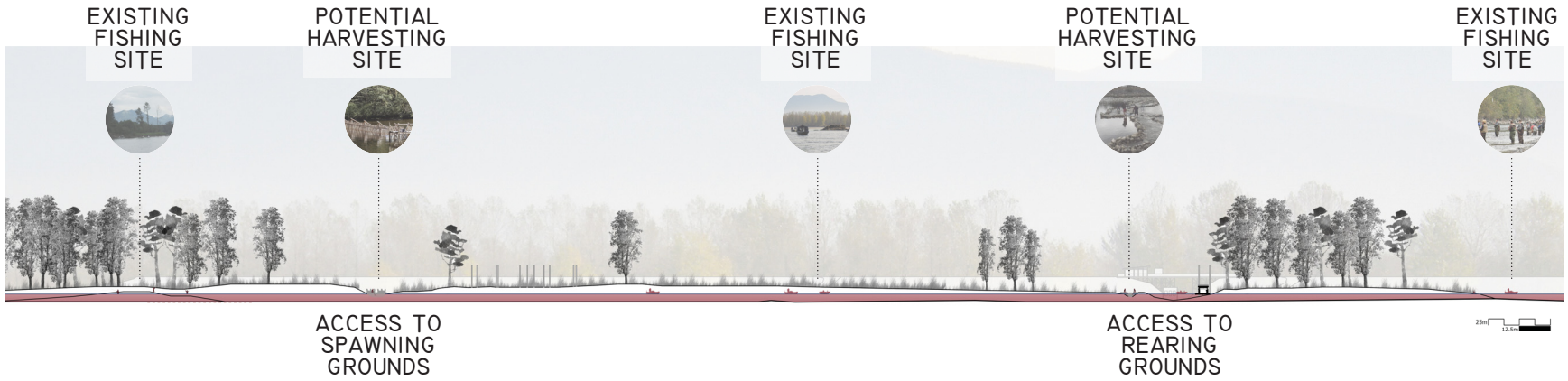
Similar to the Great Blue Heron Reserve, if there is ever a need for additional salmon habitat protection during select seasons, the existing dike entry control gates and signage can be utilized to stop people from accessing the site. Additionally, while only seven pods have been proposed for this particular site, these pods or similar designs can be utilized at other spawning sites all along the river, this would ensure that there are not too many people accessing and overwhelming this one site as the number of interested viewers could be spread out over many sites. This is in keeping with current measures that promote many different salmon viewing locations to anyone interested.




Section B-B' proposed landscape section details showing the relationship between the spawning bio-habitat, the highway, the dike, the river, and the mountain. Images from Google Street View and CTQ Consultants Ltd, "Harrison Hot Springs Screw Pump Flood Control."

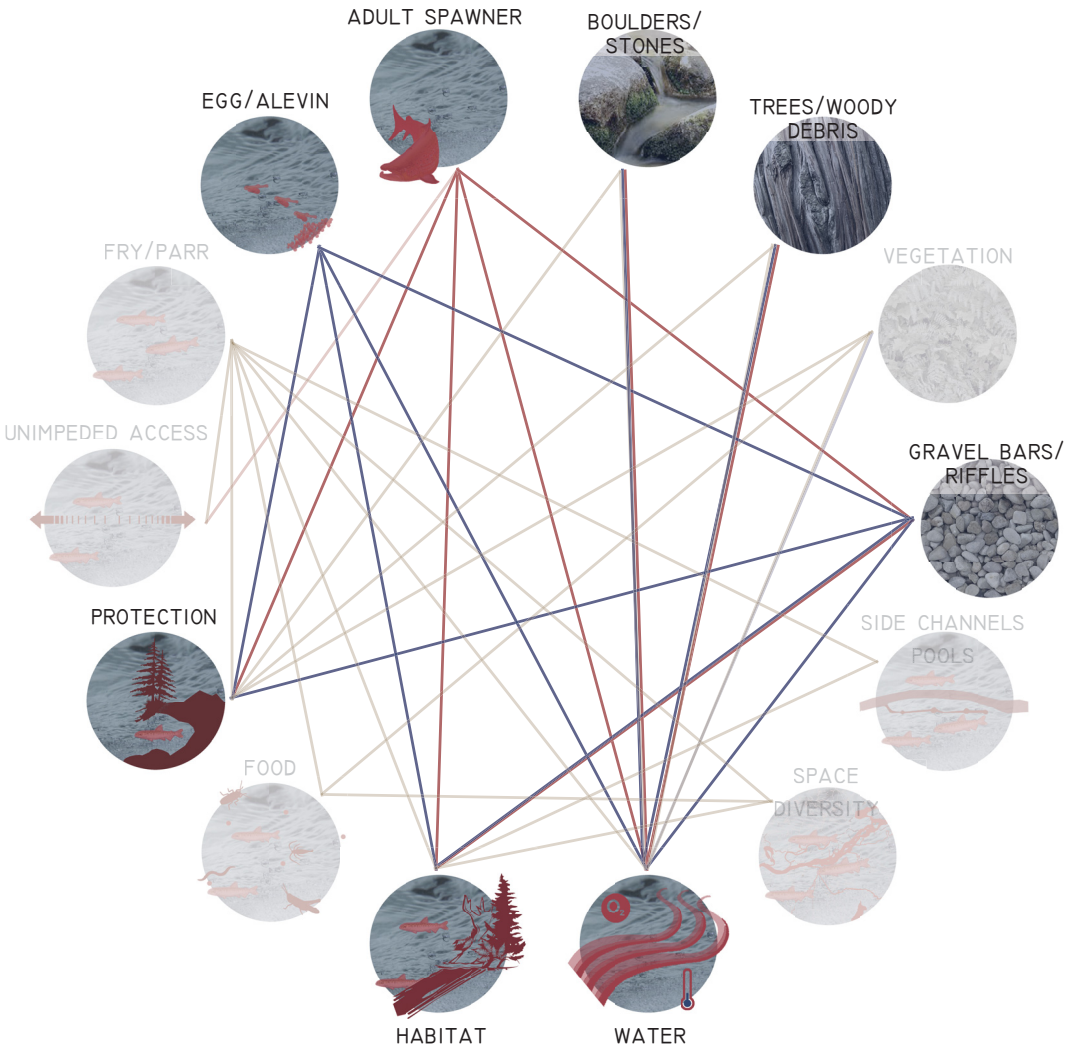
Section B-B' existing.

Section B-B' proposed.

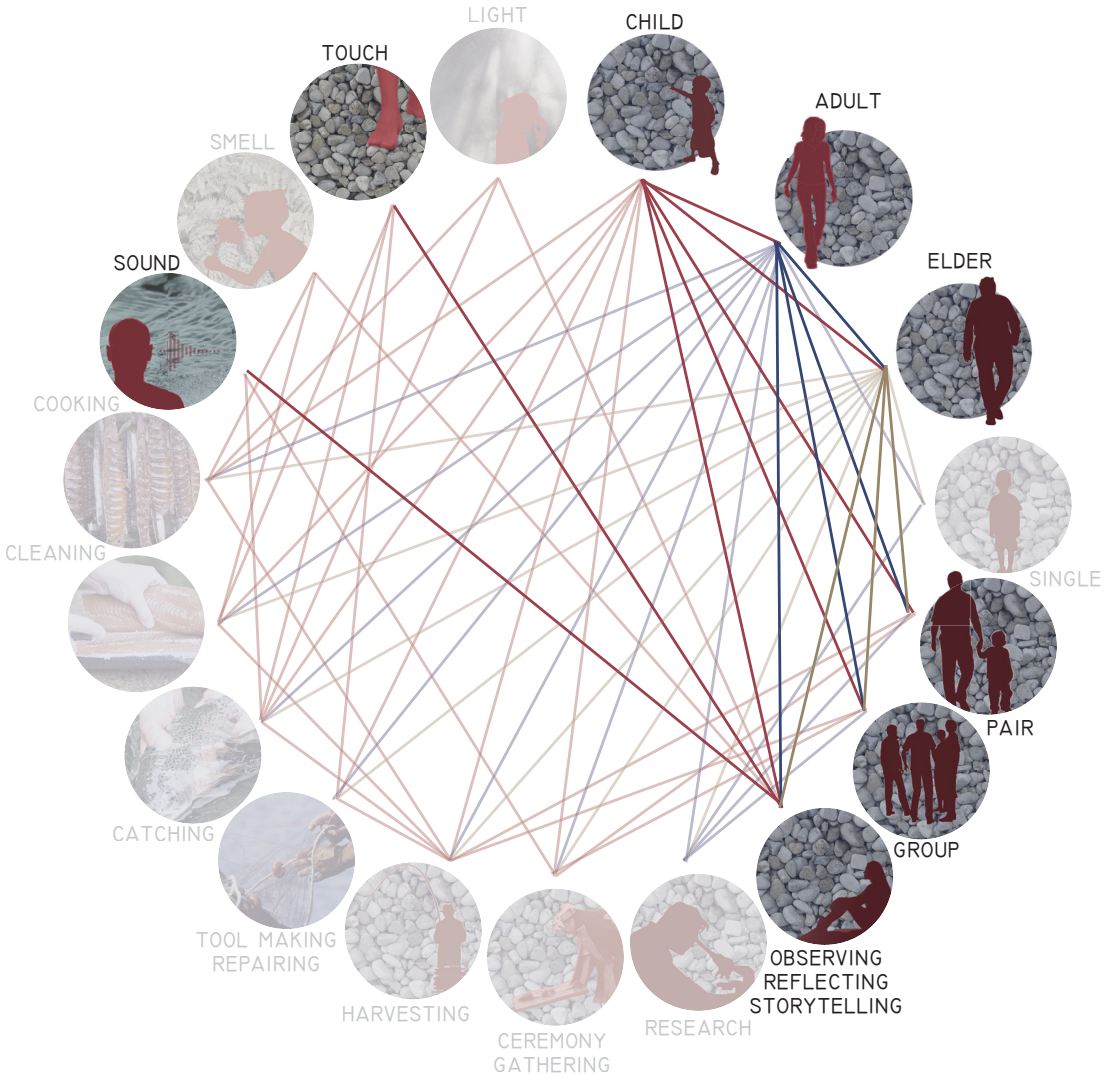



Section through Vedder-Chilliwack river showing the existing fishing sites and the potential harvesting, spawning, and rearing grounds. Images from Google Street View and Callegari, “Building Koeye Weir”;  Unknown, “Members of the Squamish First Nation catch fish on the Capilano River” and “Crowded fishing spot at Chilliwack River.”

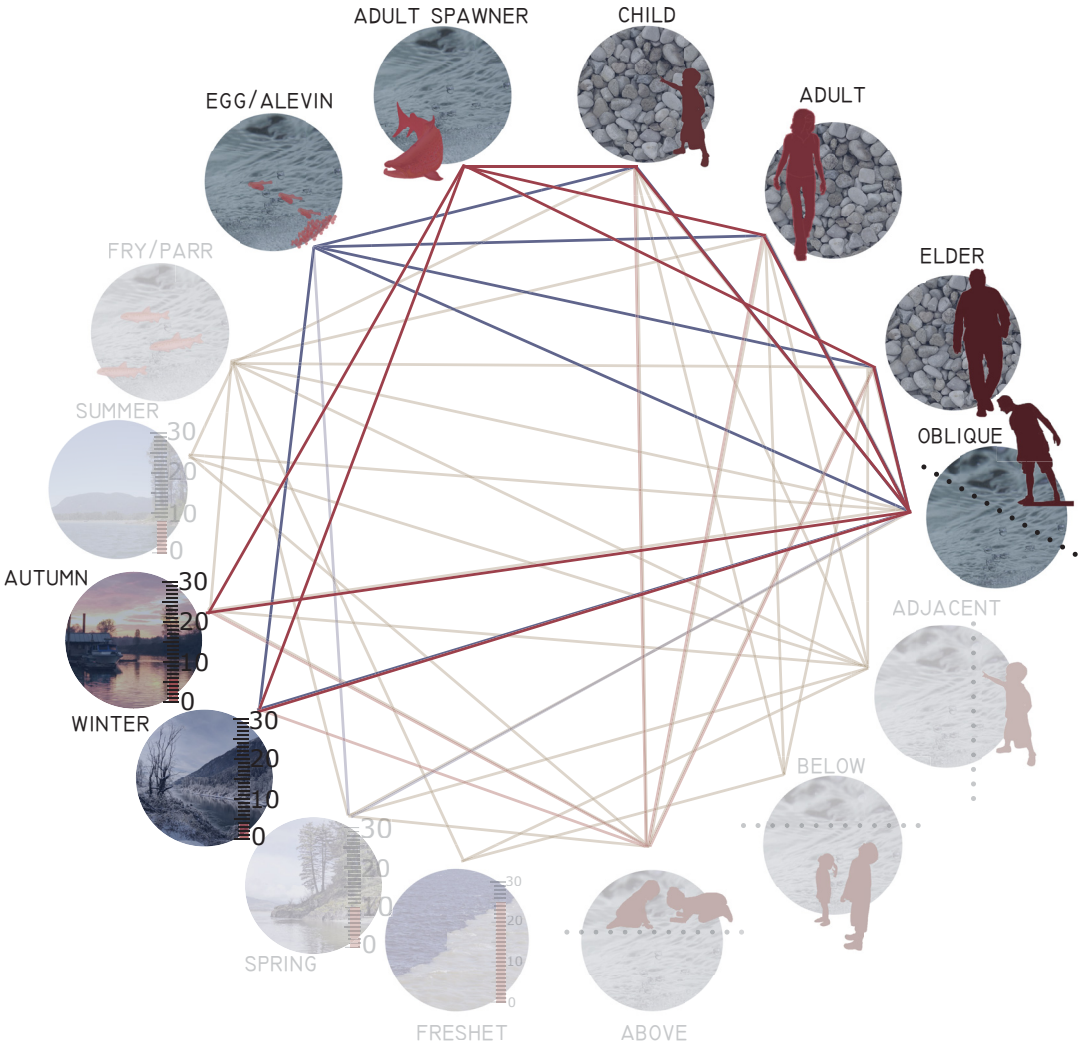
From the spawning grounds one can continue on to the harvesting or fishing grounds along the banks of the river, which are activated during the fall salmon runs, but are also used yearly for other types of fishing and angling. In addition to the existing recreational fishing grounds in the area, it is in these grounds that the Stó:lo can re-establish their traditional fishing methods which can be used for harvesting, salmon counting and research, as well as educational purposes. Thus the river becomes an example of various salmon harvesting and fishing methods.



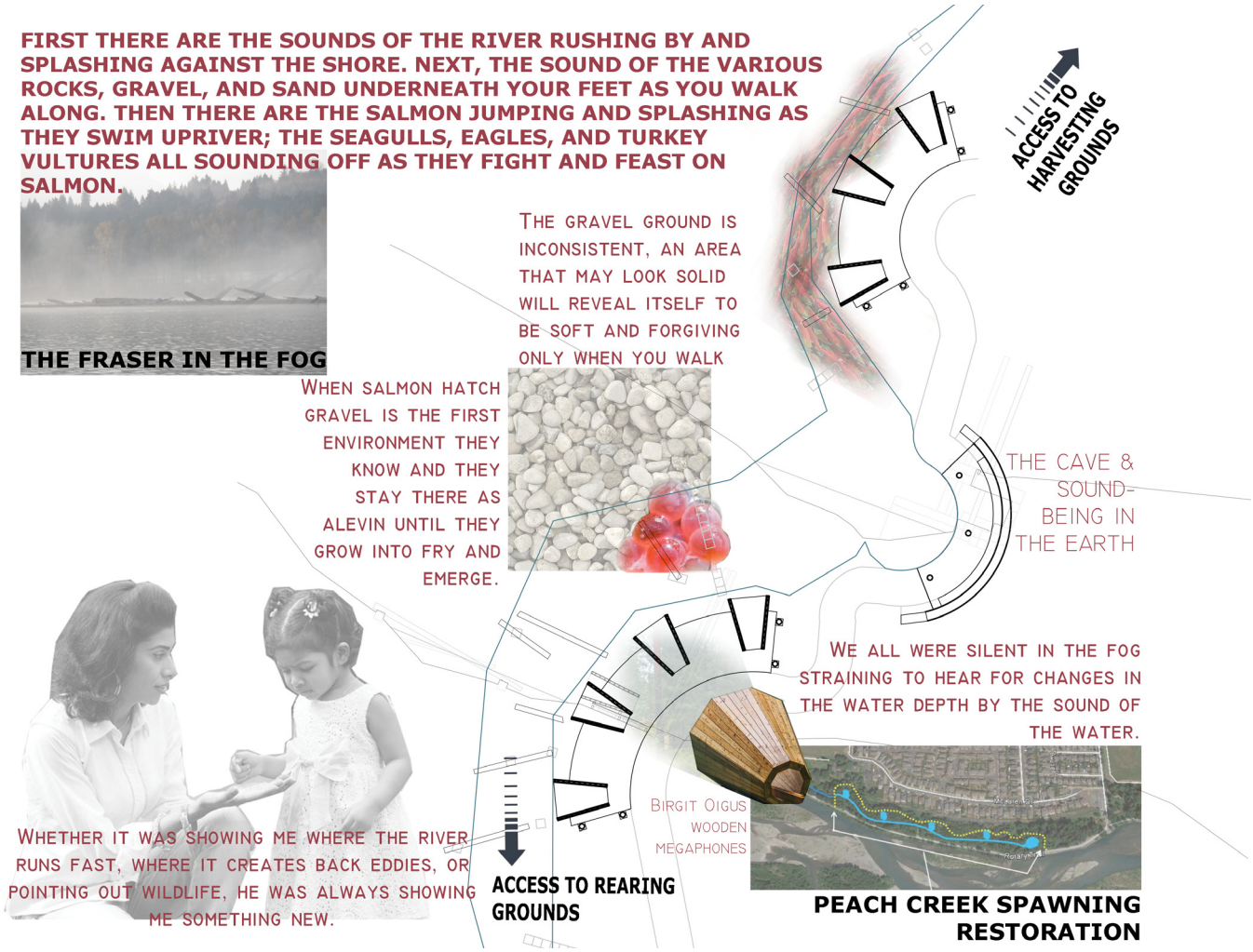

Proposed spawning ground salmon and habitat relationships.




Proposed knowledge acquisition acitivites and the senses related to those activities for the spawning grounds.



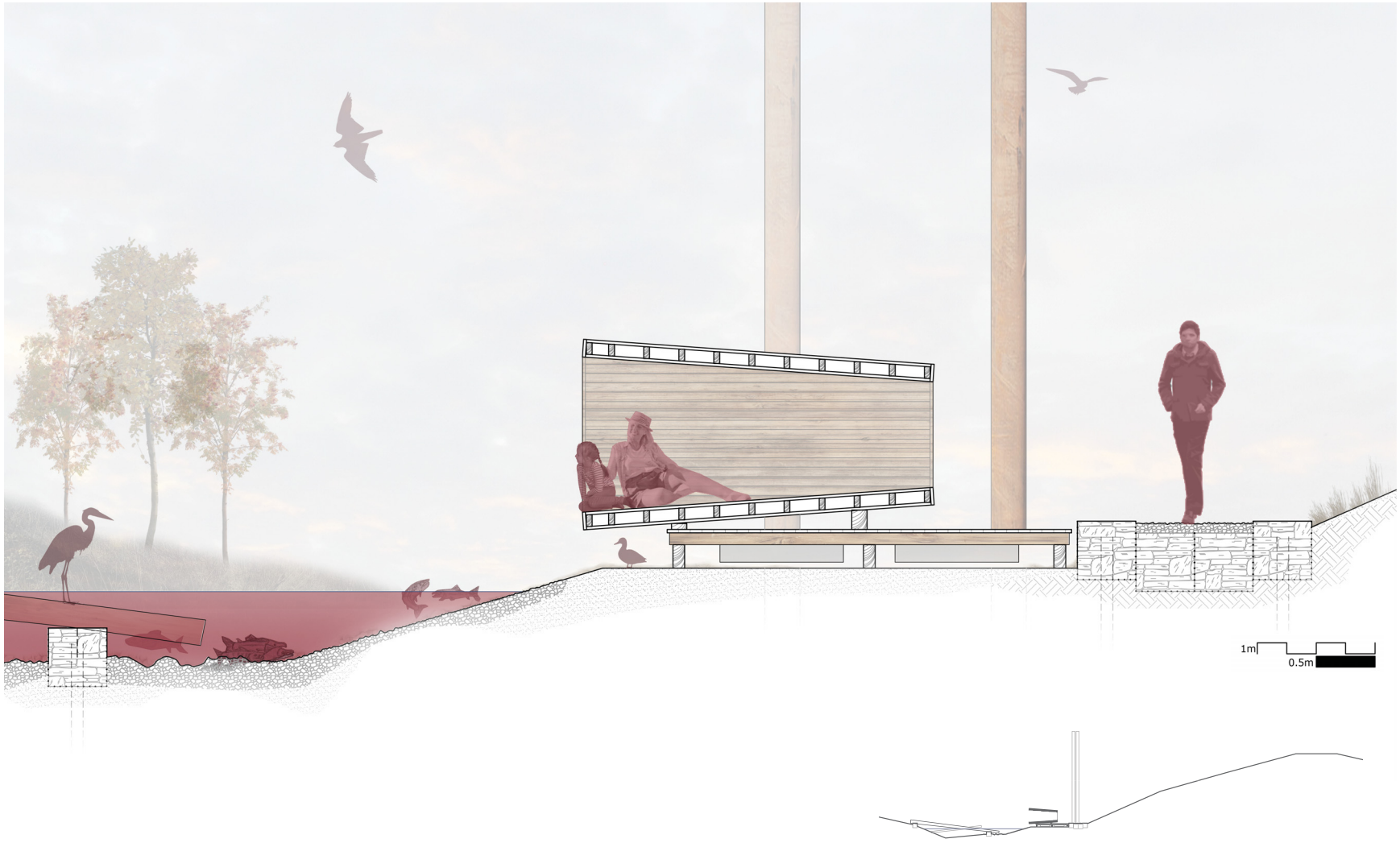

Potential human, salmon, and habitat relationships for the spawning grounds.



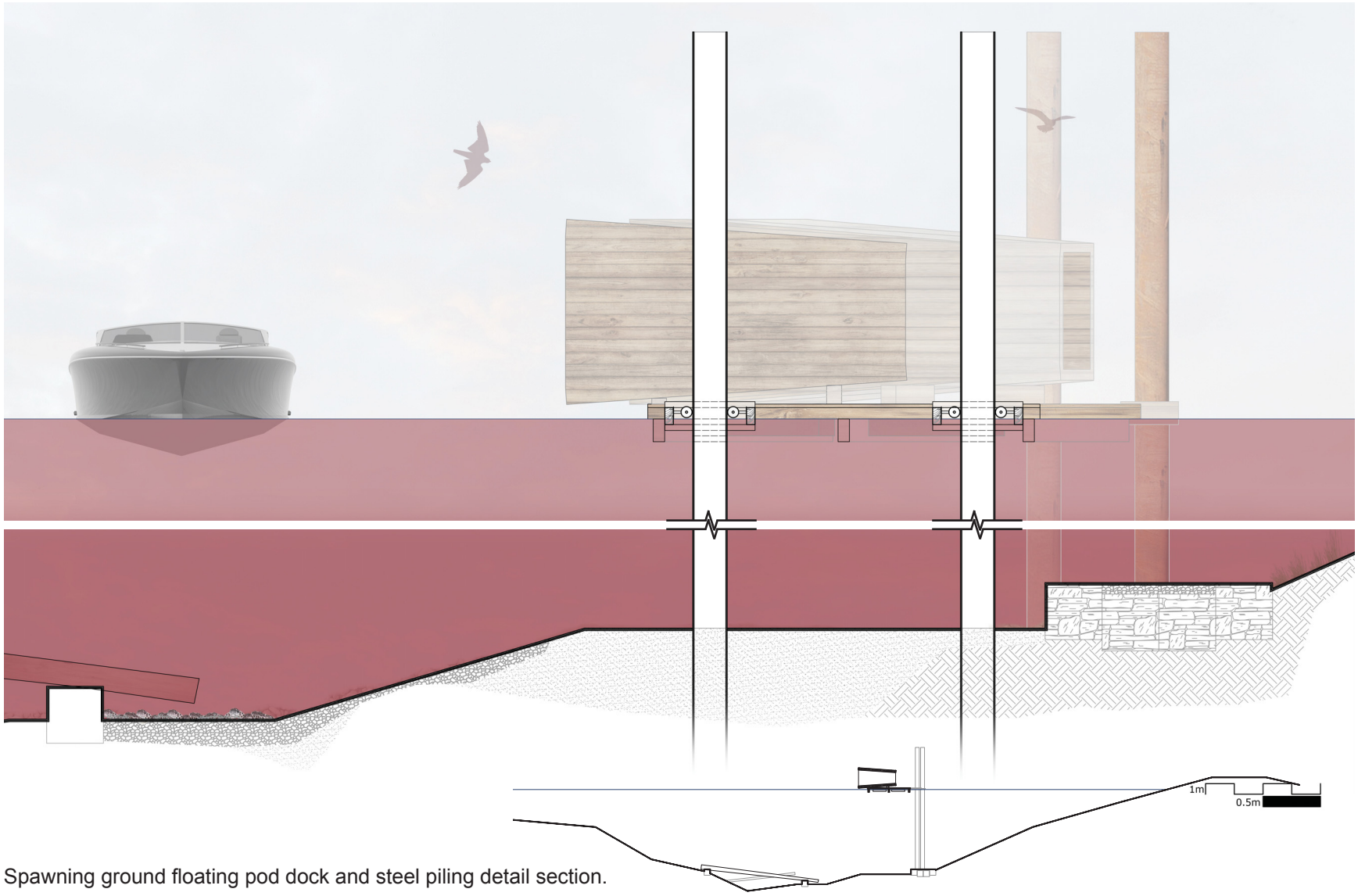

Narrative description of the proposed spawning grounds. Images from Unknown, “Salmon eggs”; Fraser Valley Watersheds Coalition, “2017 Peach Creek, Vedder River Salmon Habitat Restoration”; Unknown, “Teaching Child Stock Photo”; and Tonu Tunnel, “Estonia Wooden Megaphones 6.”

Spawning grounds preliminary section.

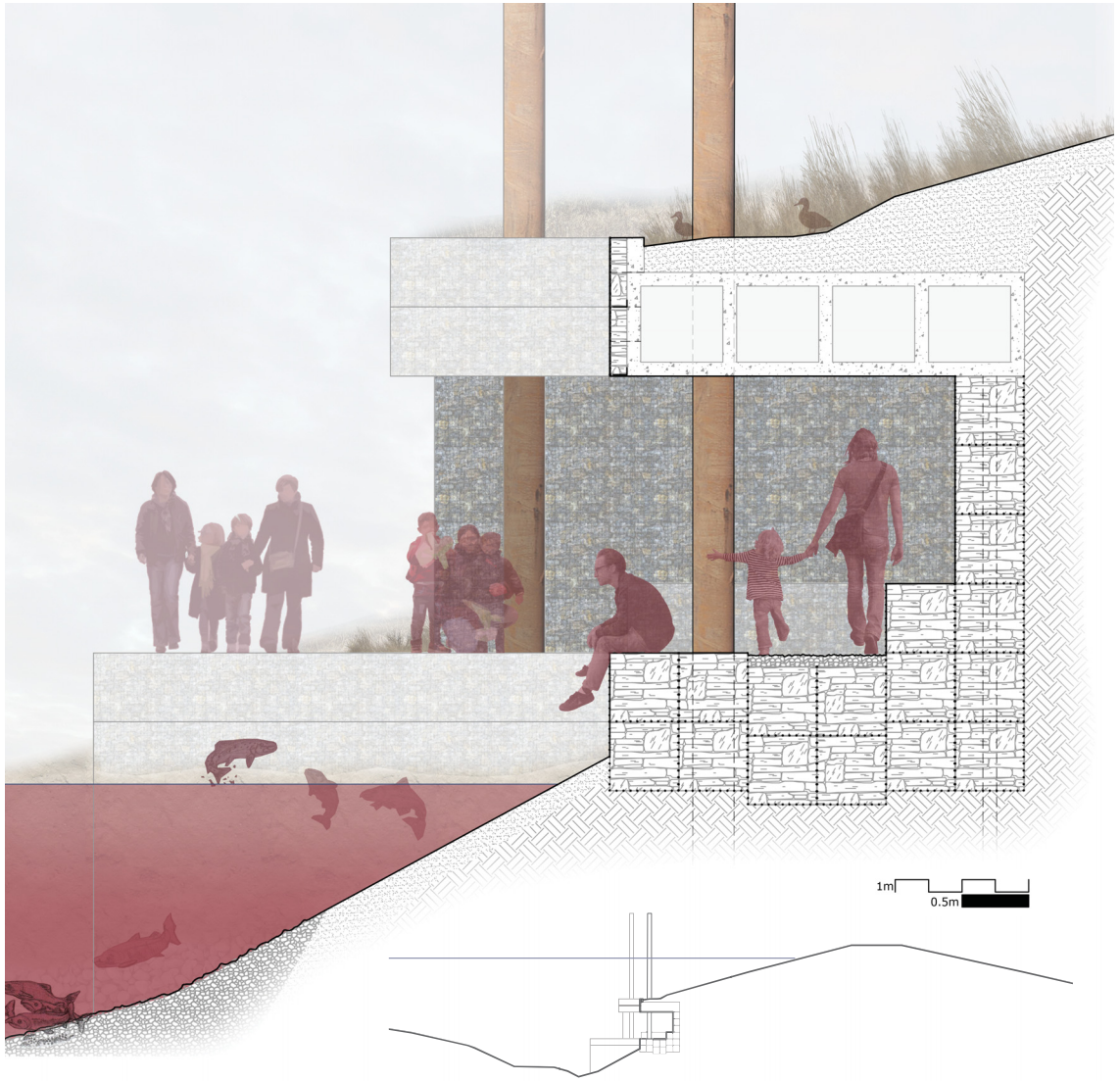
Spawning grounds detail model of pods and overall.




Spawning ground pods and path detail section.




Spawning ground floating pod dock and steel piling detail section.



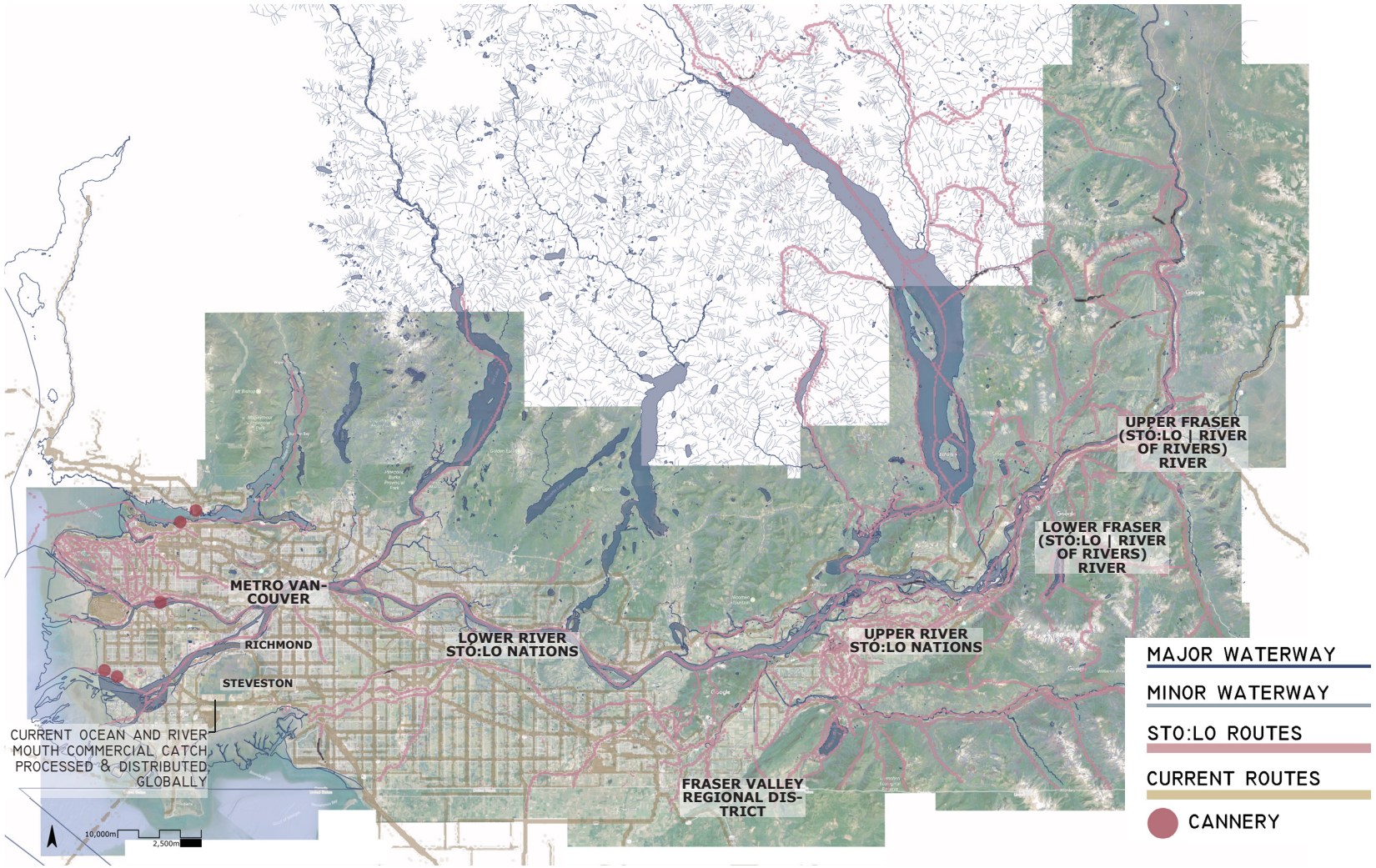

Spawning ground cavern detail section.

## Harvesting and Sharing Site

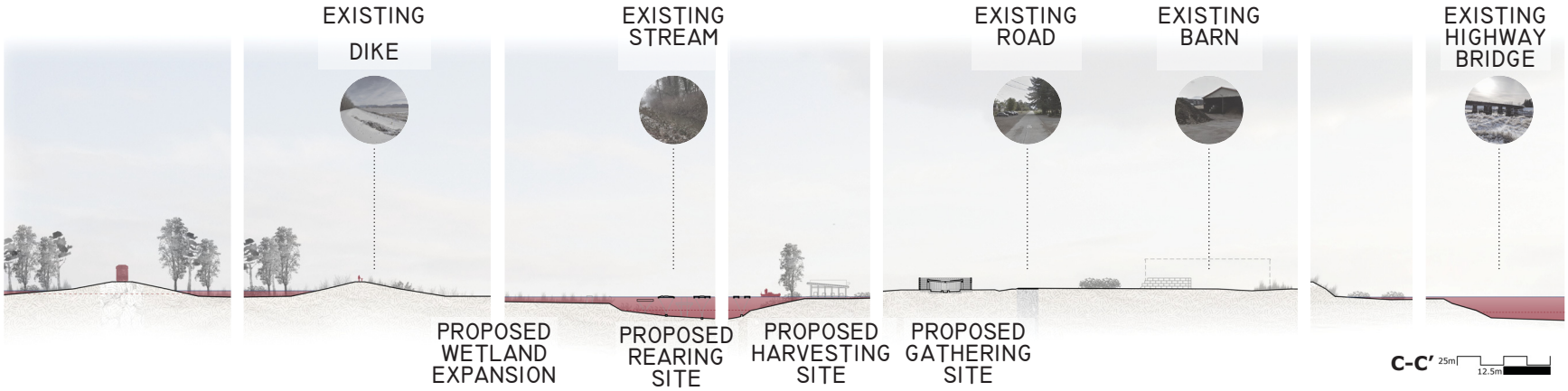
Area of interest and mirco-habitat plan of the harvesting and sharing grounds.

Coming back full circle near the rearing grounds, the harvesting and sharing microsite addresses the need for additional recreational and culturally rich sites that re-establish society's connection to the river. It additionally addresses the current attempts at reconciliation which increase the stewardship rights and responsibilities of First Nation's cultures that have historically had these rights removed. This includes addressing the issue of harvesting practices by promoting more sustainable in-river terminal fishing over ocean based commercial fishing. Now, instead of promoting global fisheries where salmon come to you, these activities promote local community based practices where you must go to the salmon.

At this site there is both access by land and water. Therefore, the daily catch can be brought to the site to be cleaned, prepped, cooked, eaten, and sold. In this way ecological empathy and community connection can be nurtured through activities that involve salmon. Additionally, once a salmon has been cleaned, the remains can be returned to the river. Just as the annual flooding brings nutrient rich soils to the site, so too can the remains of the fish. Thus, both acts reseed the river ensuring a thriving and diverse ecosystem for generations of salmon to come.



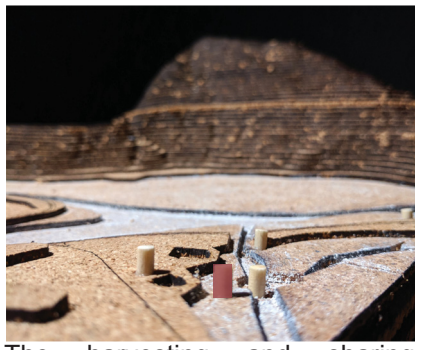

Salmon harvesting and transporation historical analysis map. Data extrapolated from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas* and Google Maps. Gis & Map base image from Google Maps and British Columbia Regional Water Bodies and Water Lines.




Section C-C' proposed landscape section details showing the relationship between the rearing, harvesting, and gathering bio-habitats, the highway, the dike, and the stream. Images from Google Street View.

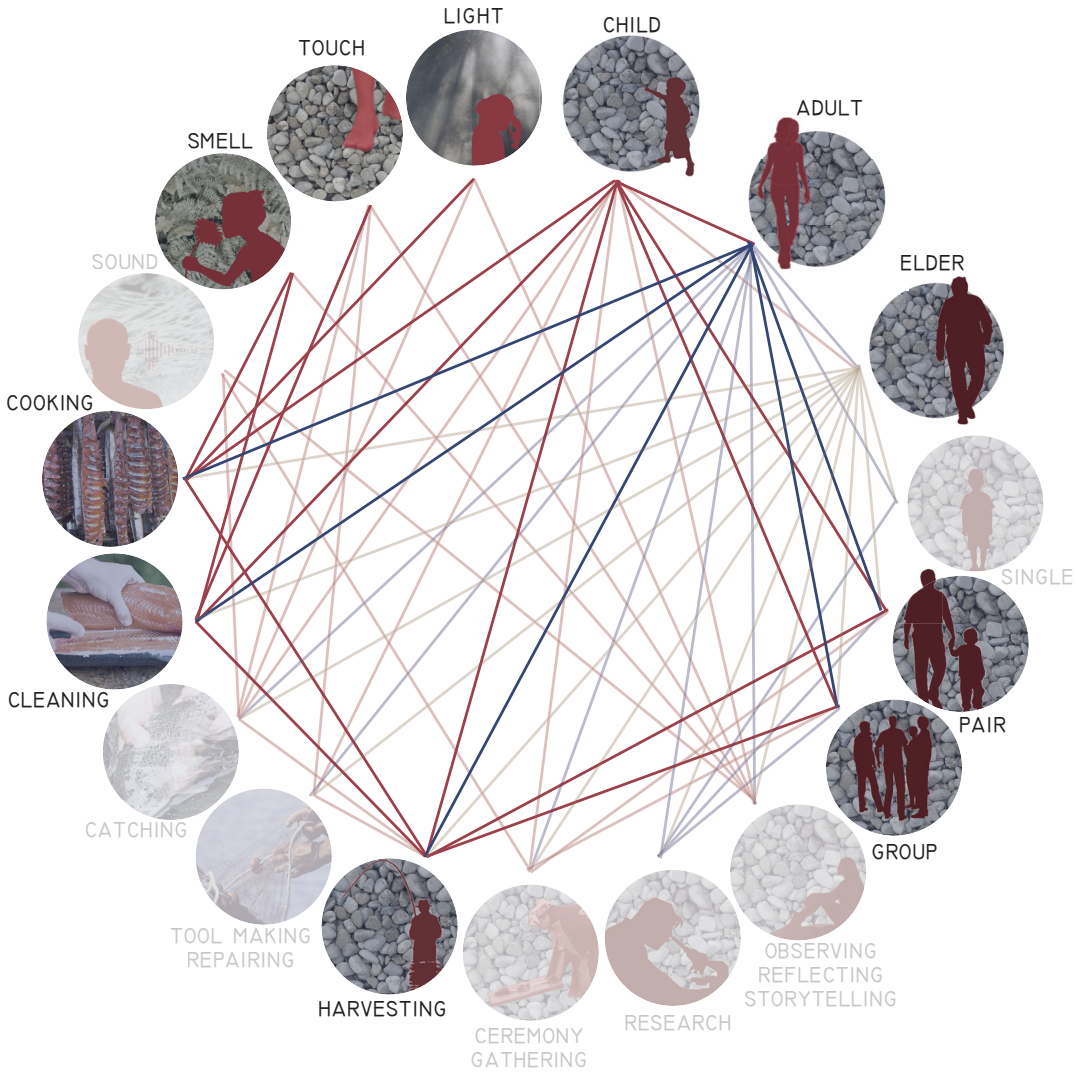
Section C-C' existing.

Section C-C' proposed.

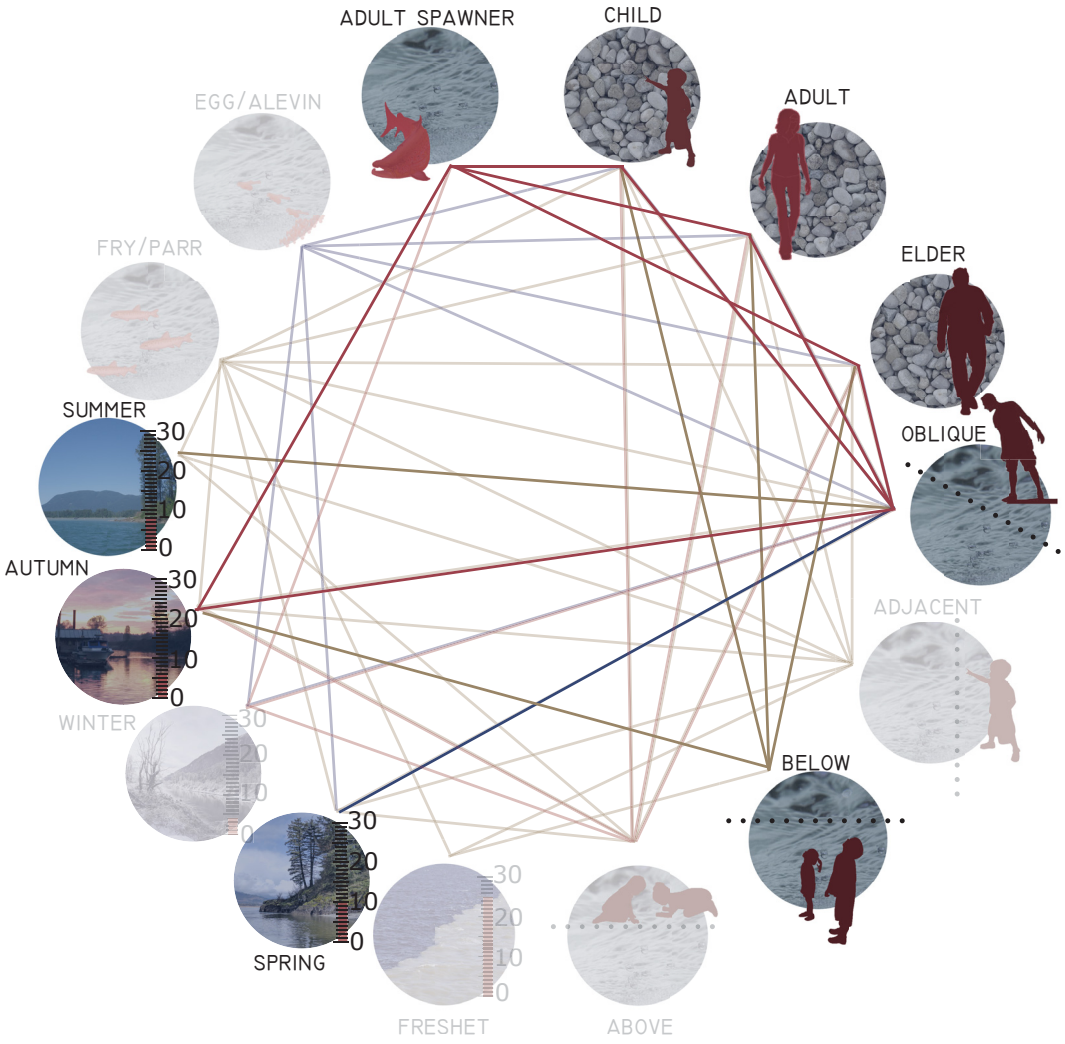


The harvesting and sharing grounds in context.

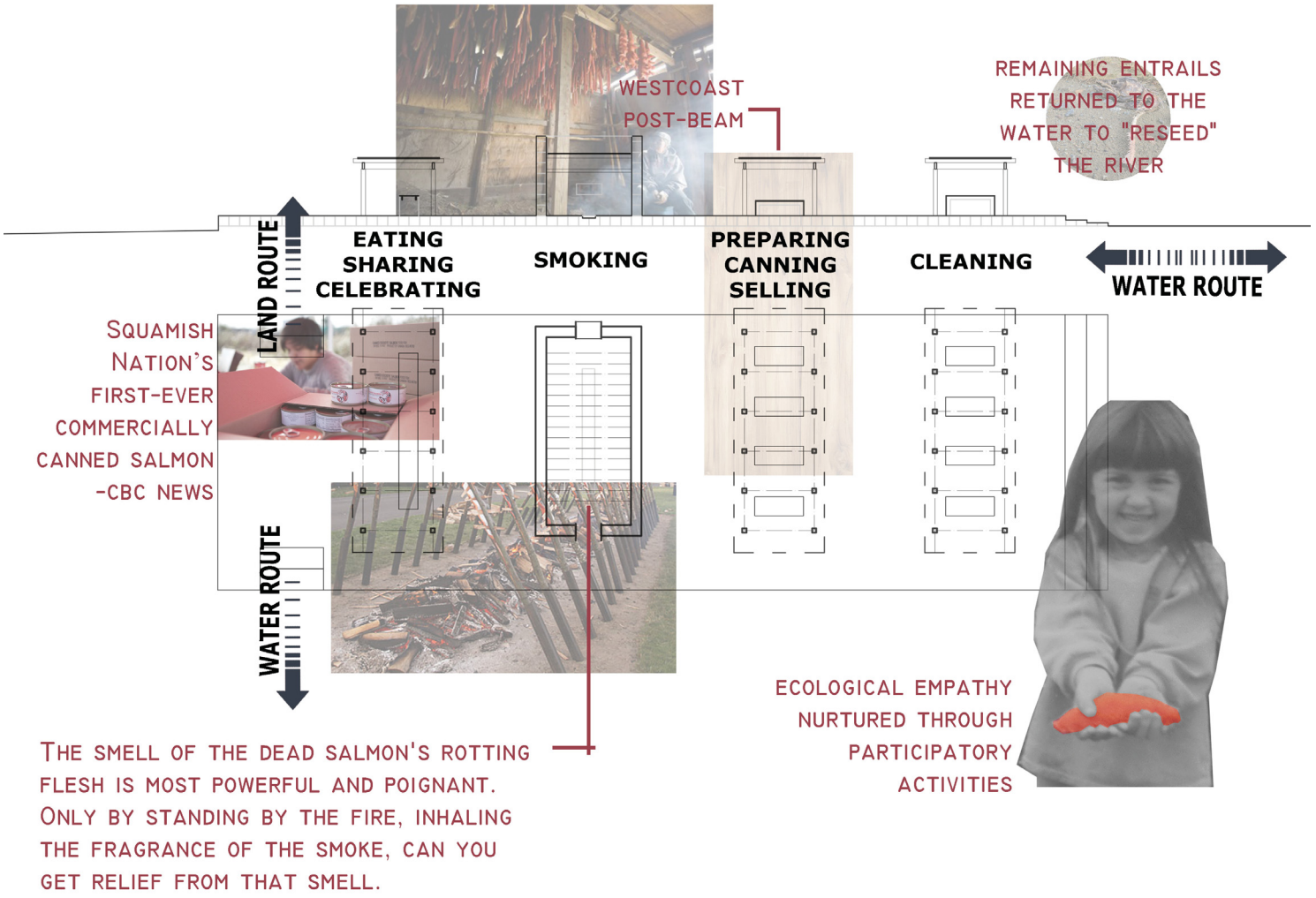
Similar to the spawning site, the intent is to have multiple sites similar to this space in order for every community to have access to these opportunities. This also ensures that this one site does not become oversaturated with people. Each site could be designed for a specific small community as well as provide opportunities for one or two school classrooms to visit the site and participate in the salmon based activities. These smaller harvesting sites are also more sustainable for salmon because they target specific runs. Thus, if one creek or stream has minimal returns that site would not be utilized for harvesting until those runs are able to increase. This type of harvesting will also highlight which runs are in need of additional restoration and preservation efforts.




Proposed knowledge acquisition activities and the sense memories activated during these activities.

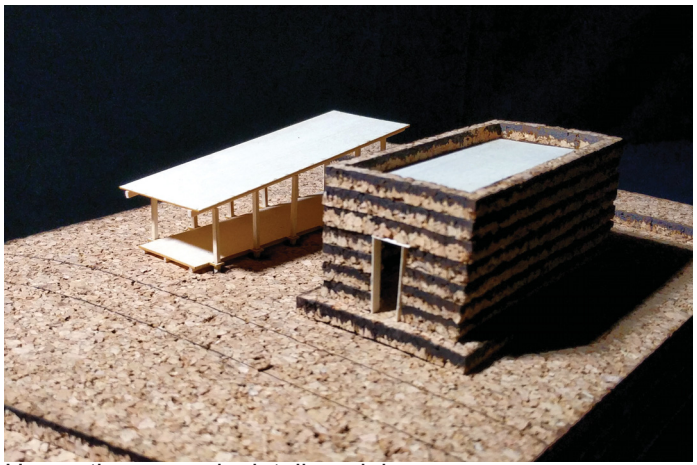



Potential relationships between humans, salmon, and nature that can be activated during certain seasons.




Narrative description of the proposed harvesting grounds. Images from Loy, “Squamish Nation’s first-ever commercially canned salmon...”; Dharapak, “White Smoke House”; and Unknown, “Smokehouse.”

Harvesting grounds preliminary section.

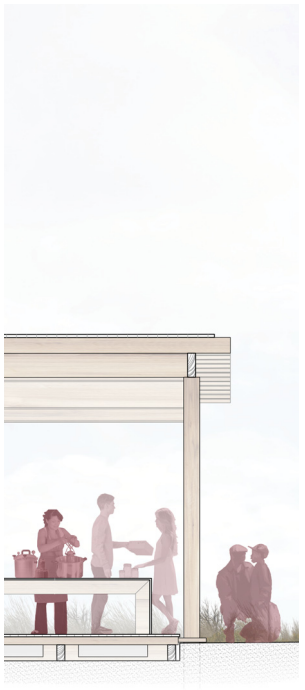


Harvesting grounds detail model.

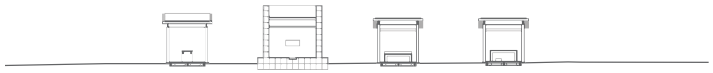
SHARING

COOKING

PREPPING & SELLING

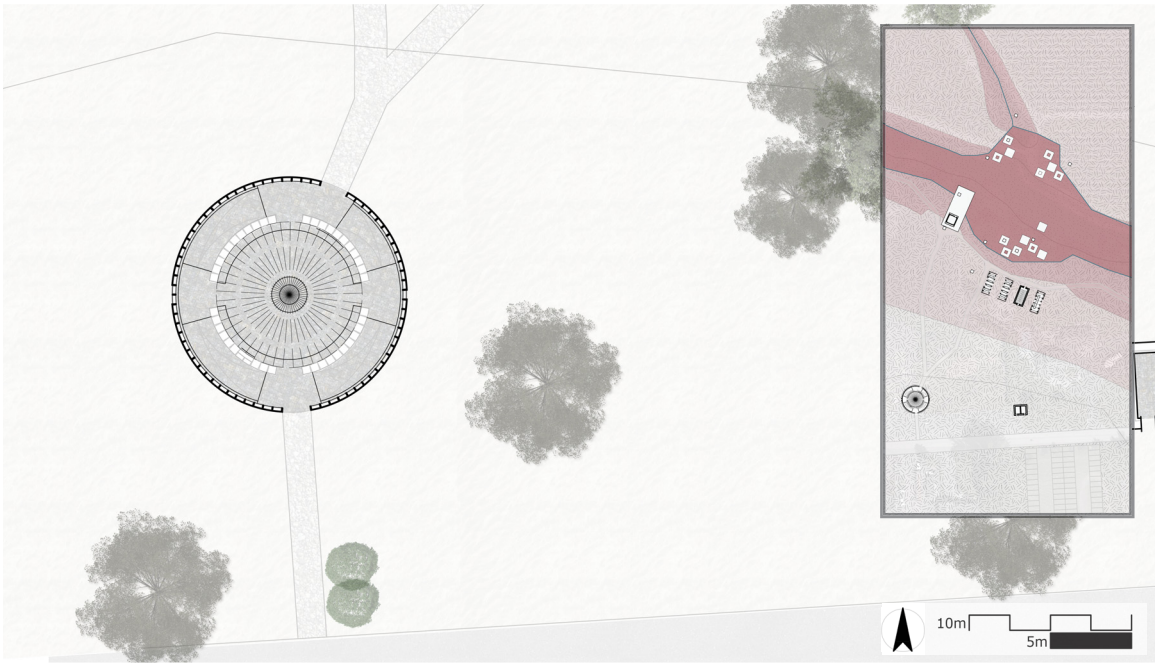


CLEANING

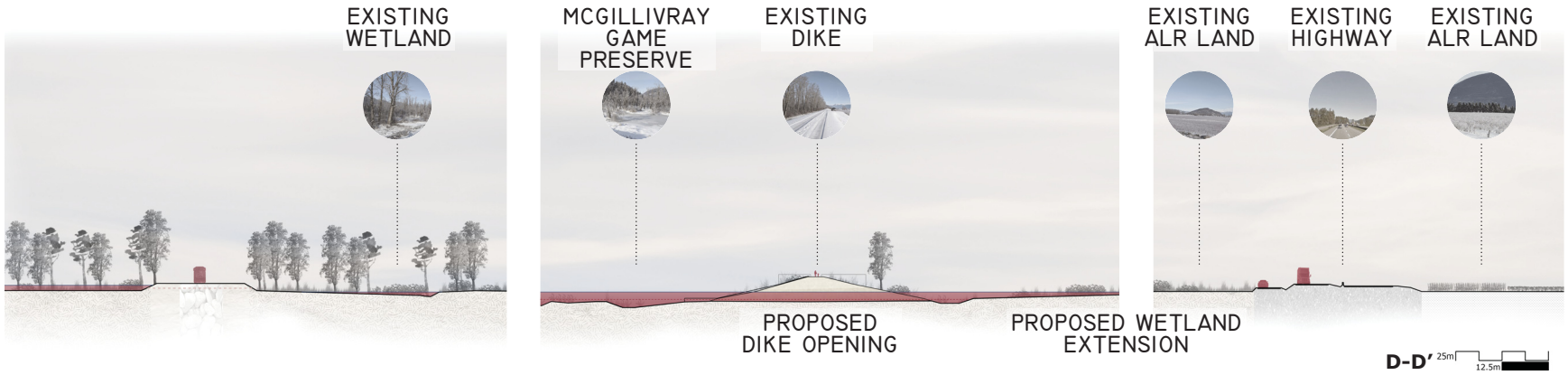
Detail sections of the harvesting grounds.

## Gathering and Celebrating Site




Area of interest and bio-site plan of the gathering and celebrating grounds.

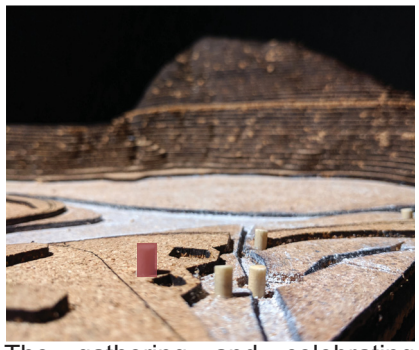
Thus far the design has provided habitat for all in-river life cycles and established a framework for a more sustainable relationship between humans and salmon. This would not be complete, however, without addressing the importance of community and ceremony, a key aspect of every culture. This is particularly evident in the act of gathering around a fire, something I recall most vividly from my memories of fishing. Therefore this sharing and gathering area provides a space for the community to gather, celebrate, give thanks, and eat salmon, as well as share stories. The space was inspired by the traditional Stó:lo pit houses that used to be in the surrounding areas as well as my own memories of fishing. This in conjunction with the other sites helps establish a different way of seeing the environment and will influence children and adults alike.



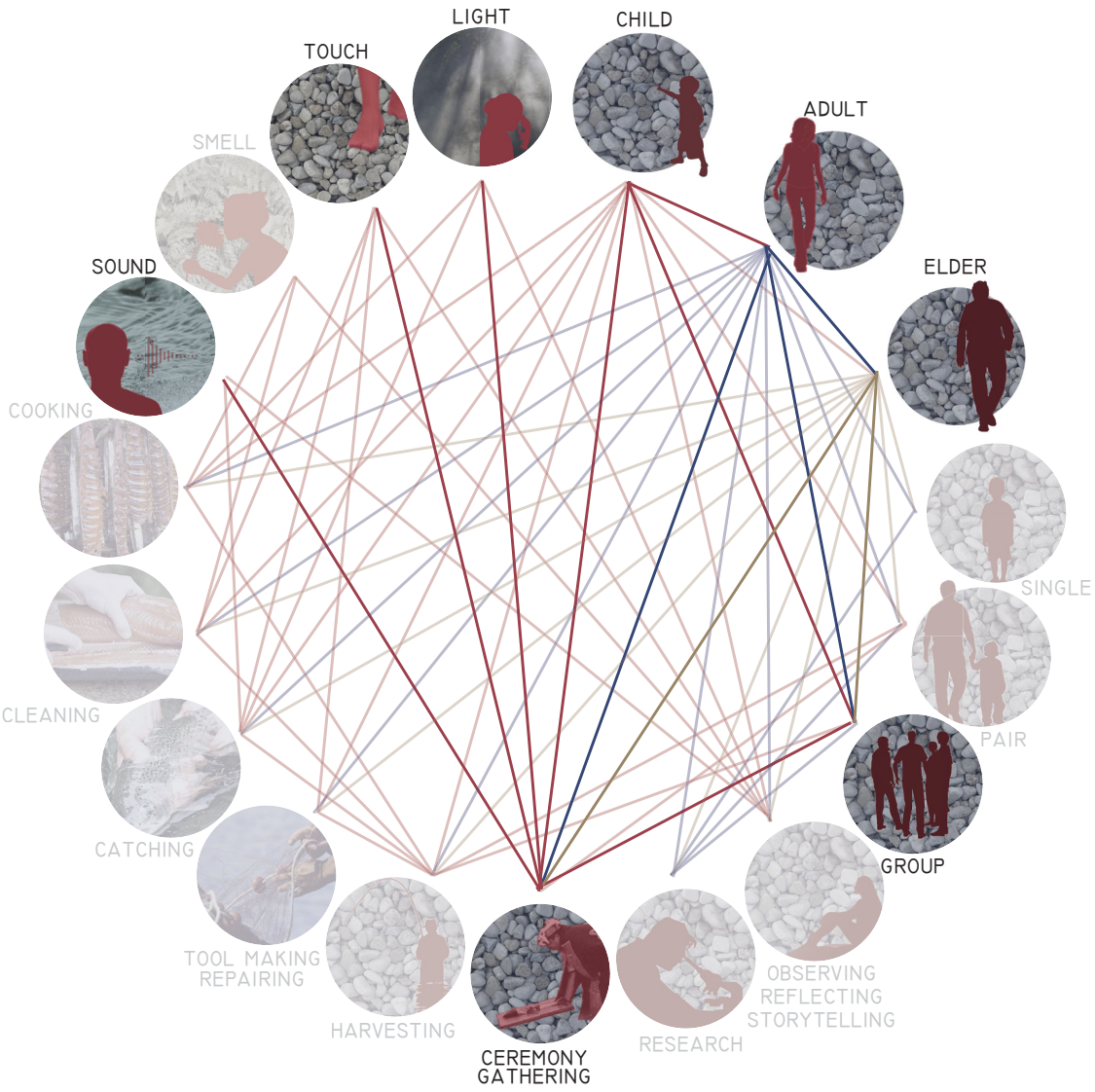

Section D-D' proposed landscape section details showing the opening in the dike and the relationship between the the highway, the dike, the railway, and the wetland. Image of Highway from Google Street View.

Section D-D' existing.

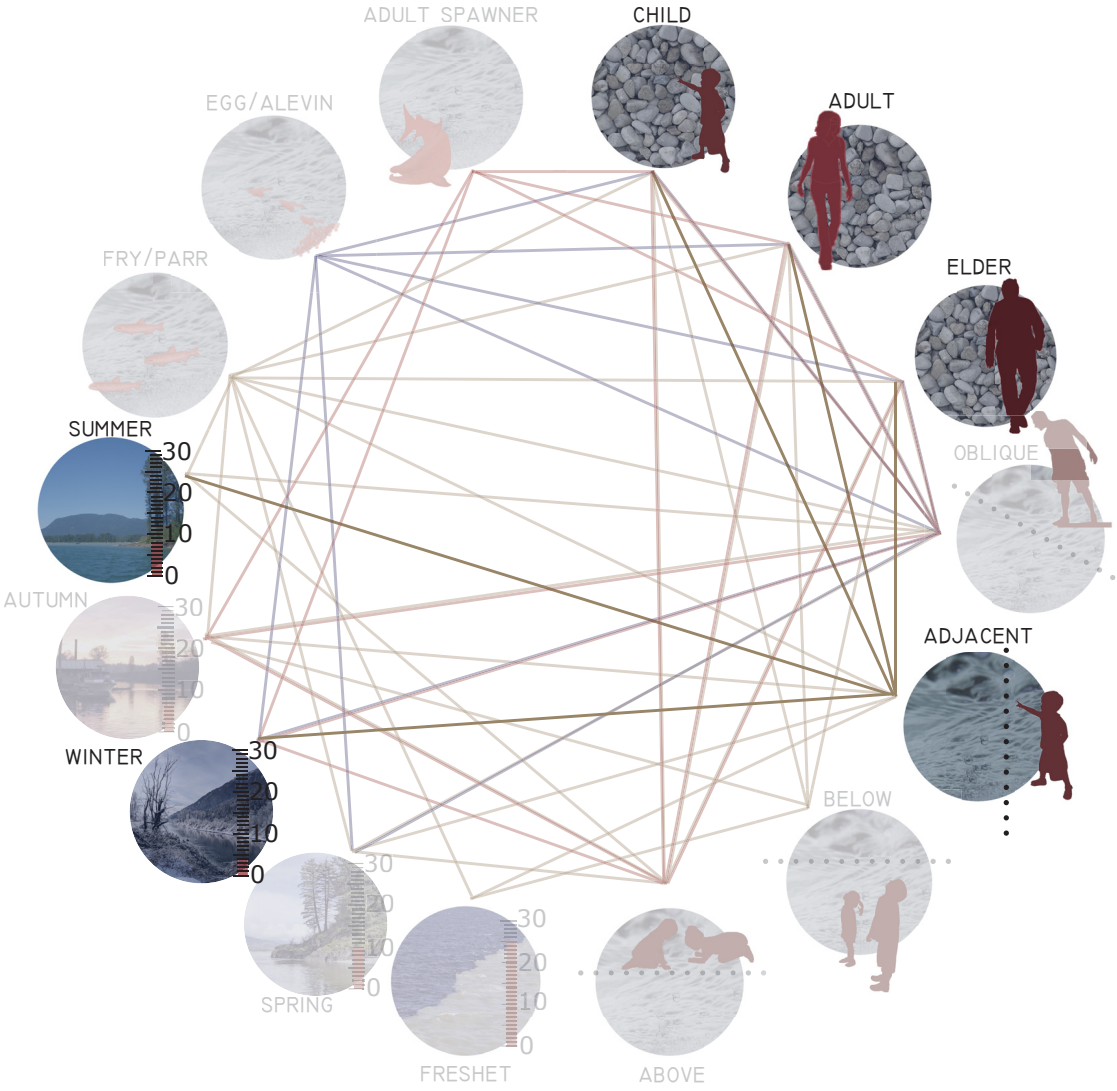
Section D-D' proposed.



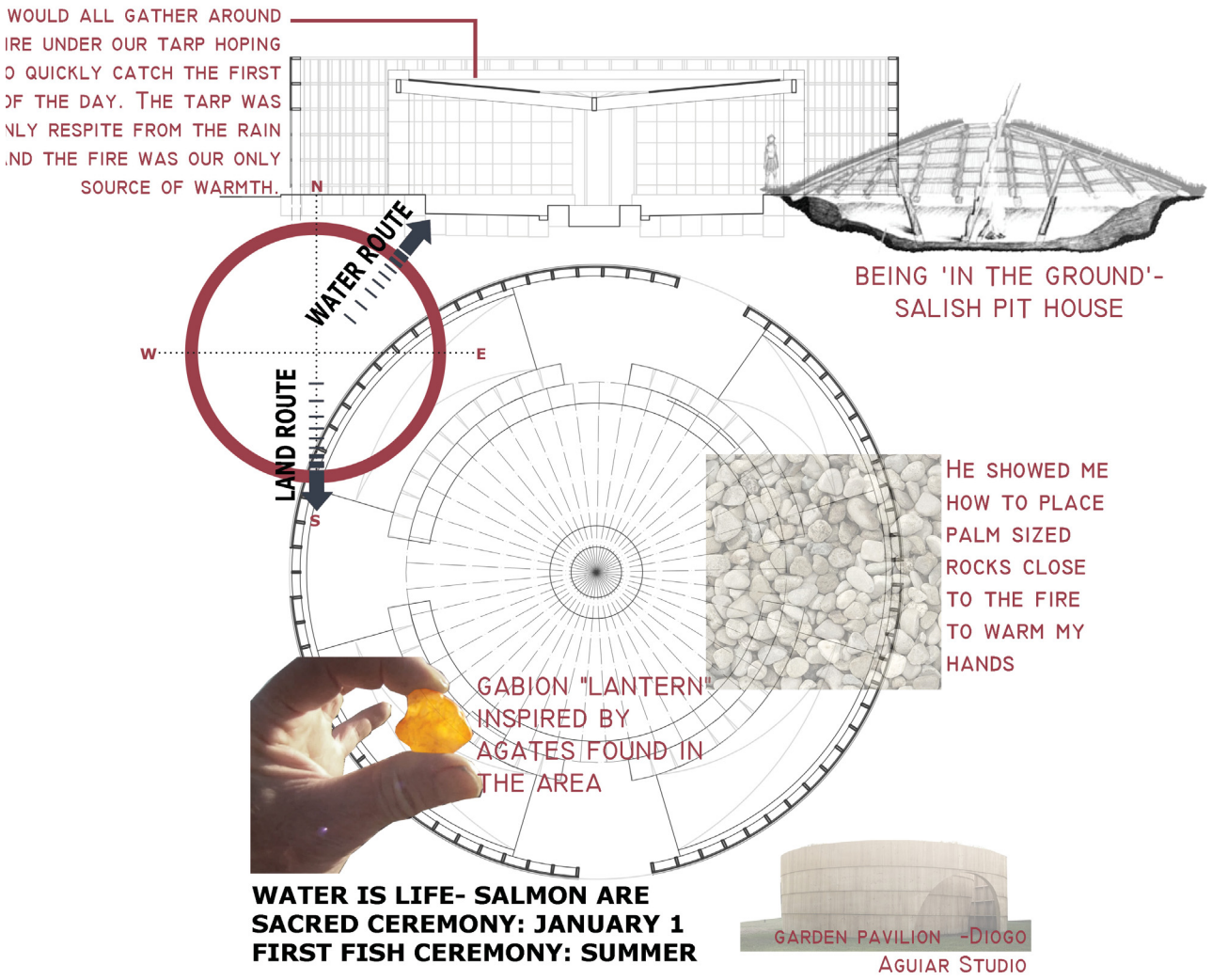
The gathering and celebrating space in context.




Proposed activities and sense activations for knowledge acquisition.

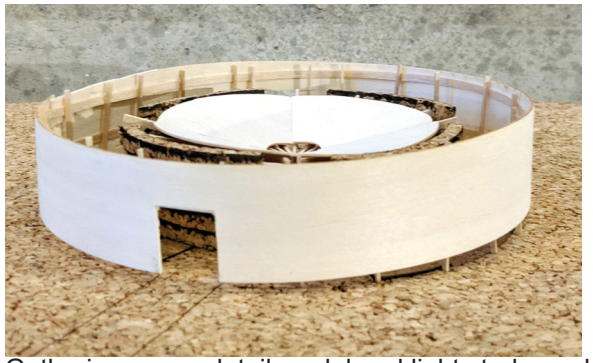


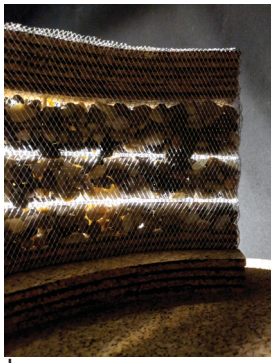

Potential relationships between humans and nature within the gathering space.




Narrative description of the proposed gathering space. Images from Carlson, McHalsie, and Stó:lo Heritage Trust, *A Stó:lo Coast Salish Historical Atlas;* Fernando, “Garden Pavilion”; and BC Rockhunter, “Hunting for agates 11 fraser river.”

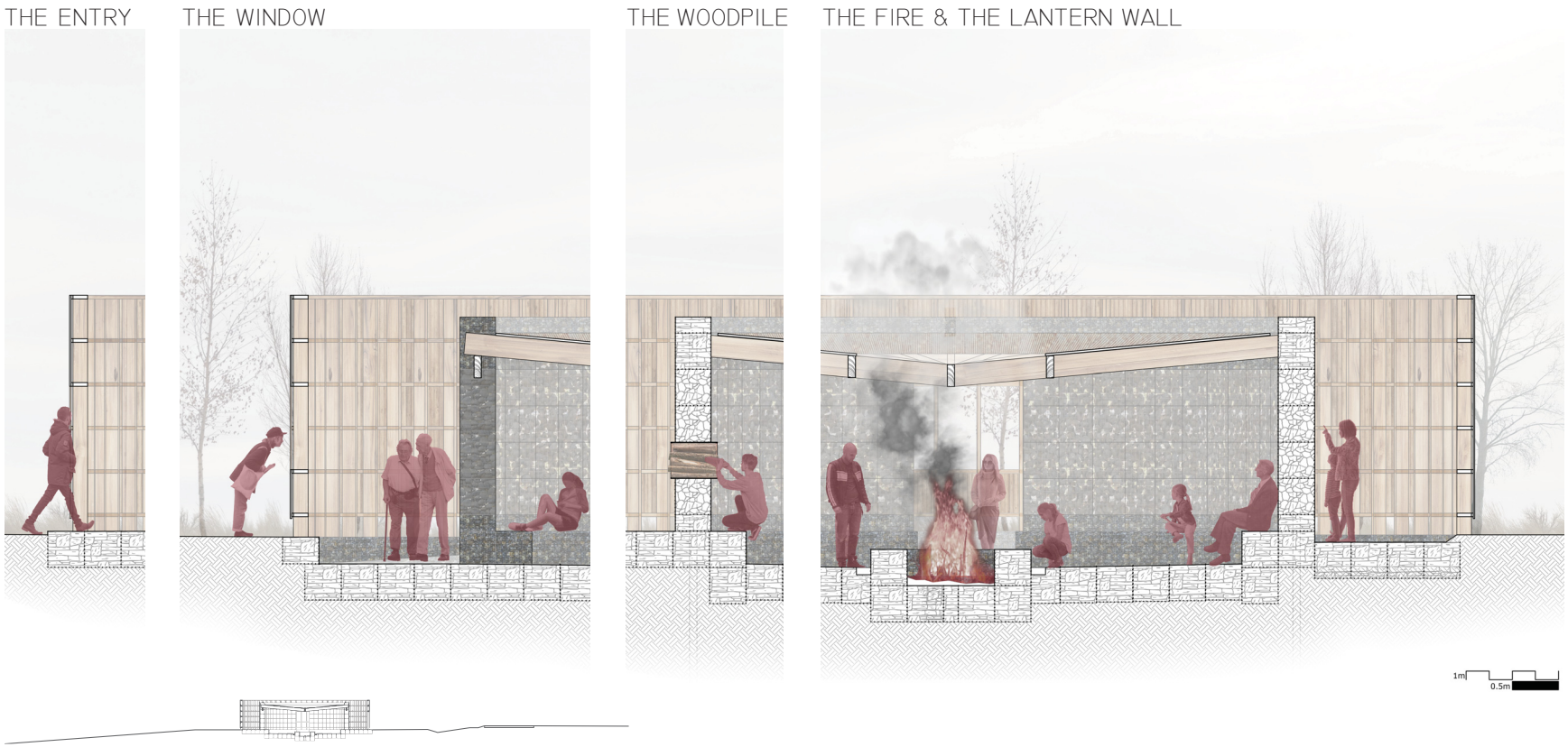
Gathering space preliminary section.





Gathering space detail model and light study model.

Gathering space, roof drainage study.




Detail sections of the harvesting grounds.

# CHAPTER 9: CONCLUSION

In conclusion, while it is clear that human practices have been a major factor in the decline of salmon and their habitat, by re-establishing relationships within salmon ecosystems there is a chance that wild salmon populations could be restored. While this salmon eco-park has been developed specifically for the Vedder-Chilliwack River, the methodology used could inform many more salmon parks all along the Fraser River and its tributaries and could utilize other relationships of connection not addressed in this specific design. Thus, an aggregation of these salmon micro-environments would result in less habitat fragmentation and a more sustainable relationship between us, salmon, and the environment.

In going further, additional work must be done on the economic viability of projects such as these. The provision of additional space for salmon and recreation results in lost space for other interests including agriculture, housing, and industry. While Montgomery argues that a gradual buyout program could provide the impetus for landowners to 'give up' their land,[177] more research would need to be done to determine if this would be possible. Additionally, there has been increasing efforts made in reconciliation as well as promoting concepts and beliefs including Two-Eyed Seeing and indigenous knowledges. This thesis could be taken further with more focus on meaningful collaboration and co-learning throughout the design and research processes in order to create meaningful connections between all community members and the environment.

The challenges this thesis faces are multiple. First and foremost, just because something is done with good intentions does not certify that the results will also be good. Moreover, in comparison to those already attempting to address the wild salmon problem, I am not an expert in salmon or salmon habitat. Therefore, while I believe the site is an excellent candidate for salmon habitat restoration, this may not be the case according to specialists and consultants. The legacy of environmental devastation may be too great to overcome and it would require numerous tests to confirm the viability. Therefore the thesis responds to this concern by providing a framework and process that could be used for sites that are determined to be viable for restoration and preservation.

177 Montgomery, *King of Fish: The Thousand-year Run of Salmon*, 238-239.

As stated before, there is no one clear answer for how we can save wild salmon. The problem is complex , and there is no guarantee that by promoting a new way of viewing and interacting with the environment that salmon will thrive. Furthermore, any attempts to alter societies' perception or to establish lasting relationships between people with different world views require much time and effort. This process is slow, but needed. Yet, wild salmon need quick actions in order to provide population restoration opportunities. Additionally, while this thesis focuses on in-river habitat if we do not move quickly on improving the entirety of salmon habitat other factors may bring about the demise of the species.

Society may also not be willing to give up certain privileges and comforts that we currently have in order to save wild salmon. As Montgomery states, "In the end, the degree to which society is willing to give space back to rivers will define the degree to which rivers can recover."[178] Even so, just because we provide the space does not necessarily guarantee that salmon will inhabit it. The rivers may no longer be suited for salmon, or they may just choose not to go to these spaces. Salmon and the environment are unpredictable and more complex than we can predict. This also means that planning for a site 100 years in the future does not guarantee that this plan will see fruition, which is why the design framework proposed must be adaptable to change.

As a final note, salmon are amazingly resilient creatures that have been on this earth for millennia, if any species was to survive against all odds it would be this amazing fish. Currently, salmon advocacy and education is on the rise. Restoration projects are increasing, while new salmon initiatives are being promoted that encourage sustainable harvesting with a focus on traditional practices. With these shifts in practices this thesis attempts to further support this progress using its architecture to create key moments of engagement with both salmon and their environment. These interactions are key to shifting held beliefs and changing our relationships to the environment. In doing so humans become stewards of salmon and the opportunity for wild salmon survival becomes more certain. While there are still many hurdles to overcome, together we can ensure a bright future for both people and salmon.

178 Ibid., 239.

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