Two-Eyed Seeing and Architecture: Restoring Reciprocal Relationships through Design

by

Bronwyn Colford

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Dalhousie University is located in Mi'kmaq'i,
the ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

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Abstract

As a Western society we have lost our sense of the rhythms of the natural world and how we fit into these regenerative cycles, which has contributed to the increasing destruction of our planet. This thesis advocates for using Two-Eyed Seeing as a guiding principle, a term coined by Elder Dr. Albert Marshall, to consider design problems from multiple perspectives to move towards reconciliation between people and the landscape. This thesis explores the migration route of the endangered Atlantic salmon along the Stewiacke and Shubenacadie Rivers in Nova Scotia. Three lenses are used, that of the fish, Mi'kmaw and Western worldviews, to develop an architectural language that symbolizes and facilitates reciprocal relationships between them. Four pedestrian bridges named "Nest," "Shift," "Cover" and "Bridge" mark places of significance for the salmon and bring together the strengths of the worldviews, both conceptually and physically.

Acknowledgements

Thank you to my thesis committee, Niall Savage and Catherine Venart, for your encouragement and guidance. All your insights and thoughtful advice throughout the process were very much appreciated.

I want to extend my greatest appreciation to Patricia Doyle-Bedwell for generously sharing your knowledge and time. This thesis began in your classroom.

To my Mom and Dad, who have supported me through my entire architectural education journey, I could not have completed this final chapter without you. To the friends I've made during my short time at Dal, thank you for welcoming me in and sharing your thoughts. To Tasha and Madi, thank you for all the laughs that kept me going.

Chapter 1: Introduction

Alton Gas Protest

Mi'kmaq Water Protectors and supporters protesting Alton Gas (Baxter 2020)

For eight years Mi'kmaq Water Protectors defended the Shubenacadie River from Alton Gas, a company that wanted to dump large amounts of salt, excavated to build underground caverns to store natural gas, into one of the principal rivers in Nova Scotia (Solidarity with Alton Gas Resistance n.d.a). The Shubenacadie River system has been sacred to the Indigenous people of Nova Scotia, the Mi'kmaq, for over 13,000 years as they have relied on it as a transportation route, primary source of food and spirituality. The increase in salinity would have had detrimental effects on the estuarine organisms, specifically the endangered Atlantic salmon and striped bass (Edelstein 2021). This protest was my introduction to the Shubenacadie River and a direct catalyst for my thesis work. Even though the Mi'kmaq Water Protectors were ultimately successful at ending the project, the conflict is representative of a larger problem, the ongoing worldwide disregard and disrespect for Indigenous worldviews and the health of our natural environment.

Flags and signs beside the Shubenacadie River in protest of Alton Gas (Solidarity with Alton Gas Resistance n.d.b)

Western (also referred to as colonial or Mainstream) society views the environment as a resource for human extraction and consumption. In the Mi'kmaw worldview, people advocate for the natural world and engage in a reciprocal relationship of care and responsibility. Through colonization, traditional Mi'kmaw ways of life, where humans lived in balance with the natural world, were erased. This way of life is best embodied by the Mi'kmaw concept of Netukulimk, which in its simplest form means only taking what you need without wasting anything to ensure the continued integrity,

diversity, and productivity of the environment for generations to come (Denny and Fanning 2016, 2).

The Mi'kmaq Water Protectors had been fighting for the benefit of everyone as we all share the same land, air and water. The lack of support from the wider community in Nova Scotia and even within the Mi'kmaq community, due to internalized colonialism, is a clear sign that we are disconnected from the rhythms of the natural world and our place within these regenerative cycles (Pictou 2021). In the report titled "What We Have Learned: Principles of Truth and Reconciliation", the Truth and Reconciliation Commission of Canada (TRC), Elder Dr. Reg Crowshoe states that there cannot be reconciliation between Indigenous and non-Indigenous people without reconciliation with the natural world (The Truth and Reconciliation Commission of Canada 2015, 123). This is only one part of moving towards reconciliation, but it is an urgent one. We need to work together in order to ensure that our planet can continue to support all living beings equally.

Argument

This thesis argues that architecture has a role to play in this journey towards reconciliation. As Ingrid Waldron says in *There's Something in the Water*, "while there will always be a role for protest and agitation in addressing social injustices, they mean very little if they do not accompany the building of something constructive and sustainable" (Waldron 2018, 111-112). This thesis uses Two-Eyed Seeing, a Mi'kmaw concept coined by Elder Dr Albert Marshall, as a guiding principle to bring together multiple perspectives to address complex problems. Three worldviews are considered: first, the lens of the endangered Atlantic salmon and then the

lens of the human, both Mi'kmaw and Western. A design methodology is constructed using three key facets of these worldviews: science, relationality and language and place. Two-Eyed Seeing facilitates the bridging between these knowledge systems to create a new architecture that symbolizes and actively facilitates reciprocal relationships between occupants and the environment. This methodology provides a step in the direction of reconciliation between people and the earth.

Personal Acknowledgment

As the author of this thesis, I want to acknowledge my place in this world as it has shaped the worldview that I bring to this work. As a white female of settler descent who grew up in Toronto, Canada, and is currently living in Halifax, I am an outsider in many ways. I have tried my best to understand the context in which I am working by gaining knowledge of the Mi'kmaw culture from personal conversations, recorded interviews and written texts, although I cannot claim to fully comprehend the breadth and depth of a culture other than my own. My goal for this process is to deepen my personal understanding of the Mi'kmaw worldview and provide a framework for architects to design with a greater sensitivity to the Indigenous worldview and the natural world.

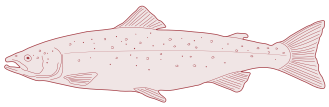
Context

Mi'kma'ki is the unceded territory of the Mi'kmaq, which includes present day Nova Scotia, Prince Edward Island, Newfoundland, much of New Brunswick and the Gaspe and part of northeastern Maine (Sable and Francis 2012, 16). Beginning in the 17th century, prior to colonization, Mi'kma'ki was made up of seven districts based on naturally existing drainage systems which followed the main river systems

(Sable and Francis 2012, 19-21). These borders were likely very flexible, adapting to changing environmental conditions and the needs of the people (Sable and Francis 2012, 20-21). The Shubenacadie and Stewiacke Rivers are located in the Sipekne’katik district.

Chapter 2: The Atlantic Salmon

Plight of the Atlantic Salmon



Adult Atlantic salmon

Historically, Inner Bay of Fundy (IBoF) salmon inhabited 32 rivers in Nova Scotia and population numbers may have been as many as 40,000 adults in the early 20th century (Government of Canada 2010). However, populations have been extremely low since 1989 and are at increasing risk of extinction each year. It is not well understood why there has been such a decline in population, but it is postulated to be due to a series of human induced threats, including interaction with farmed salmon, fisheries by-catch, water temperature increases, water contamination and barriers to fish passage (Government of Canada 2010). There is a need for further research on the species to better understand the causes for the continual decline.

Rotary Screw Trap on Stewiacke River (Mi'kmaw Conservation Group 2014)

The Stewiacke River, the main tributary of the Shubenacadie River, is one of the few remaining spawning destinations for the endangered IBoF Atlantic salmon and the focus of this thesis. A main component of the recovery strategy is the Live Gene Bank program that supplements the river with captive bred fry that are reared in a federal fish hatchery (Jones et al. 2020, 2). To monitor the success of this program, a Rotary Screw Trap is installed on the river in the spring to count, measure and weigh the juvenile salmon smolts on their first migration to the ocean.

Relationship between Mi'kmaq and Plamu

Known in Mi'kmaw as Plamu, Atlantic salmon has always been a significant species for the Mi'kmaq as a source of food but also an essential expression of their culture and spirituality (Mi'kmaq Maliseet Nations News n.d.). Prior to

Spear fishing (Denny et al. n.d.)

Food preparations for salmon ceremony (UINR 2019)

Salmon ceremony (UINR 2019)

colonization, Mi'kmaq communities lived strategically on 42 principal rivers in Nova Scotia, harvesting species based on their migration cycles (Nova Scotia Museum 2020). Colonization forced the Mi'kmaq people onto reserves, away from their traditional hunting and fishing territory. Through the acquisition of Aboriginal and treaty rights, the Mi'kmaq have the right to fish for food, social and ceremonial needs as well as the right to fish to support a moderate livelihood, respectively (Denny and Fanning 2016).

With this right, they hold a responsibility to ensure the continued heath of the species. Historically the Mi'kmaq would fish for salmon at the time of or just prior to spawning runs using Netukulimk as a guiding principle, observing the abundance of the fish that season, taking only what they needed to survive and sharing what they caught with other families that were without.

Traditionally the Mi'kmaq harvested salmon using multiple methods including rods, spears, snares, seines and weirs (Denny et al. n.d.). The fish were often cooked over a fire or smoked for preservation using heated rocks. (Denny and Fanning 2016, 2). All parts of the fish were used for different purposes to ensure none of it went to waste. Ceremonies are performed to honour the gift of the salmon, traditionally before a harvest or other important events. An important component of ceremony is the preparation and consumption of food (Mi'kmaq Maliseet Nations News n.d.).

Perceptions of Salmon Management

Mi'kmaw and Western worldviews hold different ideas of how to manage and conserve Atlantic salmon populations in Nova Scotia. The Mi'kmaq approach discussed above is in contrast to the rule-based method of the Western paradigm,

which implements overall laws for multiple watersheds focused on preventing the removal of salmon from the rivers (Denny and Fanning 2016). This is one of the reasons that there have been ongoing tensions between Mi'kmaq rights holders and Western governing bodies.

In Nova Scotia Atlantic salmon are currently managed by the Department of Fisheries and Oceans (DFO) and Nova Scotia Fisheries and Aquaculture (Denny and Fanning 2016, 4). Both the Mi'kmaq and the DFO recognize the decline in Atlantic salmon and have the same goal of conservation but different approaches to achieving it (Denny and Fanning 2016, 10). Scholars Shelley Denney and Lucia Fanning argue that a Two-Eyed Seeing approach is a necessary step to move towards co-management of Atlantic salmon in Nova Scotia (Denny and Fanning 2016, 18). The concept of Two-Eyed Seeing is further explained in the following chapter and is the method used hereafter to shape the design methodology.

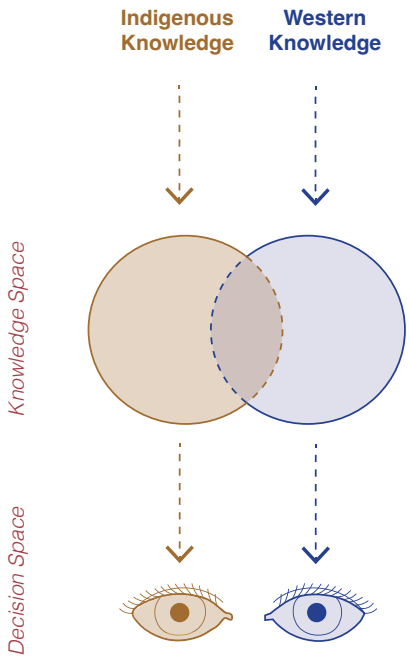
Chapter 3: Two-Eyed Seeing

Key Principles

Two-Eyed Seeing, known as Etuaptmumk in Mi'kmaw, is the guiding principle used in this thesis. It means "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 mainstream knowledges and ways of knowing, and to use both these eyes together, for the benefit of all" (Reid et al. 2020, 243). The guiding principle was developed by Elder Dr. Albert Marshall, Murdena Marshall and Cheryl Bartlett for the Integrative Science program at Cape Breton University, as an effort to make the educational curricula more inclusive to Indigenous students (Bartlett, A. Marshall, and M. Marshall 2012). As will be discussed in the following chapter, Indigenous knowledges have not been accepted as a valued contribution to the scientific discipline. Two-Eyed Seeing presents a methodology for embarking on a co-learning journey that recognizes that many of today's world issues, especially climate related, cannot be addressed without working together.

Two-Eyed Seeing is the gift of multiple perspectives, which is an idea that is very important to Indigenous culture. It values all ways of knowing but does not merely combine them equally. It is still important that each remains distinct, and that Indigenous knowledge is not assimilated into the mainstream knowledge. It requires a weaving back and forth between the knowledge systems. Depending on the circumstance, the strengths of Mi'kmaw knowledge might take precedent whereas in other circumstances it might be best to rely more heavily on Western knowledge (Bartlett, A. Marshall, and M. Marshall 2012, 335). In all cases it is

critical to consider the past histories and current practices of colonization that have erased and continue to discredit Indigenous knowledge.



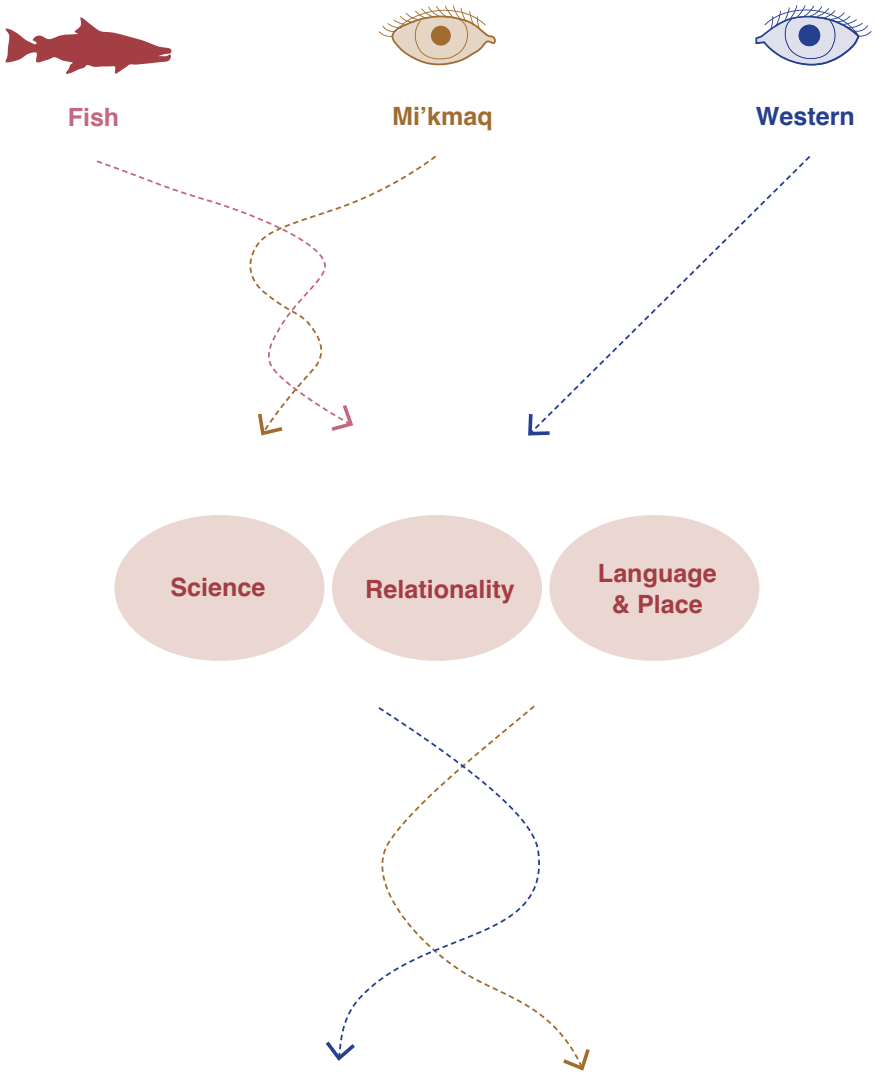
This is a diagram of the Two-Eyed Seeing approach in which Indigenous and Western knowledge systems contribute in parallel to the decision making process. (Reid et al. 2020, 254)

Another important aspect of Two-Eyed Seeing is that it is action-oriented. It cannot remain in the academic or theoretical sphere but must be put into practice as “knowledge transforms the holder and that the holder bears a responsibility to act on that knowledge” (Reid et al. 2020, 249). There are an increasing number of disciplines implementing Two-Eyed Seeing, especially in the area of aquatic species conservation, which will be discussed in the following chapter in relation to program development.

Application

There is a great need for architects to adopt Two-Eyed Seeing as a guiding principle for the design process. This thesis provides a possible pathway to this by using three lenses, that of the fish, and the Mi'kmaw and Western worldviews together to create a new way of seeing to inform the architectural design. The Mi'kmaq and fish perspectives are interconnected as the Mi'kmaw worldview draws upon the wisdom of the natural world. The following chapters discuss the concepts of science, relationality, language and place through these lenses and the translation of these guiding principles to a design framework.

Before continuing it must be stated that in this thesis, the Mi'kmaw eye cannot be represented with its full breadth and depth as I am not Mi'kmaw and the process was not a collaboration between myself and those that hold the Mi'kmaw worldview. That being said, the information used to gain an understanding of the Mi'kmaw worldview comes from reliable sources and includes conversations with Mi'kmaq individuals in the academic community at Dalhousie. I am very grateful for their input; however, I cannot claim to truly see from the Mi'kmaw lens within the time constraints of the thesis.



ARCHITECTURAL DESIGN

This diagram illustrates the methodology for the architectural design.

Chapter 4: Two-Eyed Seeing and Science

Interpretations of Science

In the Foreword of Cajete's *Native Science*, Leroy Little Bear discusses how "scientific facts are as much a product of the observer's human nature as they are of an underlying reality" (Cajete 2000, ix). Our perceptions of what is considered valid scientific knowledge is shaped by Western ways of knowing that compartmentalize science into the mathematical discipline which limits our ability to understand the constantly changing nature of the earth and how we fit into these rhythms and cycles. Since the natural world is always changing, scientific facts are never static. As Cajete says, Western Science "leaves out the sacredness, the livingness of the world" (Cajete 2000, ix-x). Native Science is built of a collective knowledge accumulated over thousands of years of lived human experience with the natural world. It is "born of a lived and storied participation with the natural landscape" (Cajete 2000, 2). It can include a broad range of topics such as metaphysics and philosophy; art and architecture; practical technologies and agriculture; ritual and ceremony and for this reason, it is not accepted as science by the Mainstream scientific community (Cajete 2000, 2).

In comparison to the results-focused Western paradigm, Native Science also holds a high value for the research process and specifically the relationships that are developed along the way, which will be further discussed in the following chapter. Indigenous cultures view animals and humans as equal beings with the same right to live on this earth,

which is reflected in their approach to species conservation research (Cajete 2000, 152). Although these authors do not discuss Mi'kmaw culture directly, these principles are shared by many indigenous cultures including the Mi'kmaq.

With the declining state of our natural world, including the threat of extinction of the IBoF Atlantic salmon, it is critical that we include multiple perspectives in conservation research. This thesis uses Two-Eyed Seeing to determine the strengths of both Western and Mi'kmaw science to develop program as well as a language of building construction and systems.

This diagram illustrates the expanded view of science from the Mi'kmaw worldview.

Developing Program

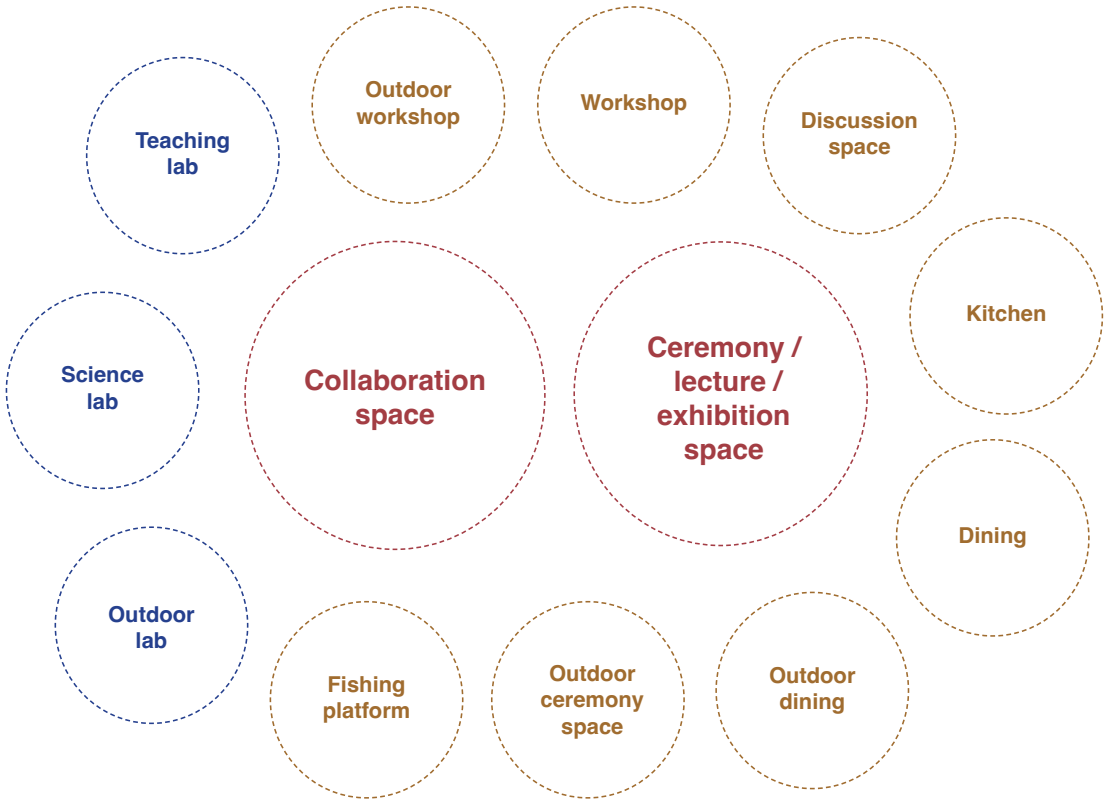
Smudging ceremony beside the Shubenacadie River (Mi'kmaw Conservation Group 2021)

Members of the Mi'kmaw Conservation Group prepare a tomcod for tagging (Apoqnmatulti'k 2021a)

Increasingly more organizations are using Two-Eyed Seeing as a method of collaboration between Indigenous and non-Indigenous groups in a variety of disciplines, including environmental conservation research. Two projects in Nova Scotia, the Shubenacadie River Monitoring Project and Apoqnmatulti'k, are using Two-Eyed Seeing to study the movements and habitat use of aquatic species in the region (Mi'kmaw Conservation Group 2021; Apoqnmatulti'k 2021b). Elements of Mi'kmaw and Western science are practiced symbiotically to gain new knowledge to inform decision making about the management and protection of these species.

Although these projects focus on other species including the Atlantic tomcod, American eel and lobster, the same principles can apply to Atlantic salmon research. The program for the design project is derived from these case studies and is described in the following diagram. The program prioritizes the practice of traditional Mi'kmaw culture focused on salmon conservation and sustainability but also includes spaces for Western science, as well as for collaboration between the two ways of seeing.

The Apoqnmatulti'k project, which in English translates to "we help each other," prioritizes relationship building (Apoqnmatulti'k 2021b). In the Mi'kmaw worldview, building respectful relationships between individuals is an important component of the research process, which will be discussed further in the next chapter. The project was developed as a collaboration between local knowledge holders, Elders, Mi'kmaq knowledge holders, harvesters, commercial fishers, government scientists and academic researchers. Although



This diagram describes the program for the design project. The Western worldview spaces are blue, the Mi'kmaw worldview spaces are brown and the collaborative program spaces are red.

each group had a different perspective on the value and management of the species, the process revealed many commonalties on which they could build strong working relationships.

Bridging Architectural Systems

In the Western paradigm, architects are taught to design spaces by superimposing a grid onto the landscape. Engineered building materials, such as steel and concrete, facilitate this approach to design. While there are many benefits to using these technologies as they have greatly expanded the boundaries of design by making high-rise structures and large spans possible, there are also large

ecological disadvantages that cannot be ignored, namely carbon emissions.

Canadian Museum of History (Douglas Cardinal Architect 2020)

Many Indigenous architects look to the natural environment to draw inspiration for their designs. Douglas Cardinal, a renowned Indigenous architect, is known for his organic curvilinear designs that are inspired by the forms found in nature (Tennant 2021). For example, Cardinal designed the Canadian Museum of History, located along the Ottawa River, to resemble rock formations that were sculpted by water and wind. It is important to Cardinal that the buildings he designs are in harmony with nature to remind the visitors that we are all a part of the natural world (Tennant 2021).

This thesis uses the strengths of Western and Mi'kmaq ways of making. The design of each architectural language is an expression of the way it is made.

Mi'kmaw Construction

The Mi'kmaw language of construction comes from the landscape. Traditionally the Mi'kmaq used locally available materials, of which trees were most abundant, to construct what they needed to live, from the scale of a basket to a canoe to a wigwam, a traditional Mi'kmaw dwelling (Crowfeather and Muin'iskw 2016). They understood how to use the strengths of different species and parts of the tree, as well as the optimum times in its growth cycle to their advantage. This method of construction requires a deep knowledge of the material which can only be developed from first-hand engagement over a sustained period. The process is driven by the unique properties and limitations of the naturally grown materials.

How the act of making is seen in the Mi'kmaw worldview can be understood through the construction of the traditional birch bark canoe. Each component of the canoe assembly relies completely on the other parts to give it its structural strength. The importance of this interdependence in the Mi'kmaw worldview will be further discussed in the next chapter.

The outer skin of the canoe is made of birchbark that is best harvested on a muggy day in July when the bark happily peels off from the inner layers (McMillan 2017). The birch bark is stretched and sewn to the hull using the strong root of the spruce tree. Once the ribs are heated so they can be bent, they are inserted into the structure and act as wooden springs stretching the skin in tension (Kroeker 2013).

Images of Mi'kmaq birchbark canoe construction process (McMillan 2021; Paul n.d.)

Bentwood truss (Kroeker n.d.)

Bentwood trusses in Pictou Landing Health Center (Kroeker n.d.)

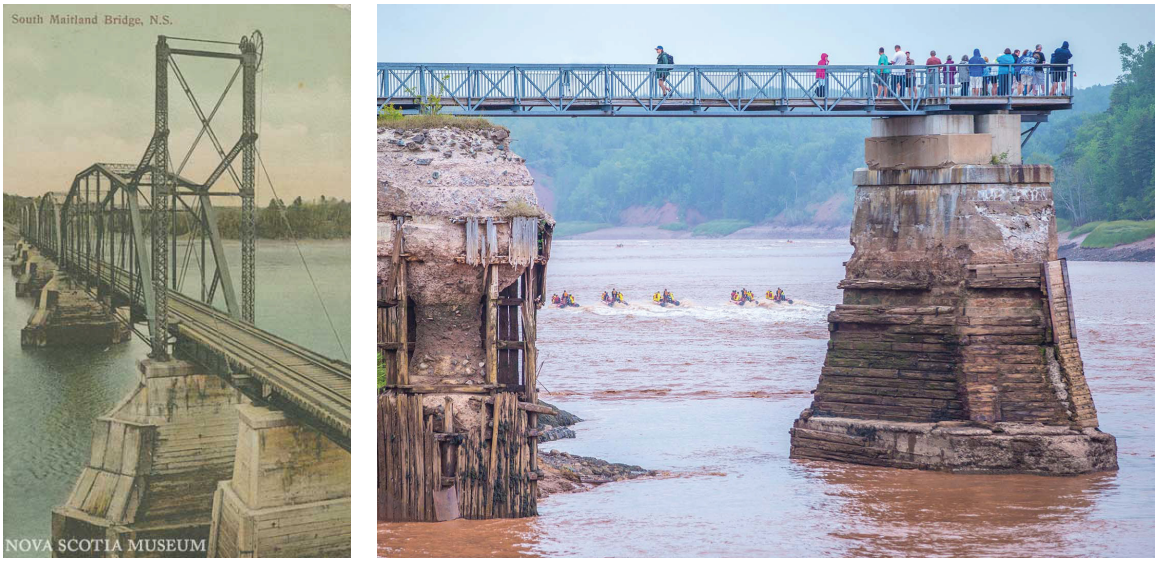
Inspired by the Mi'kmaw construction method, the thesis develops an assembly that is composed of a layering of natural materials. The primary structural system are bentwood trusses, which are a result of the long-term collaborative work done by Richard Kroeker, Professor Emeritus from the School of Architecture at Dalhousie University, and Elder Dr. Albert Marshall, a Mi'kmaw Elder. The bentwood trusses are an embodiment of Two-Eyed Seeing themselves. Kroeker studied the construction of the birchbark canoe as a way of understanding building in Mi'kmaw culture to inform the development of the bentwood truss. The trusses are built from small diameter timber, a plentiful local material in the region especially with many second growth forested areas. The wood is used while it is still green and pliable. The two poles are bent to forms and connected using stainless steel banding connectors to hold them together in tension (Kroeker 2013). The inherent bending capability of the wood creates curvilinear forms that mold to the human body and along with the warmth of the wood, welcome inhabitation. The layered building assembly creates opportunities to peel back layers to create openings and surfaces.

As the Mi'kmaq learn from the natural world, the design draws on the building techniques of the salmon. As will be discussed in Chapter 6, when building a Redd, a nest for their eggs, the salmon shape the landscape to take advantage of the natural water flow to remove waste. Although the salmon live in a different element, this same principle can translate to air movement. The design takes advantage of the dominant summer wind direction to passively cool the spaces.

Western Construction

In contrast, the Western language of construction is linear, rational and rigid, focused on efficiently connecting points together. Typically, bridges are constructed out of steel, due to its large span capabilities, light weight and durability, and concrete is used for substructural elements.

This language of construction is detached from the landscape, coming to it and not from within it. The structure hovers over the land and water, spanning larger distances across the river. Through steel trusses, mechanical systems can supplement passive strategies supplying heating, cooling and ventilation to spaces when necessary.



Images of Western ways of building bridges (Amine n.d.; NovaScotia n.d.)

This thesis puts these two construction languages in dialogue with each other but separates them with a gap which becomes a space for engagement. This will be illustrated in the design chapter.

Chapter 5: Two-Eyed Seeing and Relationality

Perceptions of Relationships

The Mi'kmaw phrase "Msit no'kmaq", which means "all my relations," best encompasses the Mi'kmaw worldview (Denny and Fanning 2016, 1). The idea of relationality is deeply embedded within the structure of their language, their relationship with the land and in the process of conducting research. Everything is understood and referred to in terms of its relationship to other beings, acknowledging that we are all highly interdependent (Sable and Francis 2012). This includes viewing plants and animals as equal beings to humans, as well as those that are not typically seen as living beings such as rivers and rocks. In Western epistemology, relationships with the environment are usually one-sided, intended to benefit humans. This dynamic is evident in the Western science research paradigm as species are seen as objects instead of living beings.

As Shawn Wilson, an Opaskwayak Cree author, explains in his book *Research Is Ceremony* that indigenous research is a practice of building relationships and trust with the entities being studied through respect and time (Wilson 2008). Ceremony is one of the ways that Indigenous people make connections with the natural world as it is an act of gratitude for the gifts it provides and an acknowledgement of its sacrifices. Ceremony aims to reduce the separation between individuals and between humans and their environment. Indigenous research follows these same principles and is in itself a sacred ceremony.

Additionally, it is critical that there is no ownership over knowledge gained from research. It must be shared with the community. As Elder Dr. Albert Marshall said “knowledge is spirit, not a property or a commodity” (Bartlett, A. Marshall, and M. Marshall 2012, 336) Knowledge sharing is an important aspect of maintaining relationships between groups. For example, Elders have a responsibility to pass on the knowledge they have accumulated to the next seven generations (Bartlett, A. Marshall, and M. Marshall 2012, 336).

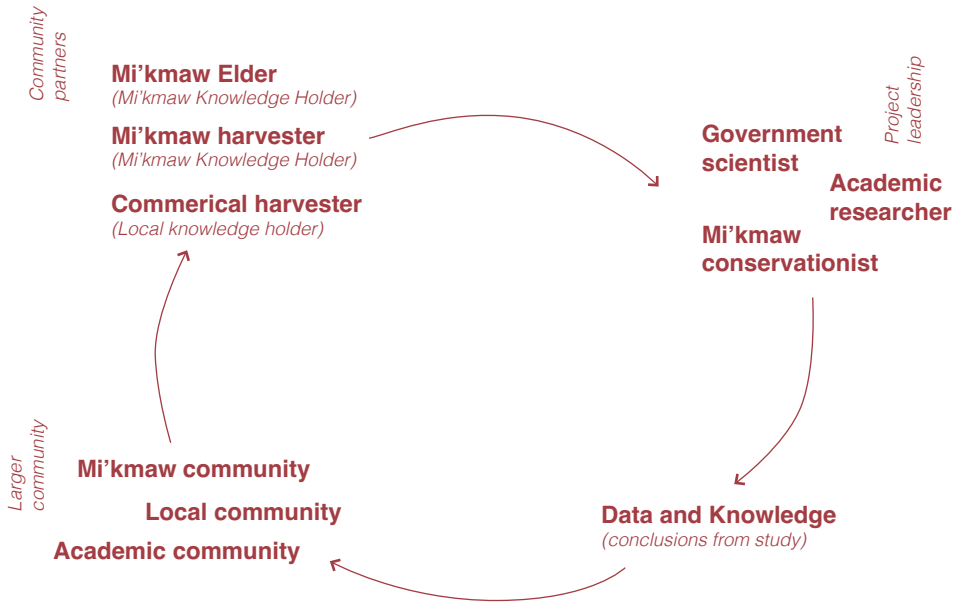


Diagram illustrating knowledge sharing based on Apoqnmatulti’k project (Apoqnmatulti’k 2021b)

In the report titled “What We Have Learned: Principles of Truth and Reconciliation,” the Truth and Reconciliation Commission of Canada (TRC) defines reconciliation as “an ongoing process of establishing and maintaining respectful

relationships” which includes concrete actions to repair the damaged trust to individuals and communities (The Truth and Reconciliation Commission of Canada 2015, 121). This thesis views architecture as a place for the development of long term partnerships to move towards reconciliation.

Introducing Actors

Seven actors that represent the different ways of seeing are used as both design and narrative development tools to communicate how the experience of the architecture facilitates reciprocal relationships between these groups. Three of the actors are members of the non-human world, the River itself, the Atlantic salmon and its predator the striped bass. Two actors hold the Mi’kmaw worldview: the Mi’kmaw Elder, who holds generations of collective knowledge of the environment and the Mi’kmaw conservationist who works to protect the salmon using Mi’kmaq practices of salmon governance. The academic researcher sees from the Western lens and is a marine biology student focusing on Salmon migration patterns. The conservationist becomes a liaison between the worldviews, working with the Indigenous and Western project partners. Lastly the group of local elementary students represent the importance of passing down Mi’kmaw knowledge of the natural world and sustainable practices to ensure its prosperity for the next generations.

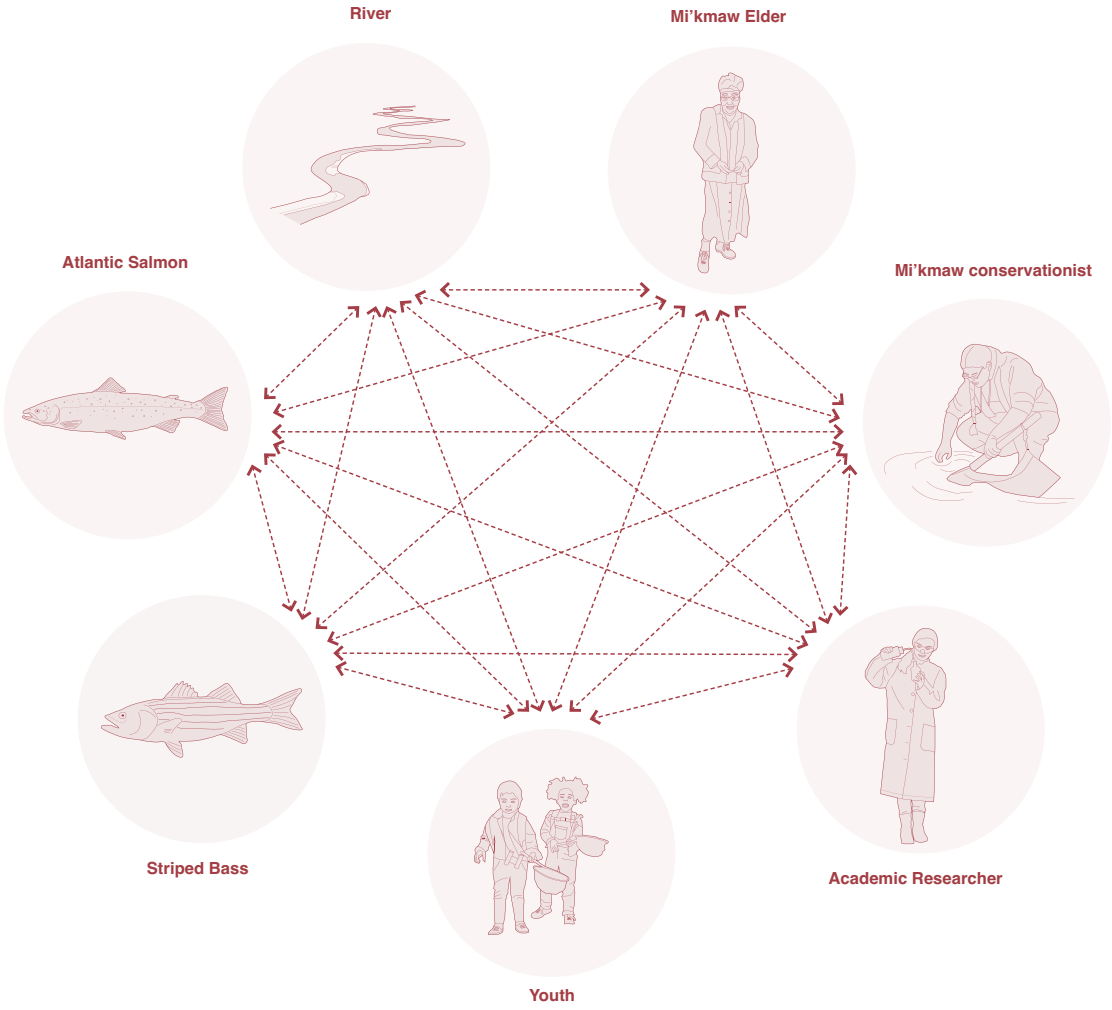
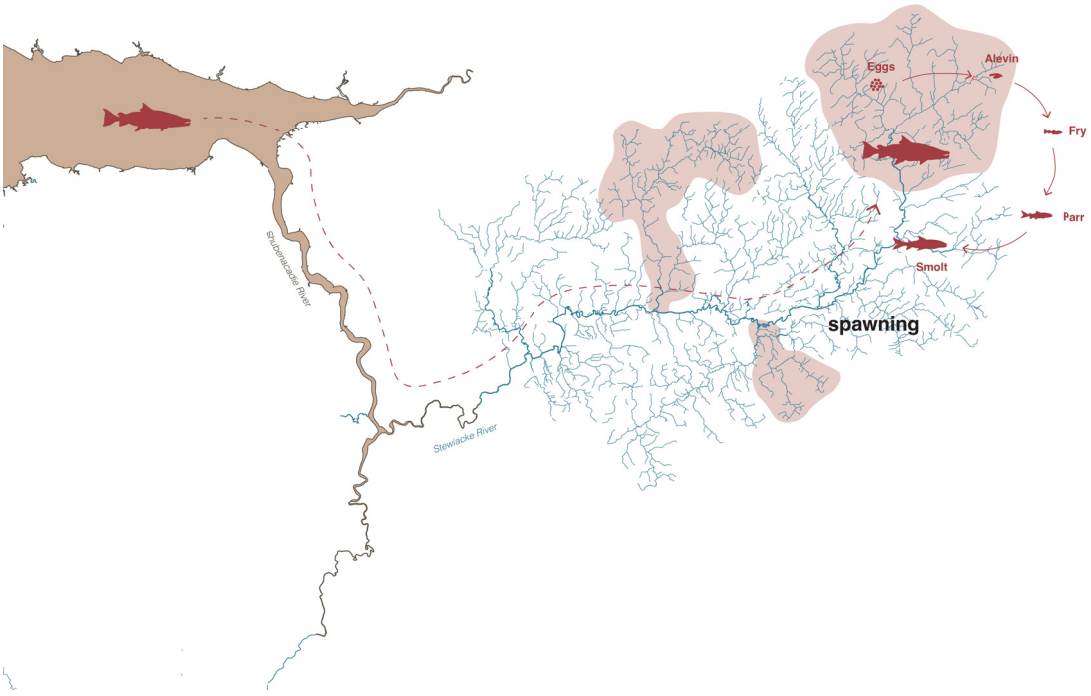


Diagram of actors showing mutual relationships between them

Chapter 6: Two-Eyed Seeing, Language and Place

Salmon and Place

Atlantic salmon have a unique anadromous life cycle, migrating from the ocean to freshwater rivers to spawn. Each summer, IBoF salmon make their way from the Bay of Fundy to the freshwater reaches of the Stewiacke River to spawn in the fall. The salmon have a strong sense of place. Unlike other population units, IBoF salmon are frequently able to survive after spawning and spawn again the next year, habitually returning to their natal river (Jones et al. 2020, 1).



Map of salmon spawning migration route along Shubenacadie and Stewiacke Rivers. The pink areas shown on the map indicate the remaining rivers that have been observed to support spawning. (Data from Jones et al. 2020)

The ideal spawning habitat for the salmon are riffles; areas of shallow water depth with high velocity water flow over gravel or boulder substrate, creating surface disturbance. The female salmon constructs a nest for her eggs, called a Redd, by rapidly beating her tail to excavate a depression in the streambed. The salmon modifies the landscape to create a form that makes use of the environmental conditions available to create clean and nutrient rich space for their young. The deposition exposes the raised mound of gravel to the fast-flowing water, increasing the amount of oxygen available and removing waste while at the same time creating protection from predators and currents (Department of Fisheries and Oceans Canada 2010).

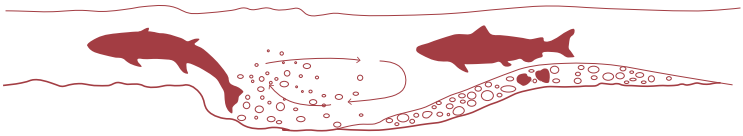


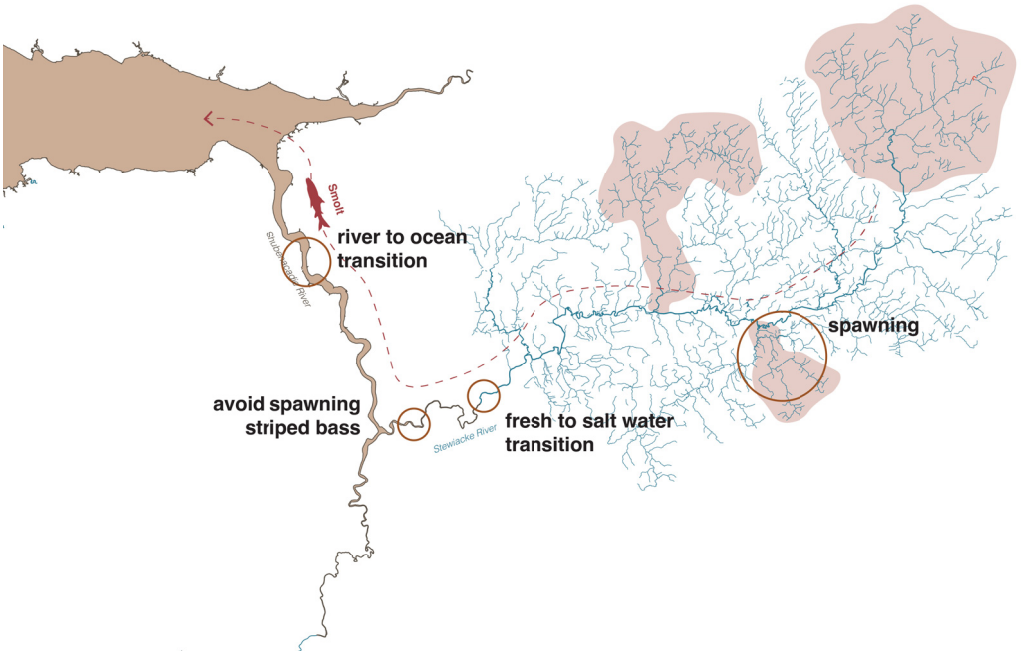
Diagram of salmon Redd construction (Department of Fisheries and Oceans Canada 2018)

After the eggs hatch, the young continue to occupy the Redd as alevin and fry, and only emerge once they are free swimming fish known as parr. After two years in freshwater parr undergo smoltification, a physical and physiological change to allow them to survive during their transition from fresh to salt water (Khaw et al. 2021). Now known as smolts, the young fish are ready to make their first journey to the Bay of Fundy in the spring. Although the smolts typically make this trip in one to two tidal cycles they are at high

risk to predators due to their small size and low numbers. Striped bass spawn at head of the estuary at the same time as the smolts are trying to leave the river. With increasing striped bass populations in the Stewiacke River, the bass are consuming almost half of the smolts before they even reach the mouth of the Shubenacadie River (Withers 2019). For the smolts that make it to the mouth of the river this is an accomplishment that gives them the opportunity to feed and grow in the ocean to one day make the same spawning migration themselves.

Selecting Site

This thesis highlights this Atlantic salmon smolt migration route from the upper tributaries of the Stewiacke River to the mouth of the Shubenacadie River. Four significant locations for the salmon along this route are selected as sites for architectural design, as indicated on the following map.



Map of selected sites along salmon smolt migration route

Spawning

The first site is along Goshen Brook, a small tributary in the upper reaches of the Stewiacke River that has been known to support repeat spawning, an indication that this location is an ideal habitat and therefore holds importance to the salmon (Jones et al. 2020). For this reason, it is also one of the locations that fry are released as part of the Live Gene Bank program in attempt to help increase population numbers. Here the riverbed is rocky, composed of a mix of gravel and boulders.

Images of first site

Fresh to Saltwater Transition

The second site is at the head of the tide, the boundary where freshwater first encounters salt water. Due to the watershed's connection to the Bay of Fundy, the lower portion of the Stewiacke and Shubenacadie Rivers are tidal. Just upstream from this, in the freshwater portion of the river, is the location of the Rotary Screw Trap, installed each spring to monitor and tag the smolts.

Image of Rotary Screw Trap (Mi'kmaw Conservation Group 2014) and second site (Google Maps 2014)

Avoid Spawning Striped Bass

The third site is the area of spawning for the striped bass, a predator species for the young salmon smolts that are on their journey to the Bay of Fundy. This portion of the river is characterized by its clay river banks that are molded by the water flow.

Image of third site at low and high tide

River to Ocean Transition

The final site is approaching the mouth of the river as it empties into the Cobequid Bay, the finish line of the journey to the ocean but the beginning of a new experience in the wide-open waters. At the mouth of the Shubenacadie River, water level changes can be as much as eleven meters in height (Martec Limited 2007).

Images of fourth site (Jetlover X 2022)

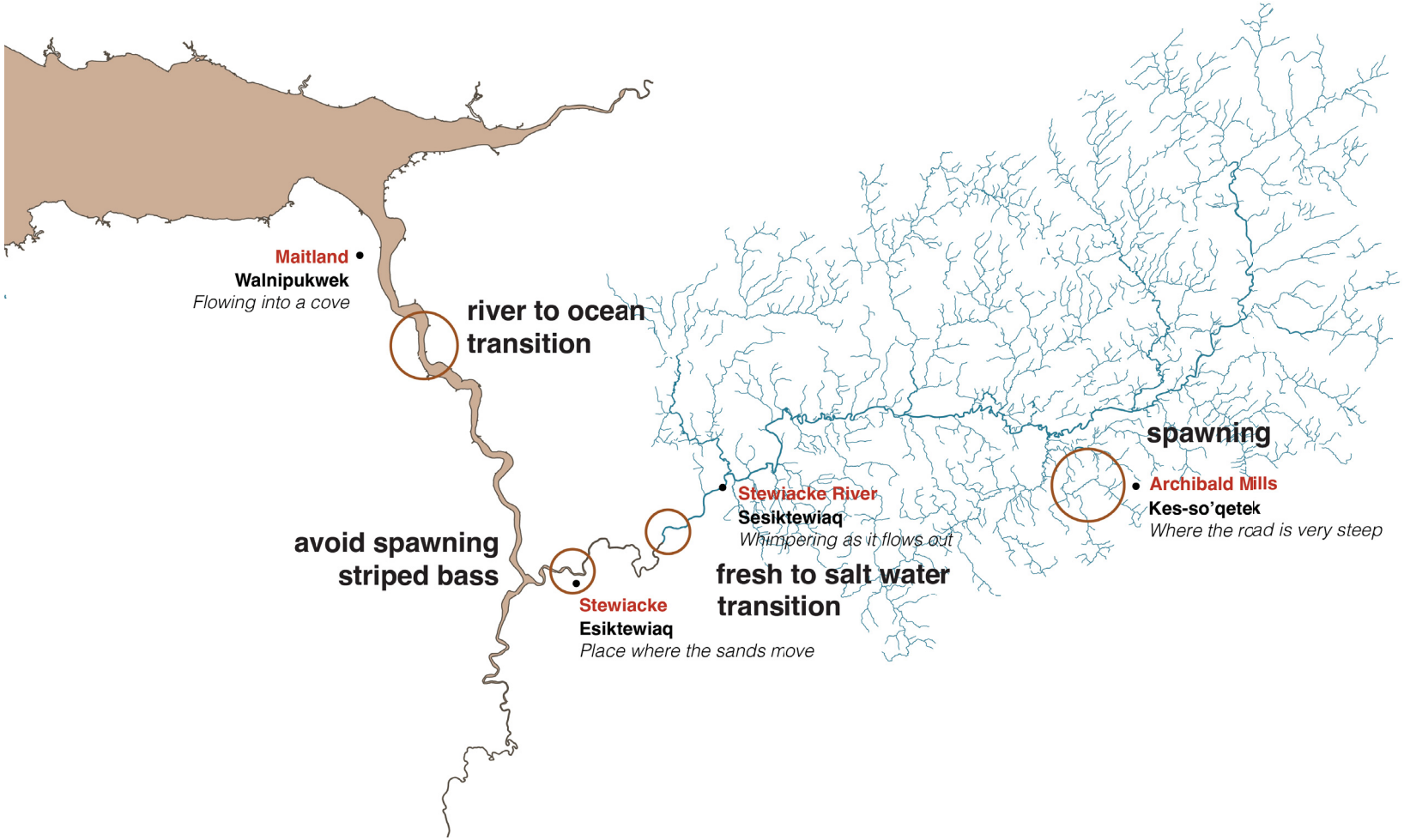
Language and Place

Language is a key component in understanding a place's significance to a particular culture. In *The Language of this Land, Mi'kma'ki*, language is described as "the unique reflection and expression of how culture's structure, give meaning to, and interact with the world" (Sable and Francis 2012, 28). The Mi'kmaw language and culture are intimately tied to the land of Mi'kma'ki which is expressed in the Mi'kmaw concept Weji-sqalia'timk, meaning "we sprouted from" (Sable and Francis 2012, 17).

The Mi'kmaq mapped the land using place names as oral maps, which described features of the landscape, historical events, important resources or acted as mnemonic devices to remind people of cultural knowledge tied to the place (Sable and Francis 2012, 50). Along with the language, these place names have been largely erased by colonization which has had a direct impact on the loss of culture and connection to the land. In contrast, the colonial names are often named after people that have achieved high status within the society or after an industry that takes place in the area. Many of them are also anglicized derivatives of the Indigenous name.

The following map compares the Mi'kmaq and colonial place names, and translations, for the selected areas along the Shubenacadie and Stewiacke Rivers. Spatially mapping these words uncovers the historical significance of each place from both lenses.

Using Two-Eyed Seeing, this thesis acknowledges both the Mi'kmaq and colonial names, however the project chooses to highlight the Mi'kmaq place names as they have been deliberately erased from the public consciousness. The

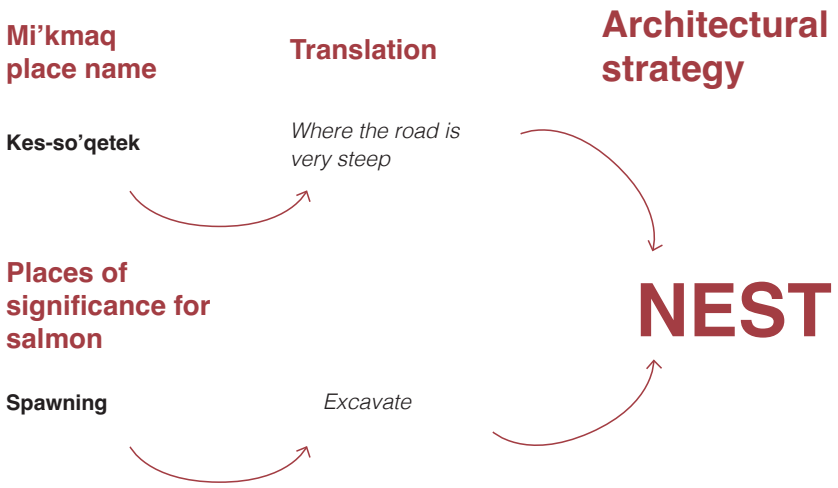


This map compares Mi'kmaq and colonial place names for the selected sites (Bernard 2022; The Governor General of Canada 2007)

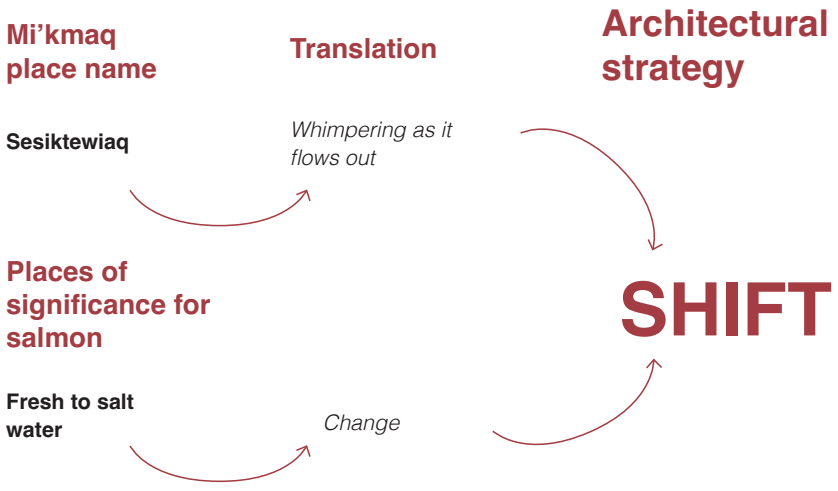
Mi'kmaq place names in this region describe different characteristics of the landscape and river which allows the reader to gain an understanding of the physical environment through language. Kes-so'qetek, which translates to "where the road is very steep", describes the significant elevation change in the Archibald Mills area, creating areas of fast-moving water, a key characteristic of spawning habitat for salmon (Bernard 2022). The Mi'kmaw word for Stewiacke River, Sesiktewiaq translates to "whimpering as it flows out" which describes the quantity and sound of the water flow. The word for Town of Stewiacke comes from the Mi'kmaw word Esiktewiaq which means "place where the sands move". This describes how the sandy riverbed and banks morph with water flow in this winding section of the river (The Governor General of Canada 2007). Walnipukwek translates to "flowing into a cove" which describes the transition point between the water flowing out of the Shubenacadie River and into the Cobequid Bay (Bernard 2022).

Verbs

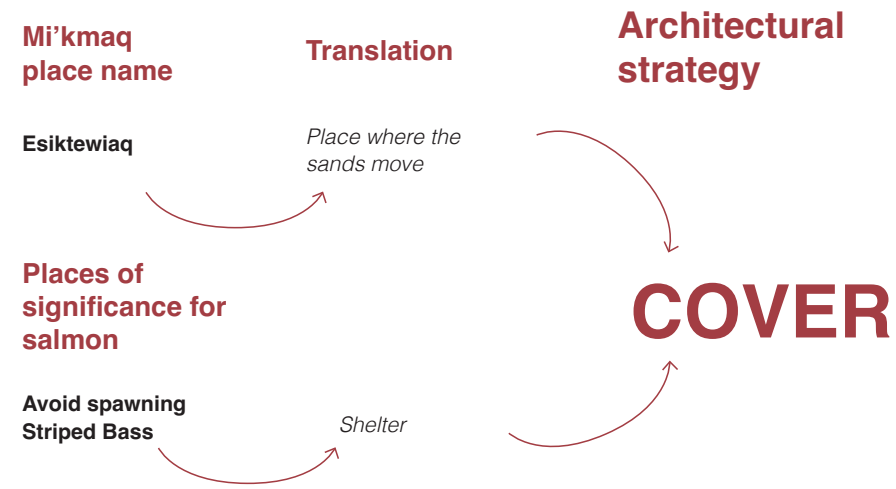
In contrast to the object-focused English language, the Mi'kmaw language is verb-oriented, focused on movement, which reflects the way in which they perceive the world as continually in flux (Sable and Francis 2012, 30). To encapsulate this idea of movement and translate it to architecture, each site is named with a verb that is reflective of both the moment in the salmon's journey and the Mi'kmaw place name in that area, as illustrated in the following diagrams. The verbs are "Nest," "Shift," "Cover" and "Bridge", adding another layer of language to the landscape palimpsest.



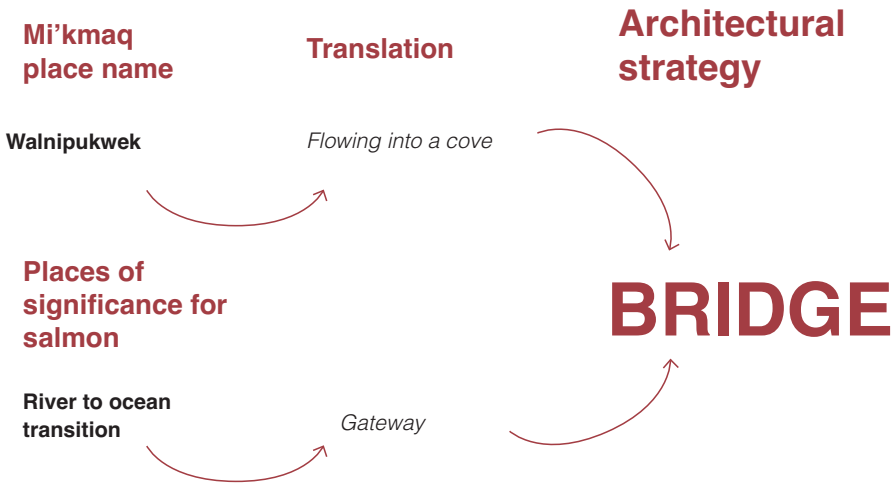
"Nest" is inspired by both the Mi'kmaw name for this area which means "where the road is very steep" and how the salmon builds a nest, called a Redd, for their eggs. The Redd is constructed by the salmon beating their tail to create a depression in the streambed and then covering the eggs with loose gravel to better expose them to the water flow. The steep topography in the area creates fast-moving water which supplies oxygen to the Redd and carries away waste.



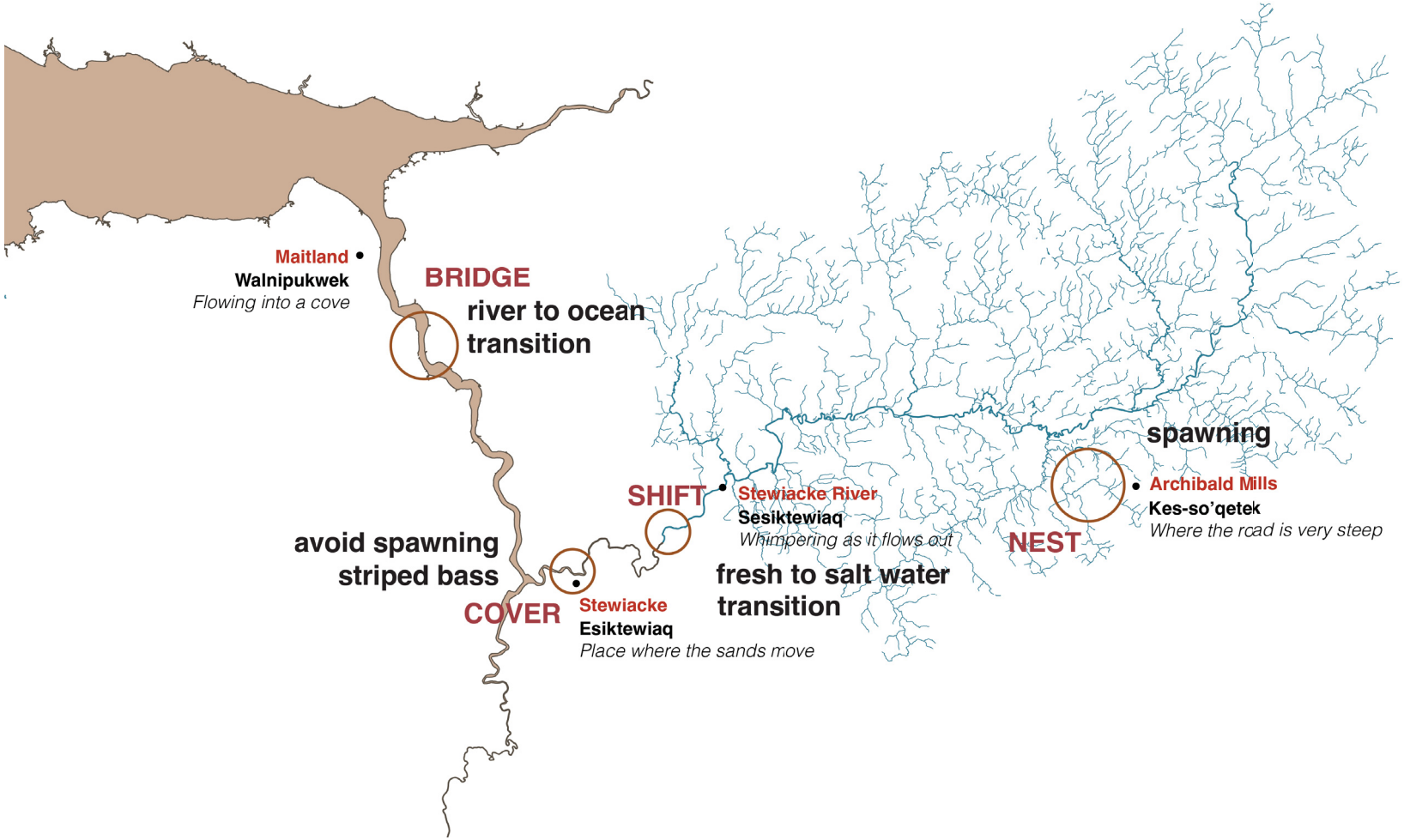
"Shift" is inspired by the Mi'kmaw word for Stewiacke River that translates to "whimpering as it flows out" which describes the movement of the water flow and the point in the salmon's journey where the water changes from fresh to salt. This is also marked by the Rotary Screw Trap used to collect smolts to measure and tag before they enter the tidal portion of the river.



"Cover" is inspired by the Mi'kmaw word for the Town of Stewiacke that means "place where the sands move" as the water is constantly covering and uncovering areas of the riverbed and reshaping the sand banks. It is also reflective of the need for the salmon smolts to shelter from their predator the striped bass.



"Bridge" is inspired by both the Mi'kmaw name for Maitland that means "flowing into a cove" and the salmon's transition from the river to the ocean. The act of bridging marks the gateway to the wide-open waters of the ocean.



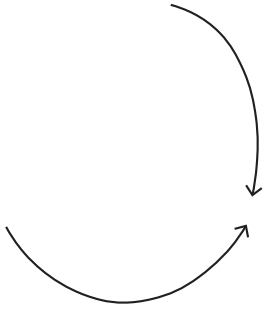
This map illustrates the verbs layered on the selected sites.

Translation from Text to Form

Architects are tasked with translating ideas into form which is often encapsulated by keywords that drive the overall design. This is an act of translation from one language to another, as architecture is in itself a way of communicating through form and material. As Chernikhov discusses in relation to the methodology of Constructivism, there are many ways that building elements can come together to create a unified structure (Reno 1992). Although the overall form is inspired by the Mi'kmaw place name and salmon migration, the design is created using the two architectural languages that are representative of the strengths of the Mi'kmaw and Western worldviews. The action of the four verbs determine how these two architectural languages come together. In the same way that Two-Eyed Seeing respects the autonomy of the unique perspectives, the two design languages maintain their individual qualities while at the same time supporting each other to create a new type of space.

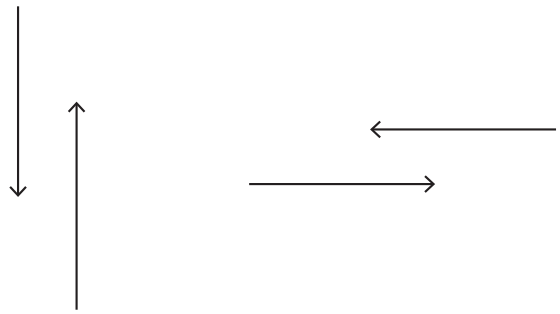
This thesis translates the four verbs, "Nest," "Shift," "Cover" and "Bridge", into form using the physical action that is associated with the meaning of each verb.

Nest



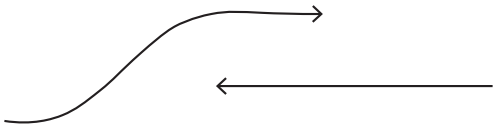
Arrow diagram illustrating action of "nest"

Shift



Arrow diagrams illustrating actions of “shift”

Cover



Arrow diagram illustrating action of “cover”

Bridge

Arrow diagram illustrating action of “bridge”

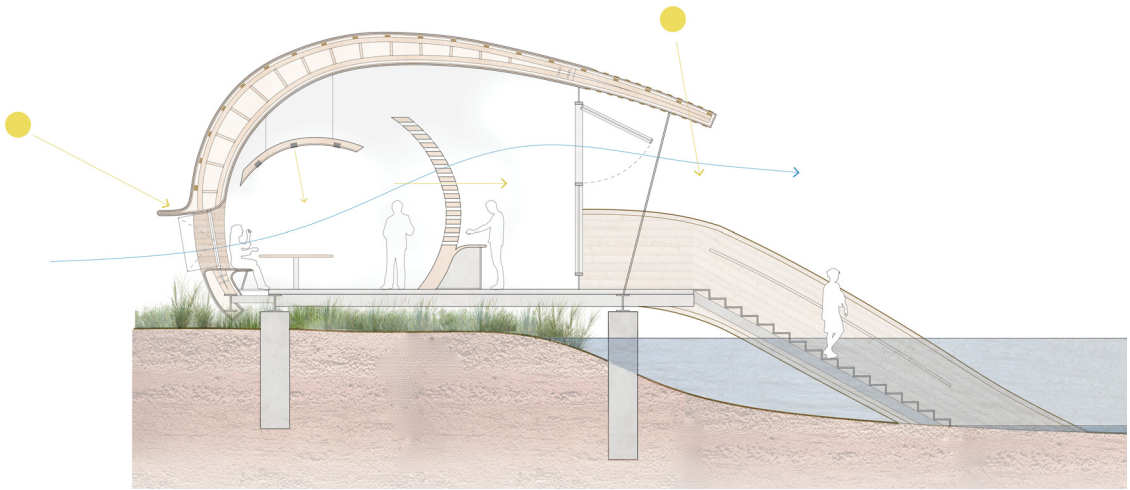
Chapter 7: Design

Key Design Principles

The following conceptual section illustrates how the two structural languages come together and outlines the overall design principles for the project.

The structure of the engineered form is a system of steel trusses and I-beams on a grid allowing for large spans that hover over the landscape. Openings in the engineered form are independent of the structural elements.

In contrast, the organic form grows from the landscape. The structure of the organic form is wood, primarily bentwood trusses and where necessary glulam beams, and the cladding system is horizontal wood planks. Openings in the wood form are created by peeling away the wood cladding. These peeled elements create surfaces for inhabitation. The wood cladding becomes a screen when space does not need to be insulated to allow for light and air flow. The interior wood cladding peels off the wall to create a suspended ceiling with additional lighting over gathering spaces.



This conceptual section outlines the key design principles for the project.

The relationship between the two structural systems is important. Both systems work together to support one another but there is also a clear separation at their connection points. This gap, or space in between, becomes an inhabited void where disparate worldviews can engage.

Methods of Representation

The story of the architecture is told through a series of drawings that represent the multiple ways of seeing. Every method of representation is coded, indirectly conveying a set of values which has implications on how the architecture is perceived.

The axonometric drawing shows a perspective from above, allowing the viewer to understand the larger site context and gesture of the design. However, this “God like” view creates a hierarchy as the viewer is detached from the human realm. From above, both the landscape and architecture are seen as objects, akin to how the Western scientist sees the natural world.

In contrast, the section vignettes meet the inhabitants at eye level and depict the relationship between the body, architecture and landscape. The section cuts through and reveals each layer of the built form and ground, including what can be seen below the water’s surface. The detail section vignettes provide a more intimate reading of these relationships. This method of representation is more attuned to the Mi’kmaw worldview. The next sections illustrate how the outlined methodology applies to each site.

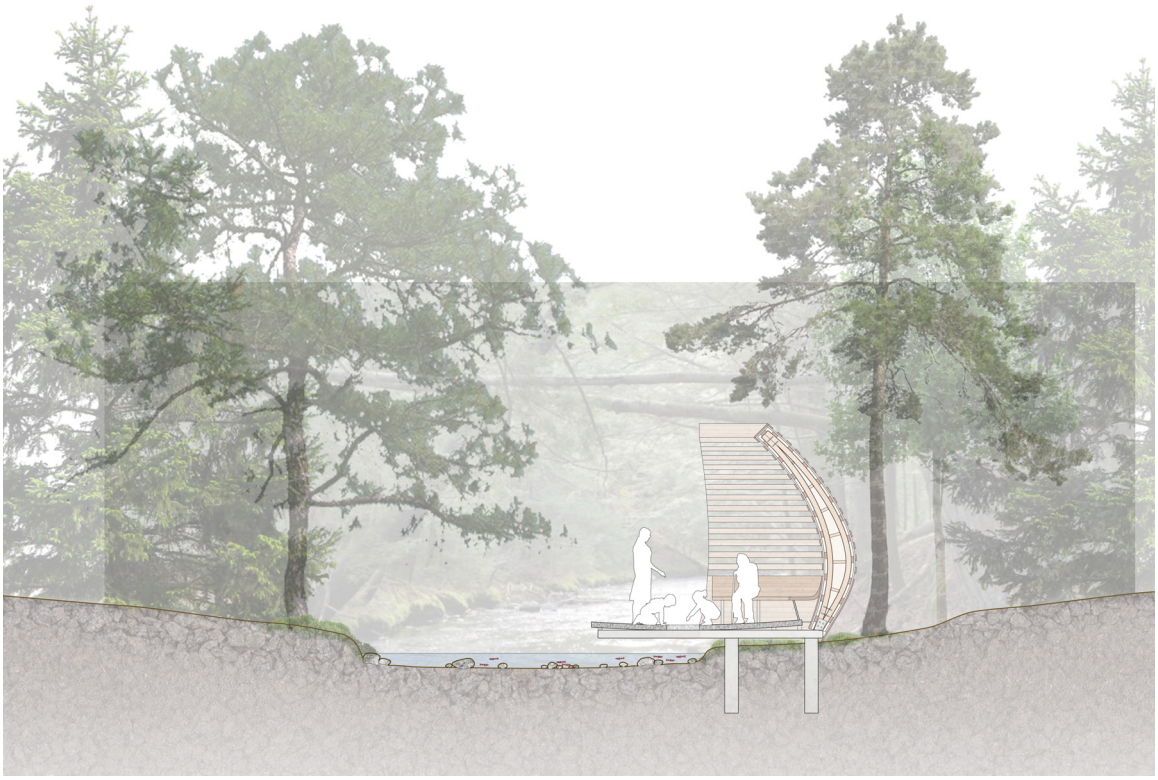
Nest

The first site is Nest. The sequence illustrated by the diagram below describes the translation of the verb “nest” into architectural form.

The concrete floor of the “nest” form is excavated to create a subtle curve.

The wood wall grows from the landscape, creating a tall vertical element that is evocative of the steep terrain nearby.

The site is remote, only accessible by an unpaved road. It is also delicate as any disruption of the streambed during spawning season is highly detrimental to the salmon. To allow humans to inhabit the river, the steel-supported concrete floor cantilevers over the water. The concrete has a rough exposed aggregate finish which is reminiscent of the gravel riverbed. The tall, curved wood wall created by a bentwood truss system is nestled within the tree canopy, providing a sense of enclosure while at the same time allowing air movement through the screened portion above the bench, similarly to how the mound of loose gravel protects the salmon eggs but still allows for water to flow.



The Nest structure is hidden in the trees and cannot be seen from above or in an axonometric view. This section drawing cuts through the ground and reveals the relationship between the cantilevered concrete floor and the shallow riverbed, and the curved wood screen and the tall pine trees.

Each year the conservationist and scientist release fry into the river. While still providing a space to artificially supplement the river with fry, the architecture encourages this act to be more than purely scientific. The design of the Nest structure transforms this human devised solution into a ritual and creates space for ceremony and celebration to honour the fish.

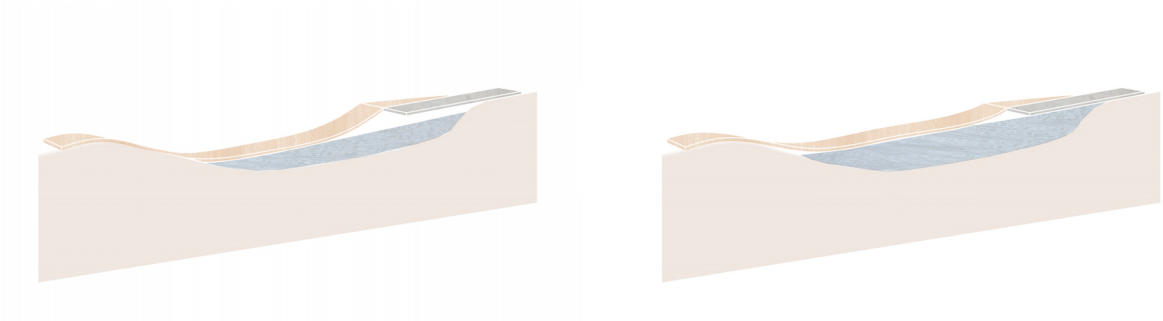
This vignette captures the moment in time when the elementary students are able to experience the river in a new way, observing the recently released fry from above and listening to a story told by the Elder about the life of the salmon.

The connection between the curved wood wall and concrete floor is marked by a change in material, a perforated metal screen that fills this separation, representing space for engagement between the two worldviews. This is the location of the bench, a symbolic place of meeting, listening and reflecting.

Shift

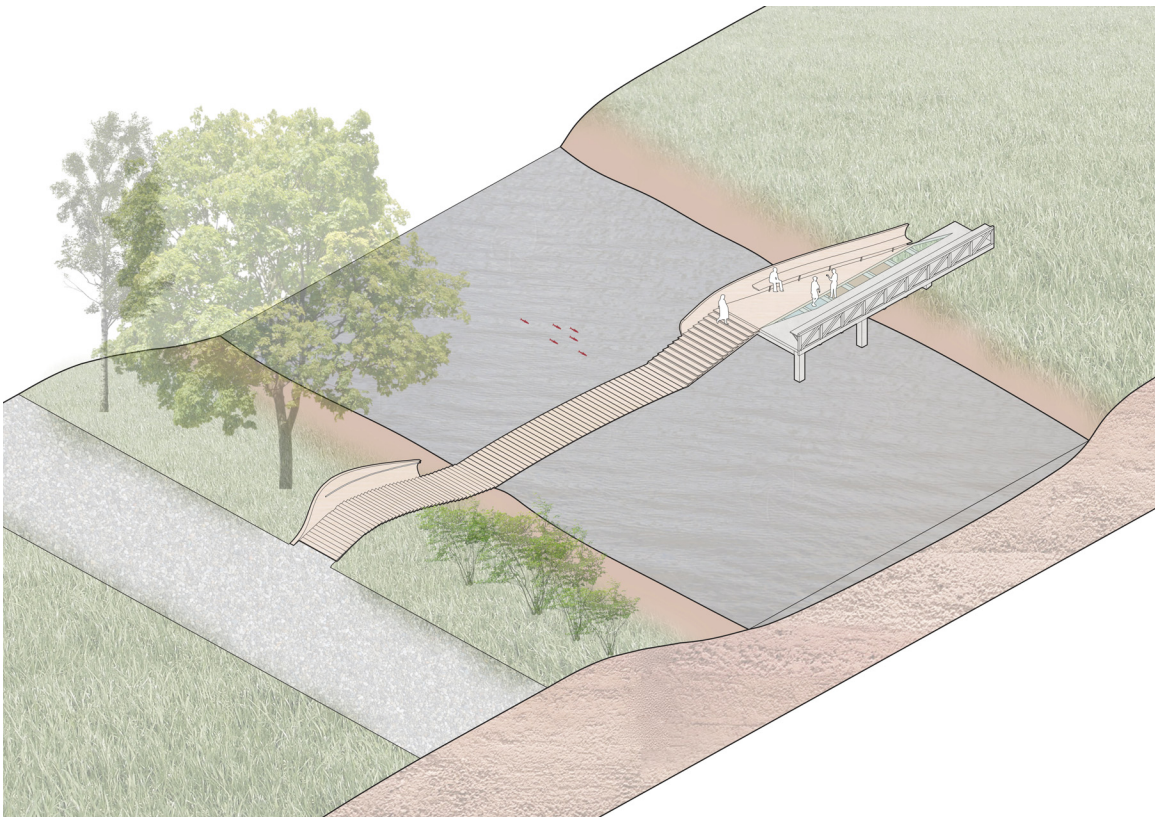
The next marker of the salmon smolt's journey to the ocean is the Shift bridge. The sequence illustrated by the diagram below describes the translation of the verb "shift" into architectural form.

The "shift" form is created through horizontal and vertical movement. First the bridge form shifts apart horizontally into the two material languages of wood and steel. Then the forms shift back together but remain distinct elements.



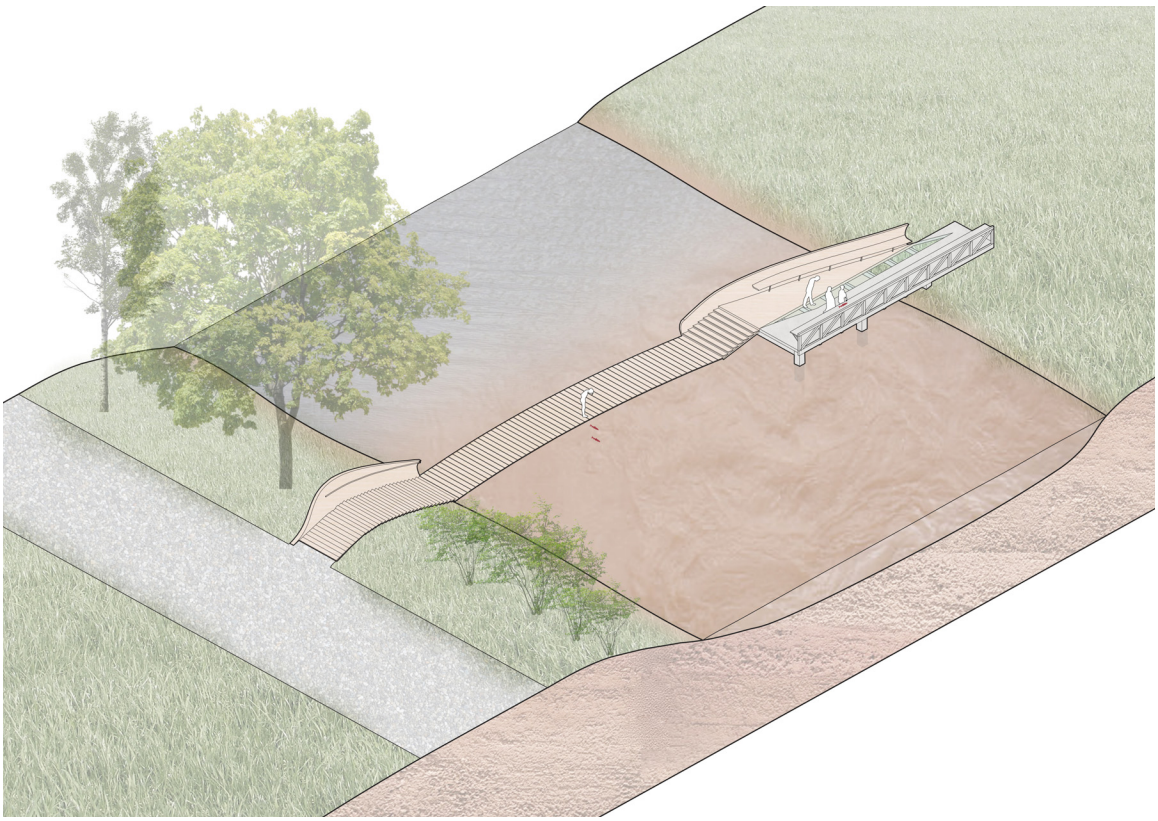
The wood form shifts down, taking on the shape of the topography and floating on the surface of the water whereas the steel form is rigid, hovering over the landscape. The wood path shifts up and down with the changing water level.

The access to the bridge is off a road leading to a public park. The Mi'kmaw conservationist and the academic researcher walk across the bridge to meet the Elder to discuss where to locate the Rotary Screw Trap this year. The wood deck path, constructed from planks, emerges from the landscape and guides them down to the level of the river. Crossing the floating wood plank bridge, supported by buoys, they feel the flow of the water beneath their feet before arriving on stable ground on the other side, an experience of the livingness of the river. On equal ground, the wood and steel structural systems meet but are separated by a glass panel that creates a gap, a space in between, for the two worldviews to engage.



The axonometric view illustrates the overall relationship of the wood and steel structures to the river.

A few hours later they notice that the bridge has shifted upwards, marking the subtle change in the water level, which signals the beginning of the tidal portion of the river. The Rotary Screw Trap is now installed, and they use the lab bench to carefully measure and tag each smolt before releasing them back into the river. The Elder sits on the wood bench which looks towards the steel lab bench, reminding them of the sacredness of the life of the fish.



The same view as the previous page illustrates the vertical shift of the bridge at high tide.

Cover

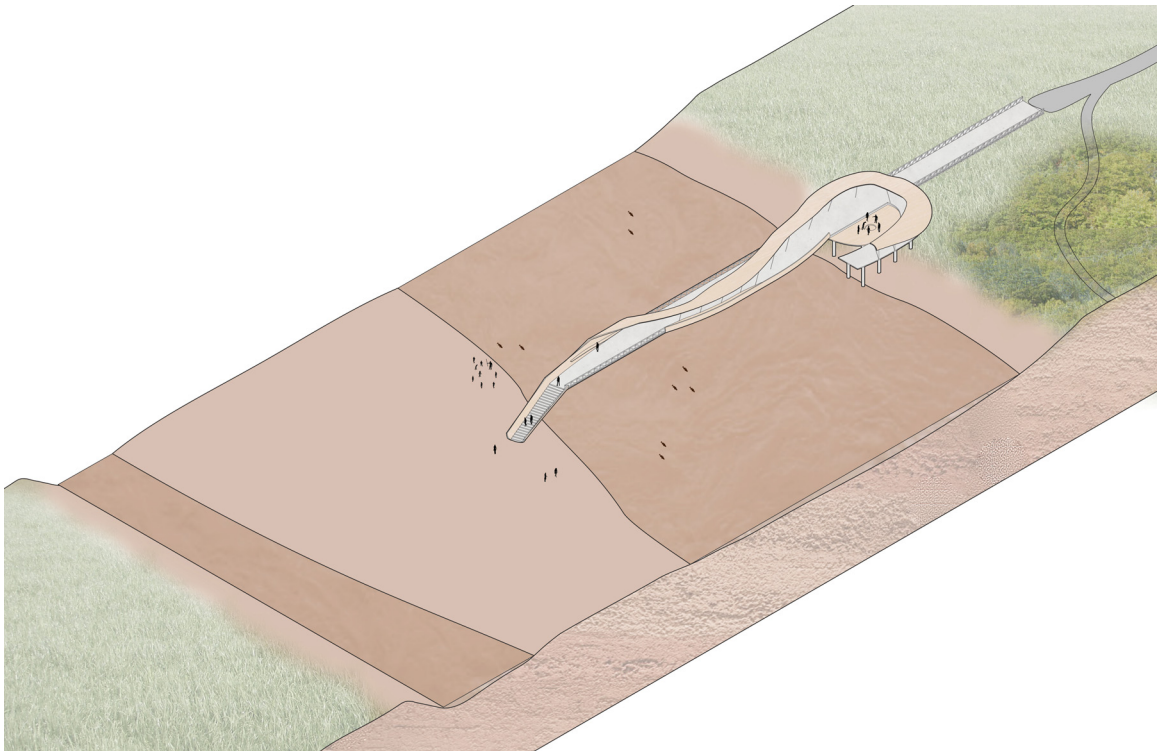
The next bridge is Cover. The sequence illustrated by the diagram below describes the translation of the verb “cover” into architectural form.

The “cover” form is created by the wood structure growing from the sandbar in the river and the steel structure extending towards it, hovering above the ground.

Once they meet, the wood structure curves around and over to create a canopy, covering the steel walkway.

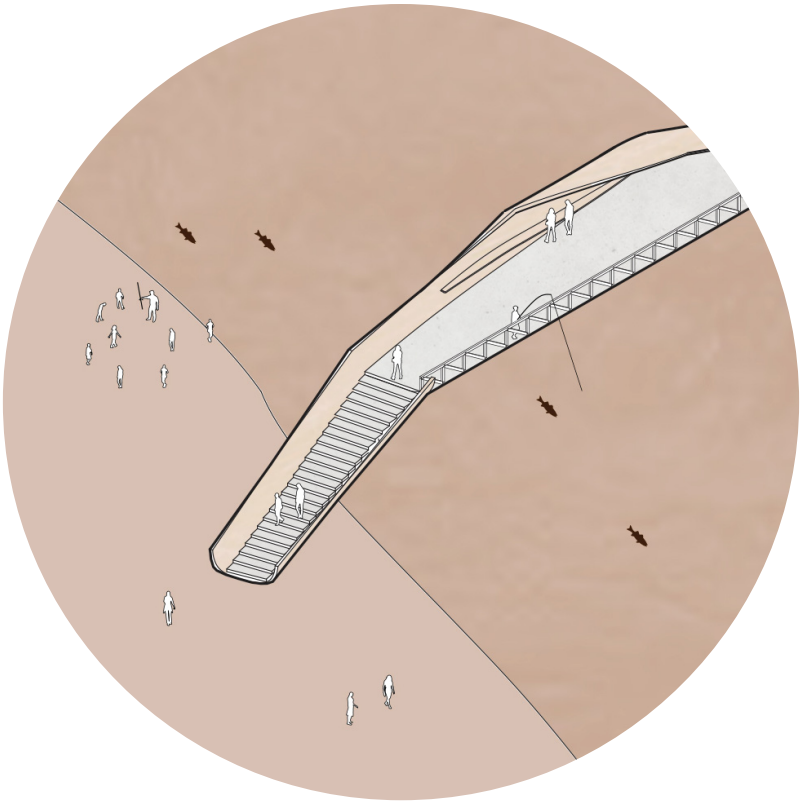
Together they bridge into the landscape, connecting the river’s edge and the sand bar.

The site is an outdoor recreation area for the town of Stewiacke. Although the park borders the river, there are few opportunities for interaction with the water along the soft clay banks. The “Cover” bridge extends one of the walking trails past the threshold of the water’s edge and across the river to the sandbar that is habitually uncovered at low tide. At the end of the bridge a stair leads down to the sandbar, allowing the public to inhabit the river. The stair acts as a marker in the river, revealing how the tide constantly reshapes the soft ground.



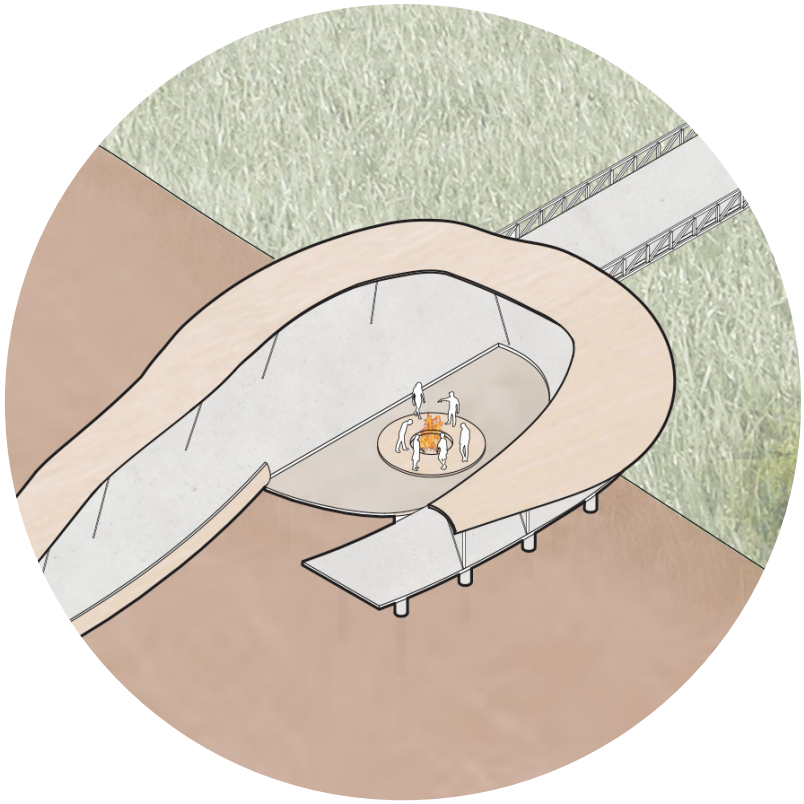
The axonometric view shows the overall gesture of how the bridge reaches out to the sand bar in the river, shown at low tide.

With an important facet of the Mi'kmaw approach to aquatic species management centered around fish harvesting, the architecture provides spaces for fishing using different methods, including casting a line from one side of the bridge and walking into the river from the sandbar to spear. Although the architecture is centred around the Mi'kmaw approach to salmon management, there is a small lab space used by the academic researcher to process non-edible parts of the fish for study.

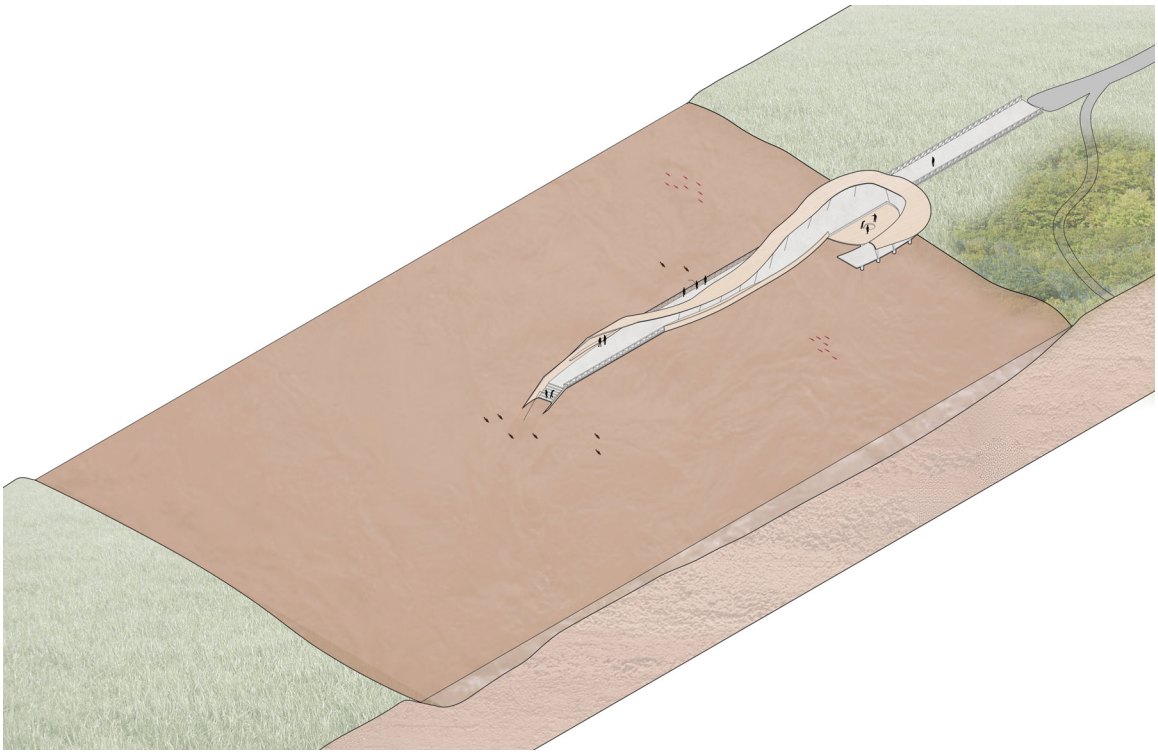


A vignette of the Mi'kmaw Elder teaching youth how to use a spear, a community member fishing from the bridge and the academic researcher dissecting a striped bass recently caught for dinner.

To support the practice of Netukulimk, to not waste any of the fish, the Elder uses the outdoor kitchen to prepare a striped bass to be cooked over the fire and shared communally in the outdoor dining space. The Mi'kmaw conservationist gathers recipes from the community to create a striped bass cookbook, as a way for the public to participate in the control of the growing bass populations and at the same time provide a source of food.



A vignette of the Elder, academic researcher, conservationist and community members gathered on the wood platform around the fire.

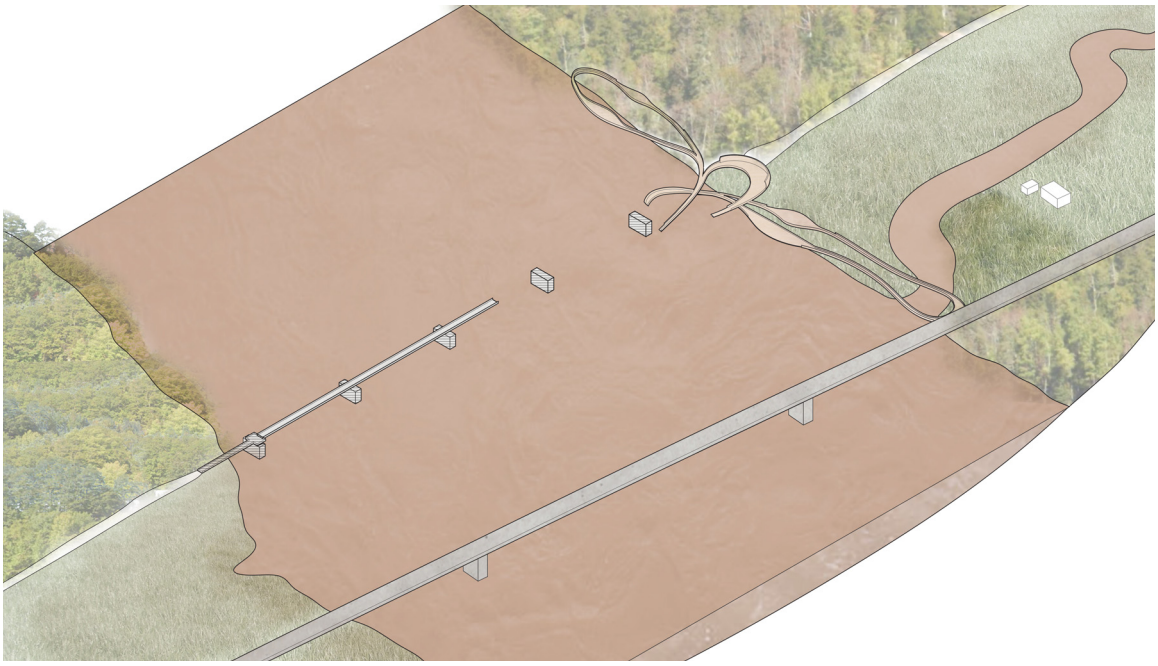


At high tide, the stair at the end of the bridge is covered by the clay-coloured water.

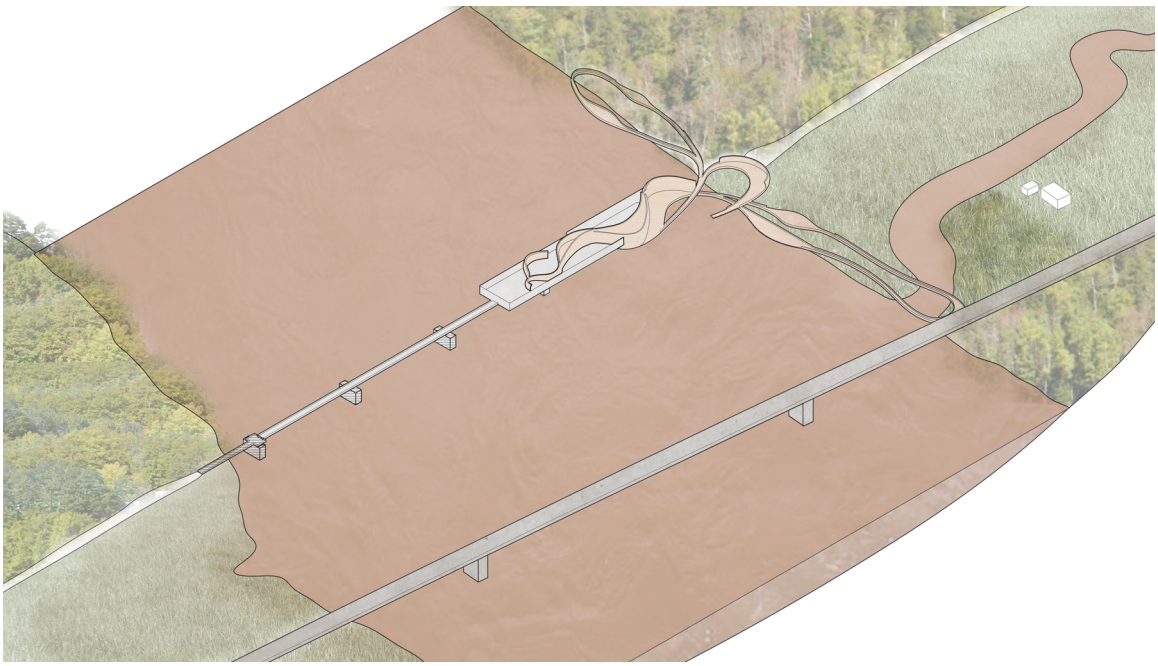
At high tide, the smolts use the treads of the stair to hide from the spawning striped bass.

Bridge

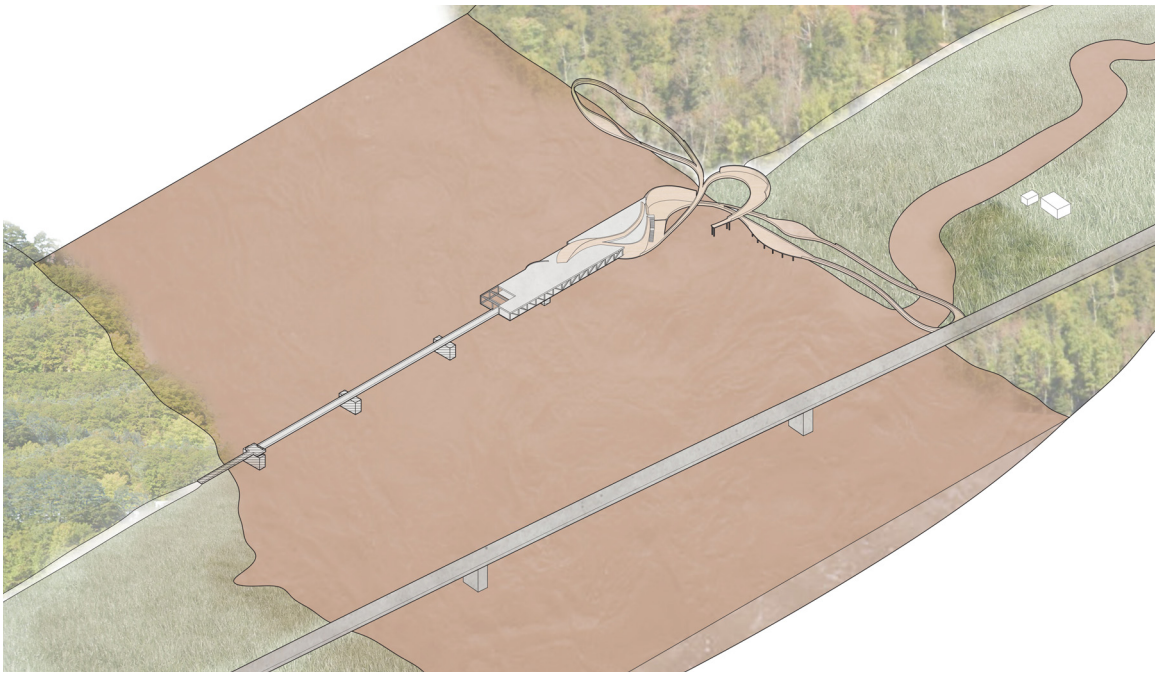
The axonometric views below describe the larger gesture of the translation of the verb “bridge” into architectural form.



The site is the location of a historical colonial train bridge. The old piers have since been used as a base for a lookout point. The design extends this steel lookout across the river. From the other side, the wood structure grows organically, creating paths through the landscape.

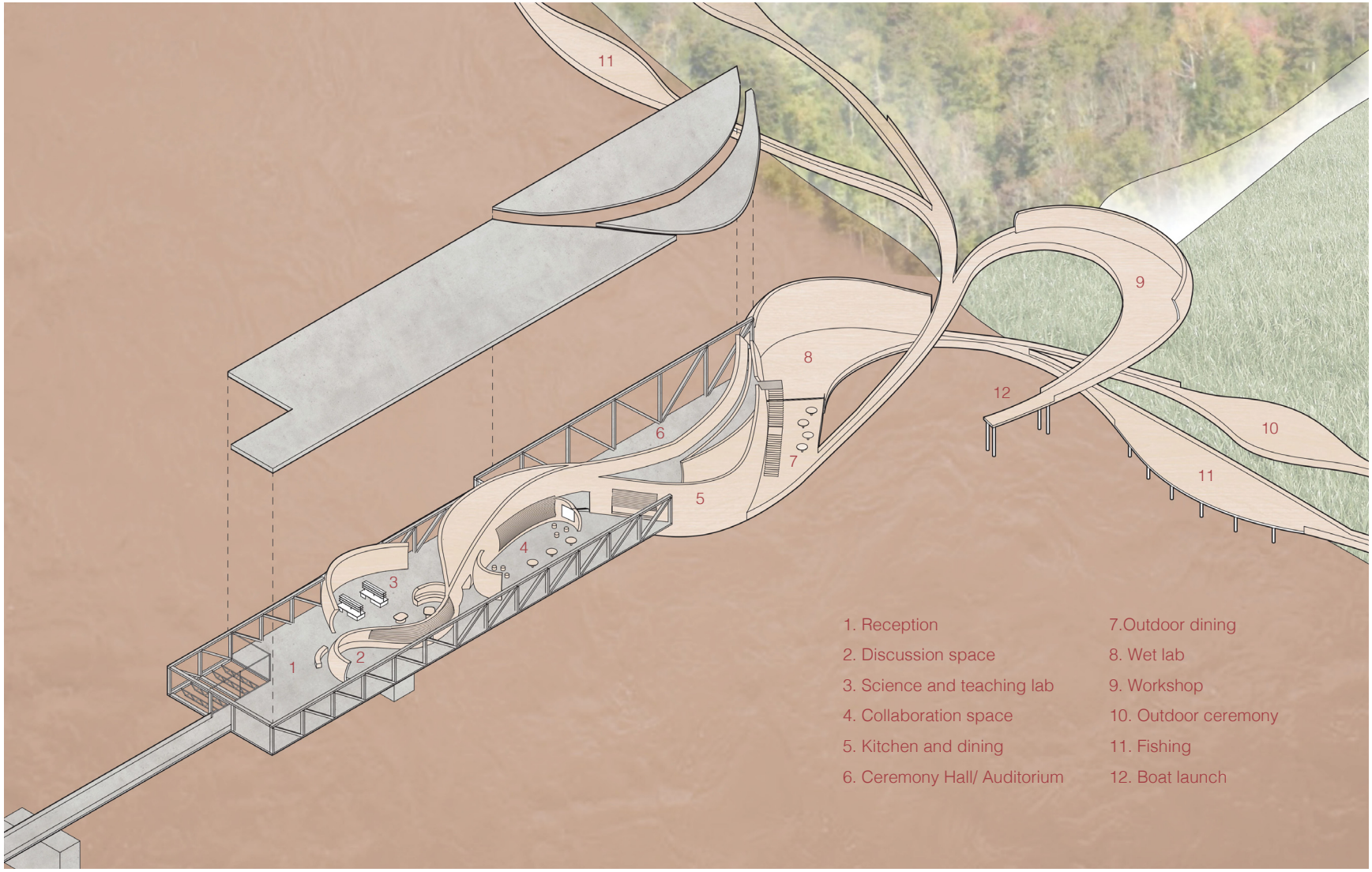


As the two languages move towards each other, the wood structure weaves through the steel structure.

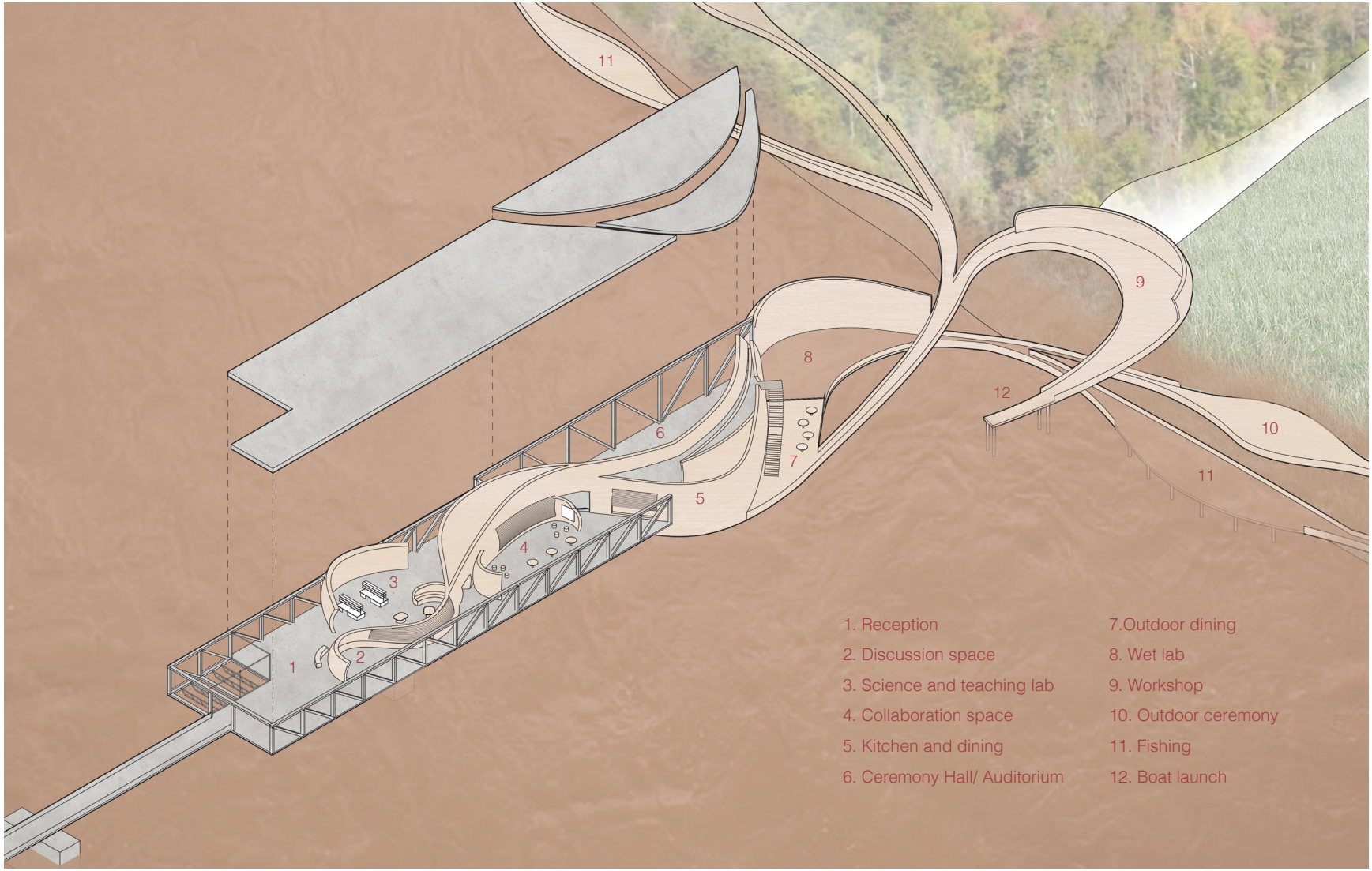


The final form connects the two sides of the river by way of the two architectural languages working together.

The bridge is a place for Two-Eyed Seeing salmon research led by the Mi'kmaw worldview. There are spaces derived from both worldviews, however the architecture infuses the Mi'kmaw way of seeing into all spaces by weaving the curved wood walls through the building. For example, the science labs represent the Western view but are enveloped in the warmth of the wood walls, acting as a reminder of the need to respect the life of each fish. The many facets of the Mi'kmaw paradigm are represented by the discussion space, for listening to stories from Elders, the kitchen space to prepare food for ceremony, the workshop to build traditional birchbark canoes, the ceremony spaces to honour the natural world and fishing spaces to catch fish for sustenance. The gathering areas, the collaboration space, dining room and Ceremony Hall, symbolize the space of engagement between the worldviews and are marked by a glass floor, an inhabitable void between the two structural languages.

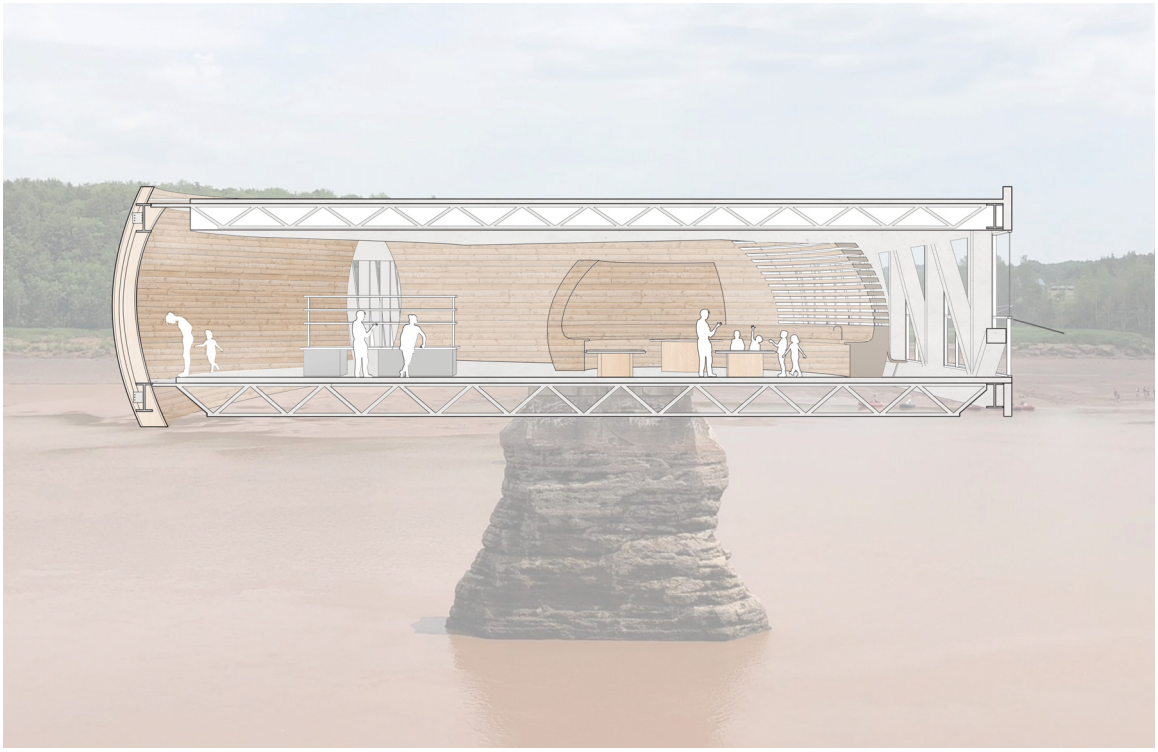


This exploded axonometric view shows the spatial relationship between the curved wood walls and programmed spaces.

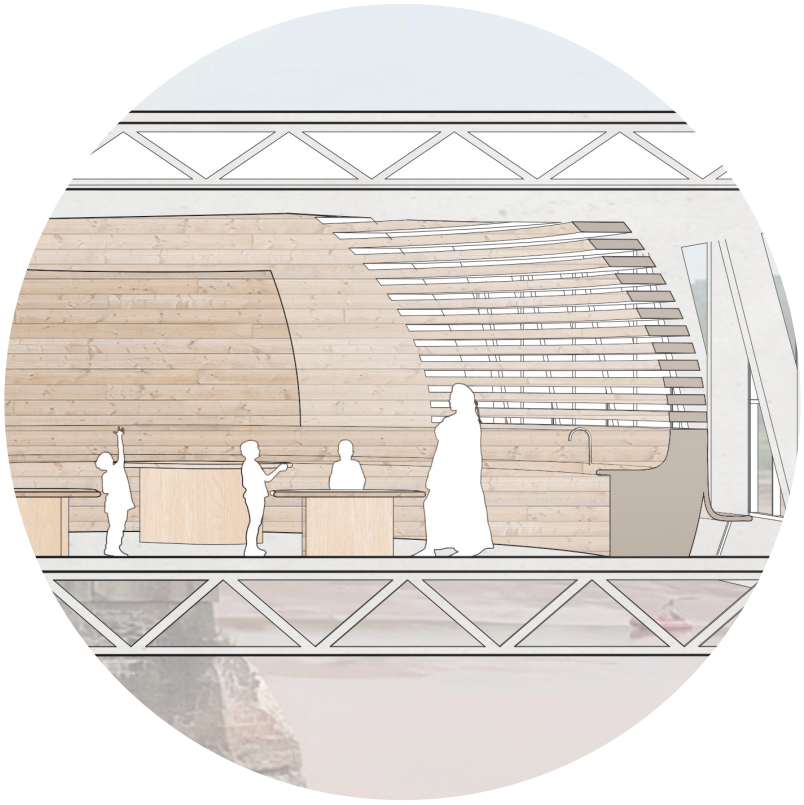


At the highest daily tide, the outdoor spaces that are closest to the ground flood temporarily, marking this moment in the natural cycle.

The section through the science and teaching lab spaces below reveals the articulation of the connection between the two structural systems. The glazed gap between the curved wood column and steel truss system brings the outdoors into the building through sunlight and views down to the river.

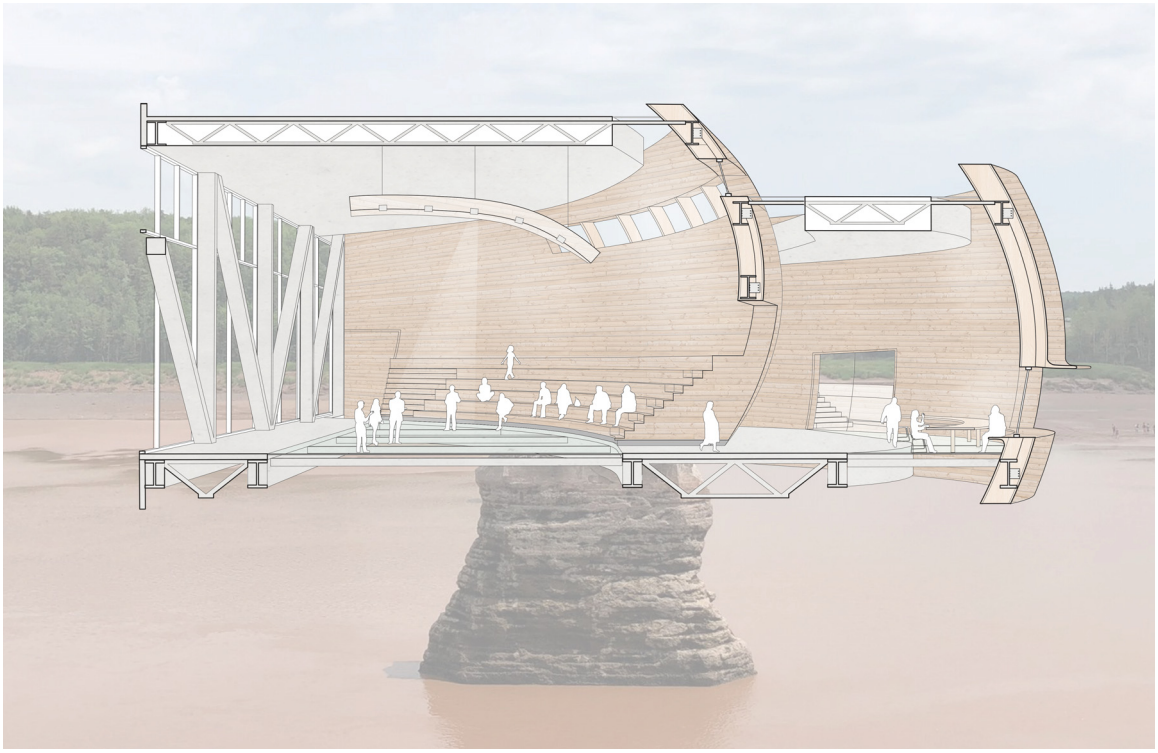


The academic researcher demonstrates to the students how to analyze the stomach contents of a fish that was caught for the salmon celebration later today. The wood interior is a reminder of the importance of respecting the fish during the process. Adjacent to this in the lab space, the Mi'kmaw conservationist discusses an upcoming field study with a volunteer from the community.

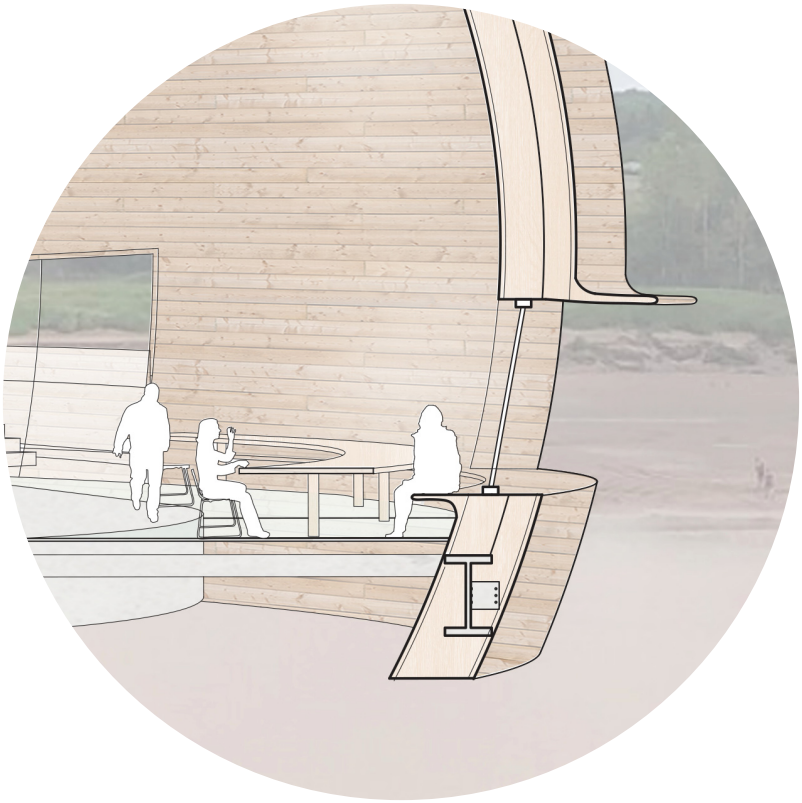


The Elder is welcomed by the warmth of the organic wood walls that contrast the typical sterile aesthetic of the Western science lab. To the South, the wood screen allows in filtered natural light. The elementary students eagerly listen to the Elder tell a story about the original salmon runs.

The section through the Ceremony Hall and dining space below illustrates how the architecture symbolizes the places for engagement between the worldviews. The places of gathering are denoted by the larger area of glazed floor, a void able to be inhabited by a group of people that are open to respectfully listening and discussing differences in their worldviews and using their collective knowledge for the benefit of the salmon.



The community gathers in the Ceremony Hall for a Mi'kmaw ceremony and to learn about the current research projects in progress. The large area of glazed floor reveals the power of the water below, reminding the participants of the importance of protecting the river. In the connected dining space, community members share stories with the academic researcher over a salmon meal that was prepared for the ceremony.

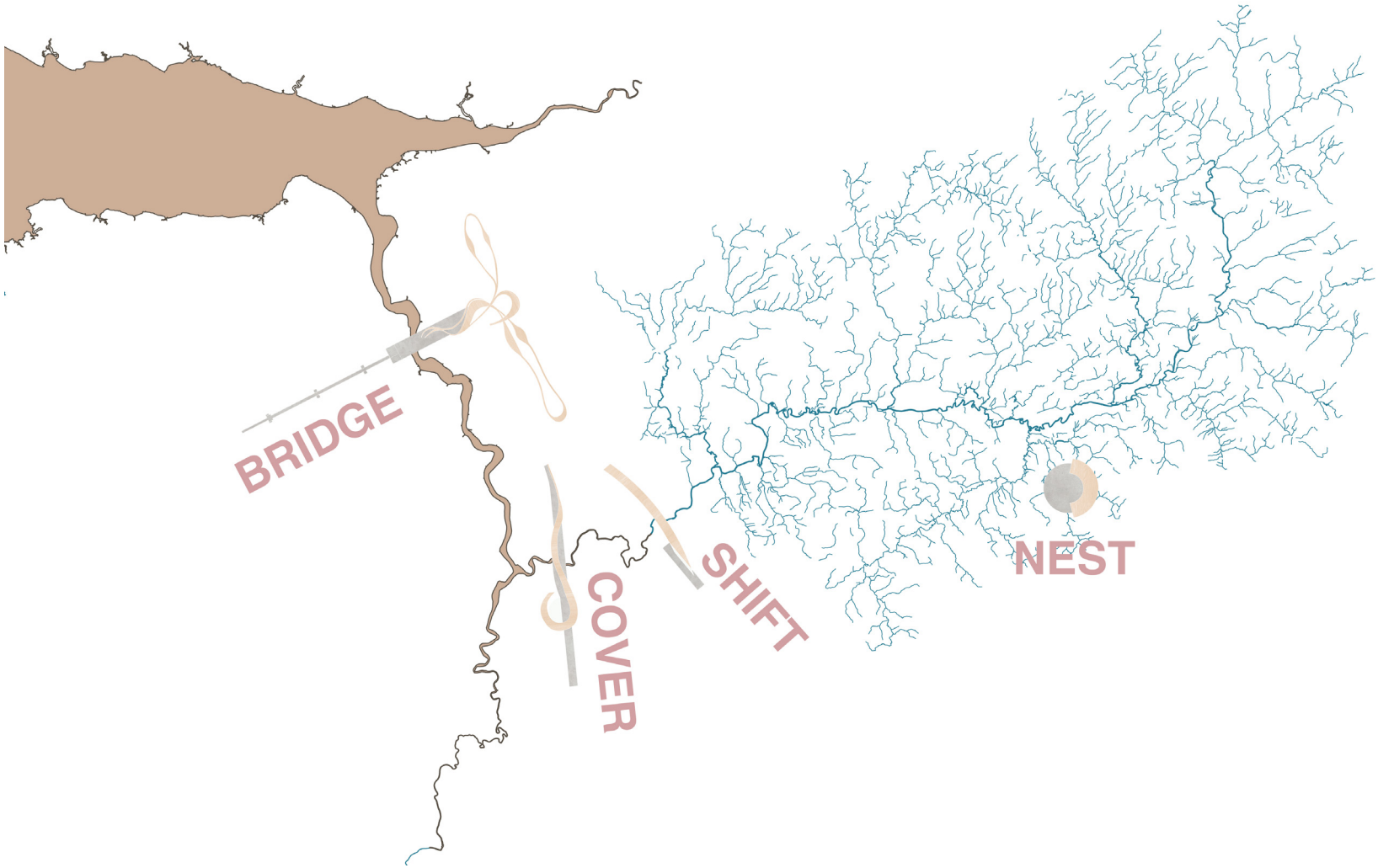


As the academic researcher listens to the Elder, she looks through the large window at the river, a reminder of the sacredness of our natural resources. This vignette of the dining space illustrates how the architectural connections symbolize this space of engagement between worldviews. The section drawing reveals what cannot be experienced from occupying the building, the inside of the walls where the steel plate acts as the glass floor does, a bridge between the steel I-beam and the curved wood column.

The Elder, Mi'kmaw conservationist and academic researcher invite the community to participate in a conversation about the successes and challenges of the collaborative process of salmon research and management using Two-Eyed Seeing. Standing on the glazed floor symbolizes their willingness to listen and learn from each other to improve the partnership for the future.

Relationality of Sites

The overall map on the following page zooms back out to the scale of the watershed, an unfamiliar scale to the human body but an important reminder of how everything is connected. The river links the four architectural gestures together, creating a system that relies on the relationships between its individual parts to attempt to address the complexity of bridging disparate worldviews for salmon research.



This map illustrates the four bridges as a system of marks along the path of the river.

Chapter 8: Conclusion

The architecture brings the seven actors together, allows them to interact in different ways and learn from each other and therefore, build reciprocal relationships between them. The design of the four bridges are by no means the only approach but were a result of my research journey. On a larger scale, the thesis suggests how architecture can play a role in the Mi'kmaq regaining governance over their traditional territory and natural resources which is an important step for the transmission of their culture and the health of the natural environment. It imagines the potential for this architecture to become places of continued partnership building to move towards reconciliation.

Through this process it became clear that the two worldviews do not fit easily together, nor should they, as they have been created through completely different ways of seeing the world. Each worldview has something to offer the other as their strengths differ greatly. It is difficult to convey the nuances of the relationship between Western and Indigenous worldviews through symbolic design as I did not want to make any generalizations or impose the idea that the worldviews are equal. The process revealed the difficulty of practicing Two-Eyed Seeing without a long-term collaboration with Mi'kmaq knowledge holders, as I am not Mi'kmaw myself. The thesis would have been stronger if the Mi'kmaq worldview had a greater influence on my final design. Possible ways to achieve this are dedicating time at the beginning of the process to develop relationships and the exploration of the potential of wood as a building material. If I were to embark on this journey again, those would be an important inclusion to the research and design

method. Being the sole author of this thesis means that I made decisions based on the knowledge I gained however it is an ongoing learning journey that will continue well past the end of this thesis.

To return to the Alton Gas protest, the initial inspiration for this thesis, it demonstrates the resilience of the Mi'kmaq people. Despite the actions and effects of colonization which still exist today, they will continue to assert their rights, practice their culture, and protect the natural environment. This thesis is more than an invitation, but a plea to non-indigenous readers to listen, learn and support Indigenous voices on the path towards reconciliation.

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