

**Site as Education: Using Architecture to Communicate Nature's
Behaviours**

by

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ABSTRACT

This thesis is an architectural exploration of The Serpentine Fen Wildlife Area in Surrey, British Columbia as a public park and an opportunity for environmental education for children. As public education becomes more environmentally conscious, there is a need for architecture that supports how the child interacts with and perceives their natural environments.

This thesis proposes the use of a single architectural element as a transition between multiple site conditions to create a dynamic link between earth, air, water which affords the ability for a relationship to be developed between the user and their environment. This element will consistently be present in the user's journey through the site and serves to encourage interaction with the identified site conditions. The thesis investigates how this continuous element acts as locus, datum, frame, reference, stage and devise to enhance the child's experience of nature.

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Thank you to my parents for their unlimited support, I could not have done this without you.

I dedicate this work to my late Grandma Nelson; whose mentorship, patience and love for living things inspires my life on a daily basis.

CHAPTER 1: INTRODUCTION

Thesis Question

How can architecture create a connection between children and nature?

My Story

The two biggest influences in what I describe as “an affinity for nature” for me were the experience of being in nature and interacting with it, and having a mentor to help guide and teach me about the important interactions in the natural environment.

Within the last few decades, the way children understand and experience nature has changed radically. The polarity of the relationship has reversed. Today, kids are aware of the global threats to the environment- but their physical contact, their intimacy with nature, is fading. (Louv 2008, 1)

As a child, I was fortunate enough to have a grandparent that maintained a strong connection with nature. My grandmother rented an old farmhouse in the woods at the edge of a small wheat and cattle farm on the Sunshine Coast of British Columbia between Roberts Creek and Sechelt. Because both my parents worked in Vancouver and the lower mainland, we used to go see Grandma frequently on the weekends for casual visits and take the ferry from Vancouver to Gibsons. In the mornings I would ask Grandma to make me her famous waffles for breakfast and she would request that I go out to the chicken



1986



1989/90

coop to gather fresh eggs for them and maybe some raspberries from the garden or blackberries from the edges of the forest where they grew wild (a delicious invasive species from Europe). Not only was her garden magnificent and full of the dynamic relationships of organisms (organic, of course) but the property on the periphery of the house offered an endless supply of adventures for a young boy to experience.

During the day, I spent my time wandering around in the forest and exploring the small creek that crossed the 400 acre property. Along the creek grew wild and bright orange salmon-berries that seemed to always be ripe, and huckleberry bushes that grew on top of fallen tree stumps bursting with tiny red berries. I would stop at small pools to drop my fishing line and bobber in to try to catch the rainbow trout hiding in the shaded pools. If I was lucky enough to catch one, I would hurry it back to Grandma's house to clean and fry up, just enough of a snack for a young adventurer.

If I wasn't busy wandering on my own, I would spend time helping my Grandma in her garden. There, she would show me the dense web of interactions occurring constantly and the importance of these relationships. She would tell me why we shouldn't kill wasps; because they eat the aphids, or why we don't plant potatoes in the same patch too many years in a row; because all plants need and replace different nutrients in

the soil so we should rotate what we grow. I now realize that I wasn't only learning how to grow vegetables, I was learning how to be part of an interdependency of natural relationships.

Sometimes we would go to the beach and turn over rocks to catch shore-crabs or splash around in the intertidal with starfish, sculpins, gunnells, kelp and algae. We would also pick mussels off the side of the pier and use their hearts as bait to fish for shiners and perch, a trick my dad taught me that he learned from his dad.

My childhood is ripe with experiences in nature. What concerns me is that not all children get to experience nature in a similar way. This concerns me because if people don't learn to love nature, they won't protect it.

Children and Nature

Thus down to the same stream and the same bank for the 237th time, children can discover a world that is inexhaustibly new. It is also the world in which human beings evolved, with which children have a connection to as ancient as the chemistry of their cells. It is the world for which they are adapted, on which human existence depends. (Chawla 2006, 70)

Aside from the inherent ecological dependence humans have on nature for survival, there also exists a deep-rooted and measurable spiritual connection between living organisms. In his book *Biophilia*, Edward O. Wilson describes biophilia as "the urge to affiliate with other forms of life". A sense of environmental interconnectedness is

essentially engrained in the DNA of living organisms. It is in the nature of human beings to have a relationship with other living organisms but this relationship is being undermined by a plethora of powerful influences from modern civilization.

The role that memory plays in this concept is key because “direct experience with nature is the most highly cited influence on environmental attitude and conservation activism” (Zardiac 2007, 130). As described in “Videophilia: The Implications for Childhood development and Conservation” the authors describe the subtle, yet detrimental influence that sedentary, video-based childhoods have on mental and physical health. In contrast, they discuss the incredibly positive influence of a nature-based childhood: “Outdoor play and nature experience have proven beneficial for cognitive functioning, reduction in symptoms of ADD, increase in self-discipline and emotional well being at all developmental stages” (Zardiac 2007, 130).

Affordances

The ecological psychologist James Gibson describes affordances as “functionally significant properties of the environment which are defined by the relationship between the environment and an organism” (Chawla 2006, 64). The affordance is neither the organism nor the environmental condition which it is interacting with, but the ability that the condition creates for that interaction to take place. For example, a bench affords the

ability for a person to sit. Neither the bench nor the person is the affordance; the affordance is the potential for the bench and the person to interact with each-other.

Gibson's approach to the psychology of perception was based on action-oriented learning as progressive development. In his revised 1955 article published in *Psychological Review*, Gibson states:

perceptual learning . . . consists of responding to variables of physical stimulation not previously responded to. The notable point about this theory is that learning is always supposed to be a matter of improvement—of getting in closer touch with the environment. (Greeno 1994, 336)

With this in mind when considering the role of affordances, the interaction with the environment is a dynamic relationship because it changes based on the previous experience of the user. A new learning experience is offered every time a child turns over a rock on a beach. If the same child were to flip over ten rocks with exactly the same configuration of sand, stones, wood, kelp, algae, limpets, shore-crabs, and sea-lice underneath them, there would still be ten new and independent learning experiences.

Children learn the most about the environment and their own competencies when they have a chance to engage with affordances which give them immediate feedback about the effects of their actions. (Chawla 2006, 67)

This thesis uses “affordances” in a number of different ways to allow for the user to begin inter-

acting with their environment in a manner they might otherwise overlook. By offering opportunities for the user to recognize how the architecture is interacting with its environment, the user is encouraged to investigate their own interaction and impact on that environment. The bench not only affords the ability for the user to sit at that location, but enlightens the users awareness of being part of that place.

Childhood Pedagogy

Environmental Education is a growing trend in contemporary pedagogy. It encourages an appreciation for nature in a time when its preservation is becoming increasingly difficult in many places. It is, by no means, a new form of pedagogy but the current paradigm shift in ideals and necessity is the catalyst to developing new programs related to environmental sustainability. More and more educators are raising concerns and are incorporating environmentally-focussed teaching objectives into curriculums to encourage the development of an appreciation, understanding and connection with nature throughout childhood.

As of 2011, the British Columbia Ministry of Education began offering full-day kindergarden to all children in an effort to encourage more of a play-oriented early educational atmosphere (Full Day Kindergarden Guide). Previously, the program was offered only to aboriginal, ESL and special needs children but the program has proved to be

successful in providing children with the necessary guidance and support for healthy development in contrast to the more typical half-day / daycare model. Built on the model of contemporary curriculum for kindergarten, the full-day kindergarten expands upon the concepts of individuality in children and allows educators to further understand each child and their specific needs.

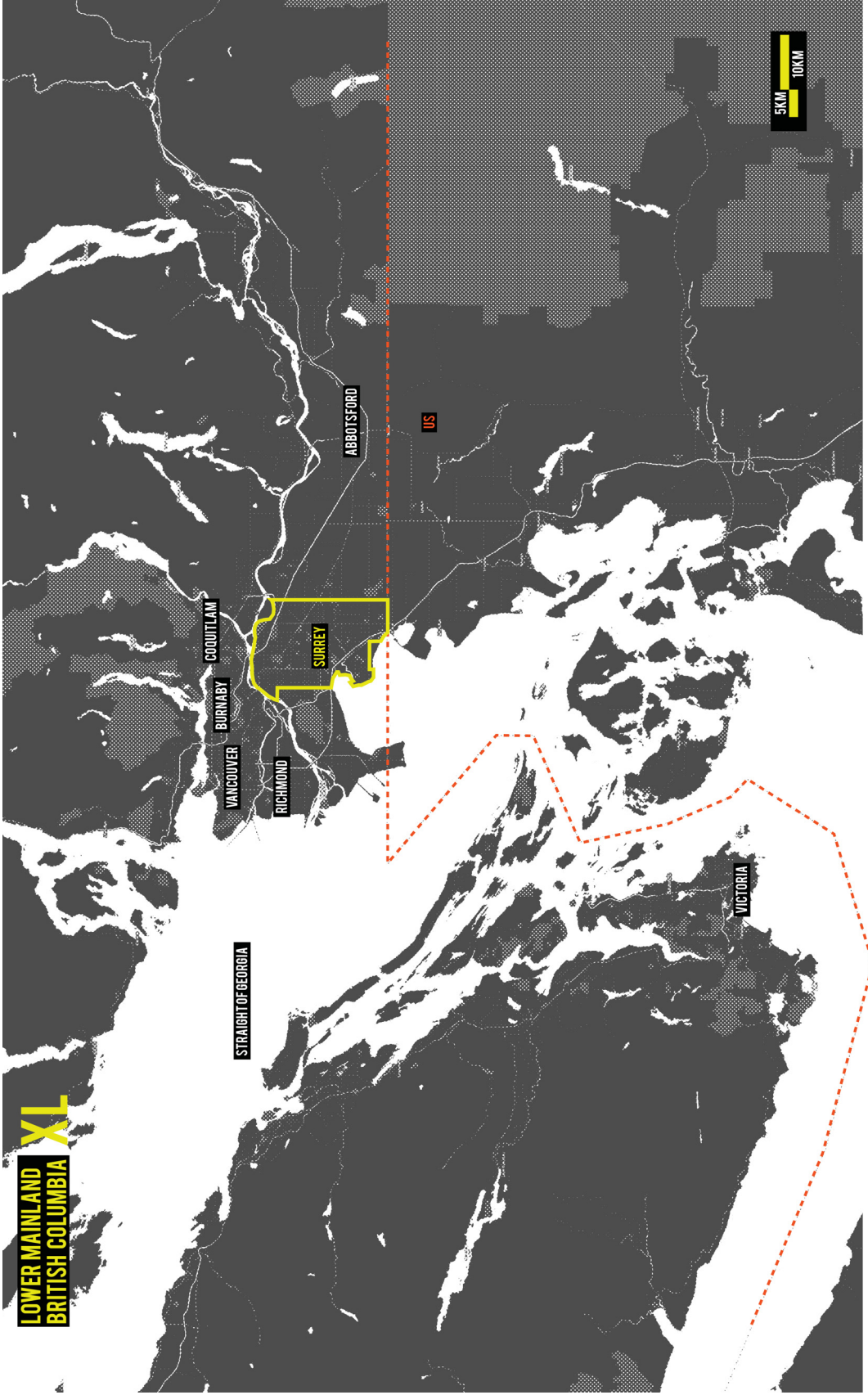
The importance of childhood education cannot be understated because it builds the framework for continued development and education. Understanding that each child is unique, the established principals for teaching remain consistent insofar that firstly: learning requires active participation; secondly: people learn in a variety of ways and at different rates; and lastly: learning is an individual and group process.



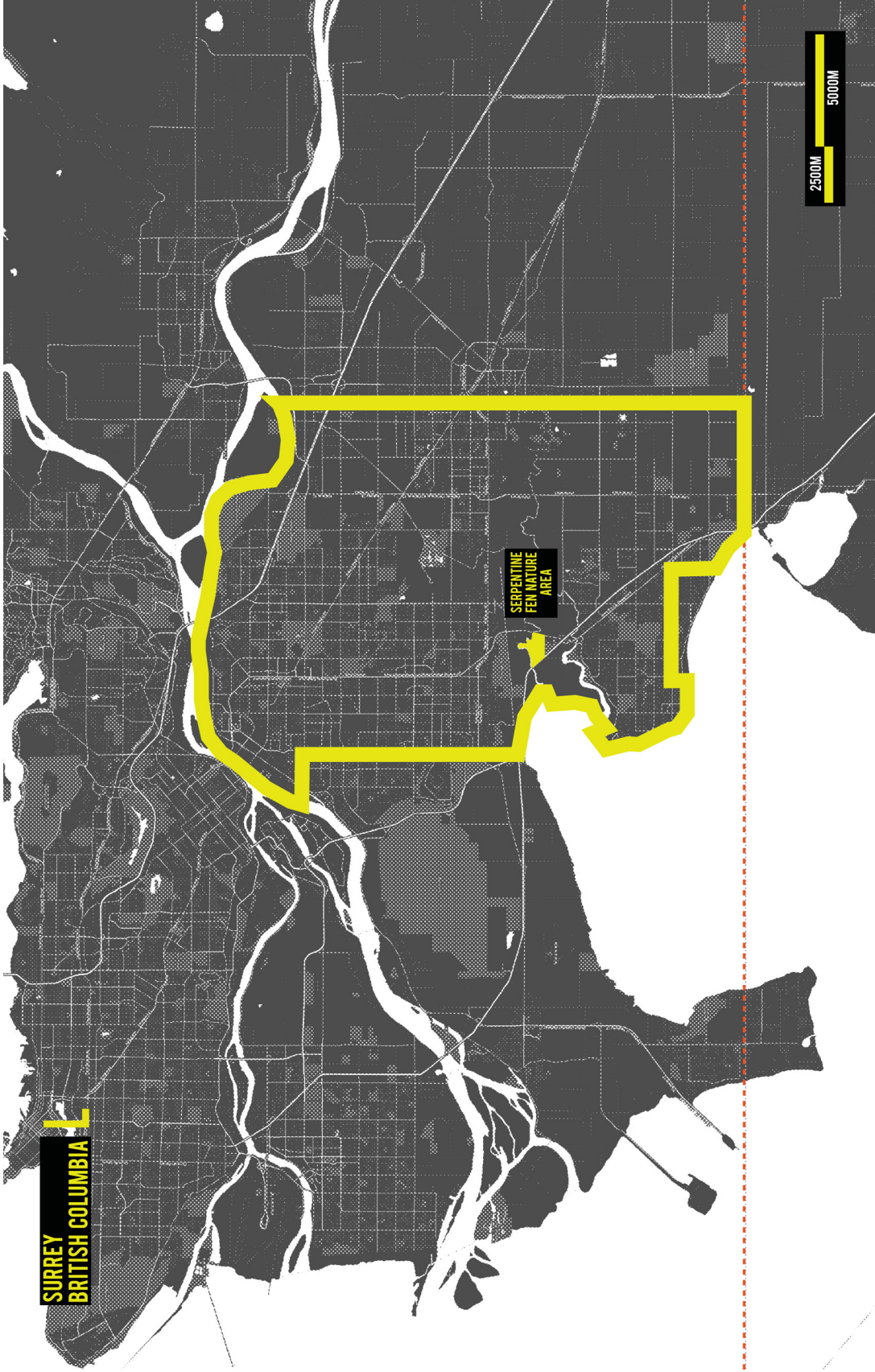
Dragline working on Serpentine and Nicolmekl rivers. (City of Surrey 2013 a)

Another aspect that is understated is the effect that the built environment has on learning. There are many established parameters for developing childhood education programs that include field trips, mentoring programs, after-school programs, summer school, and extra-curricular programs, but very few requirements that suggest the impacts of the quality of the environment has on learning.

With the growing interest and diversity of curriculums including environmental education and lack of guidance for quality of learning spaces, there



Extra large scale map of the lower mainland, British Columbia. (Open Street Map 2013)



Large scale map of Surrey, British Columbia. (Open Street Map 2013)



Mapping of contextual information in Surrey, BC. (Open Street Maps 2013, City of Surrey 2013 b)

is a great opportunity to develop architectural responses that support an inclusive approach to required learning objectives and, more importantly, help to frame the evolution of childhood pedagogy.

We have to go from something that is basically an industrial style of education – a manufacturing model – which is based on linearity, and conformity, and ‘batching’ people. We have to move to a model that is based on principles of agriculture. We have to recognize that human flourishing is not a mechanical process, it’s an organic process. And you cannot predict the outcome of human development. All you can do is, like a farmer, create the conditions under which they will begin to flourish. (Robinson 2006)

Site

The Serpentine Fen Wildlife Area

Located in Surrey, British Columbia, Canada The Serpentine Fen is bordered by two major intersecting highways to its south-east and south-west and the Serpentine River which snakes its way across the northern border.

The site of the fen was initially settled in the late 1800’s when farmers began claiming the land for agriculture purposes. In spite of the fact that much of the area was an intertidal estuary where brackish water flowed freely during high-tide, farmers continued to settle the area. In the early 1920’s the Surrey Dyking District was formed and established a dyking system for the Serpentine and Nicolmekl rivers that was constructed from the 1920’s to the 1950’s. Currently, the Serpentine river flows through a flood-gate under the



Mapping of SWA management units, hydrology and existing structures. (Serpentine Wildlife Management Area: Management Plan)

King George Highway Bridge which allows fresh water to flow into the bay and prevents brackish water from flowing up into agricultural land (City of Surrey 2013).

In 1973, Ducks Unlimited Canada, in cooperation with the British Columbia Ministry of Environment, Lands and Parks, established 71 hectares of the Serpentine Wildlife Area as protected natural habitat and constructed 1.4km's of path and three elevated nature pavilions throughout the site for public use. The site is important for the preservation wildlife diversity and provides extensive habitat for many plant and animal species such as over 130 different bird species that draw many visitors that enjoy birdwatching. (Greater Vancouver Parks 2013)

CHAPTER 2: DESIGN

Design Intention

The design intention of this thesis is to use consistent architectural language that transitions between the tectonic conditions of the site. With this in mind, I established a simple element that is able to move, bend, twist, envelop, define, frame and carry the intention is in the form of a wooden ribbon. As the ribbon moves through the site, the user is presented with how the ribbon interacts with the site and will afford the users ability to interact with the site in a similar manner.



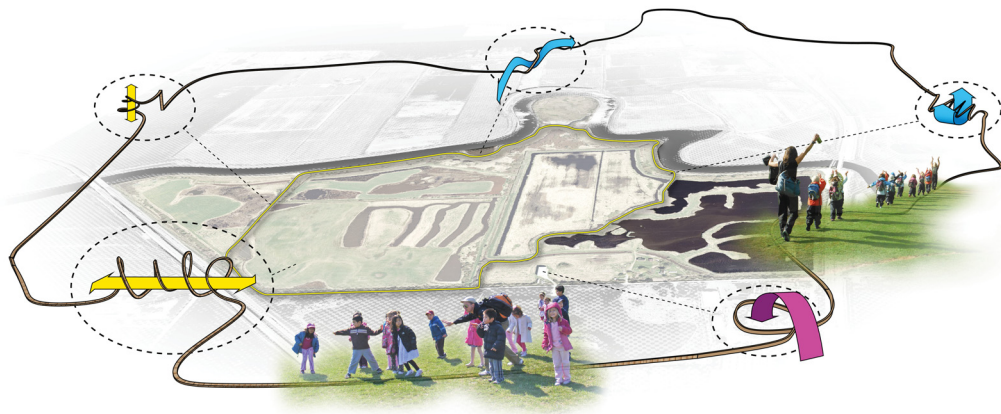
The ribbon will be present throughout the entire pathway both as a surface that supports: procession as a boardwalk; habitation as a building; rest as a bench; retreat as covered shelter; threshold as an entry; transition as a bridge; and enclosure as a fence.

SITE CONDITIONS

A series of site conditions are identified to create a tectonic strategy specific to each condition.

WITH
ON
ABOVE
IN
UNDER

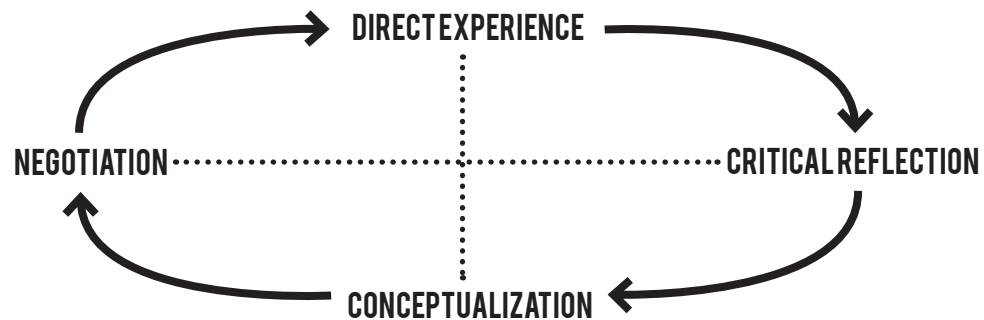
STUDENT BODY
30-40 TOTAL STUDENTS
2 GROUPS



Conceptual diagram of wood-ribbon along path with site condition strategies.

Site Strategy

The site strategy is to identify different site conditions that exist within the Serpentine Fen. The dynamic nature of a wetland enables the ability to identify a variety of tectonic relationships between the user and the site. As the user moves through the site on the established path, so as not to disturb the sensitive environment, he or she will be encouraged to enrich their experience by interacting with architectural elements that embody the different site conditions. The identified site conditions are: 'on', 'above', 'in', 'under' and 'with'. Each site condition insinuates a different tectonic condition, in which the user will perceive and form a relationship with the site in different ways. The tectonic condition refers to the architectural expression of materiality and siting the architecture in an environment.



On

The familiar relationship of being on the earth is inherently easy to understand, but therein lies an opportunity to broaden the learning experience of the user because of this familiarity. The implications of one's relative position on the earth



Interior view of 'On' building.



Interior/exterior view of 'On' building.



is rooted in the conscientiousness of that position. However small it may be, the user's causal relationship with the environment often goes unappreciated. The architecture serves to emphasize the magnitude of that relationship by encouraging the user to identify with the ecological conditions in that zone.

Above



Looking down from birdwatching platform on 'Above' building.



View from inside slide of 'Above' building.

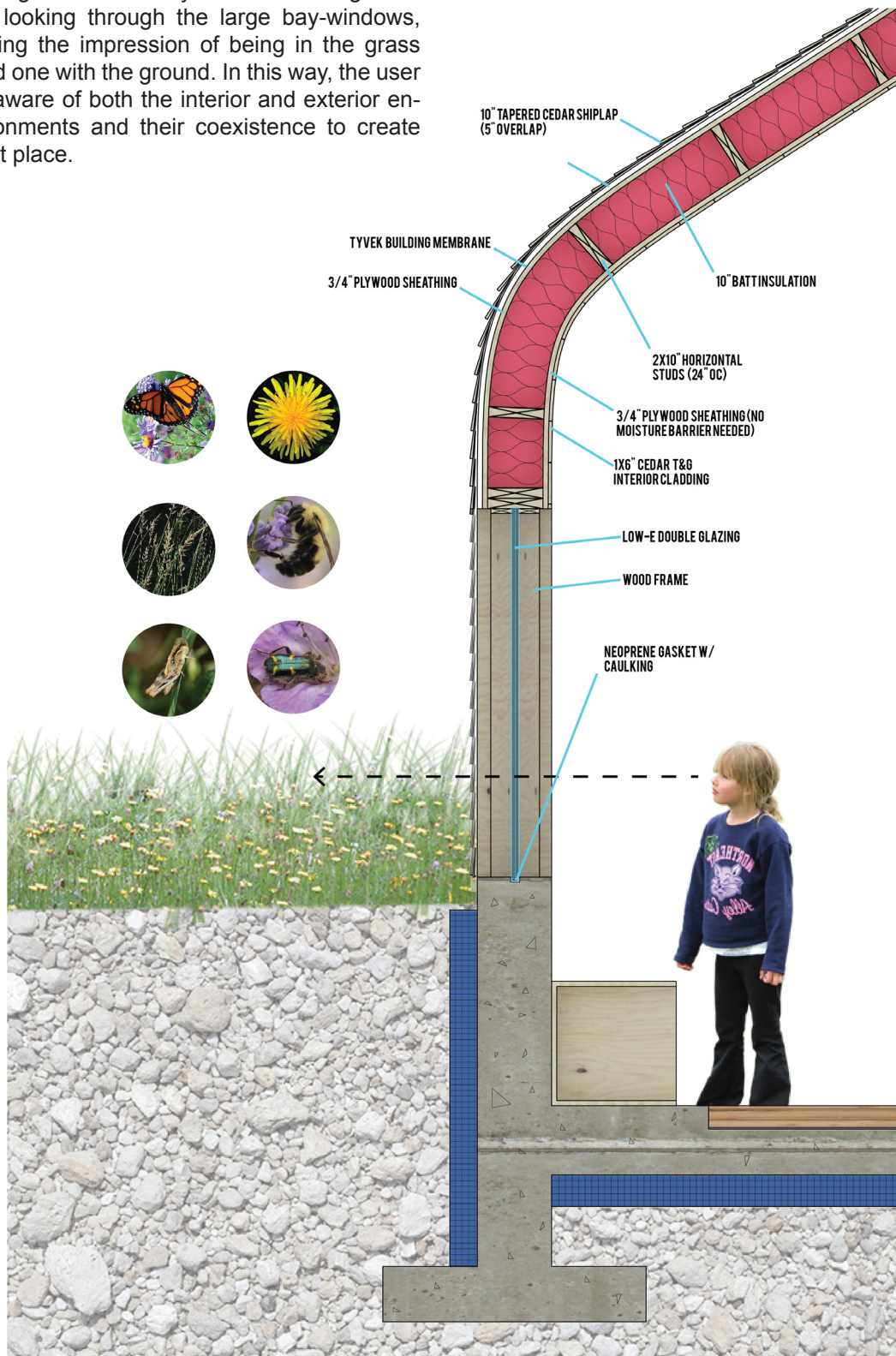


A clear connection between the elements from grade to sky is the essential vertical condition of this pavilion. The play-centered nature of the kindergarten and the playful nature of the wood ribbon constructs this day-trip pavilion into a vertical play structure. The structure also accommodates

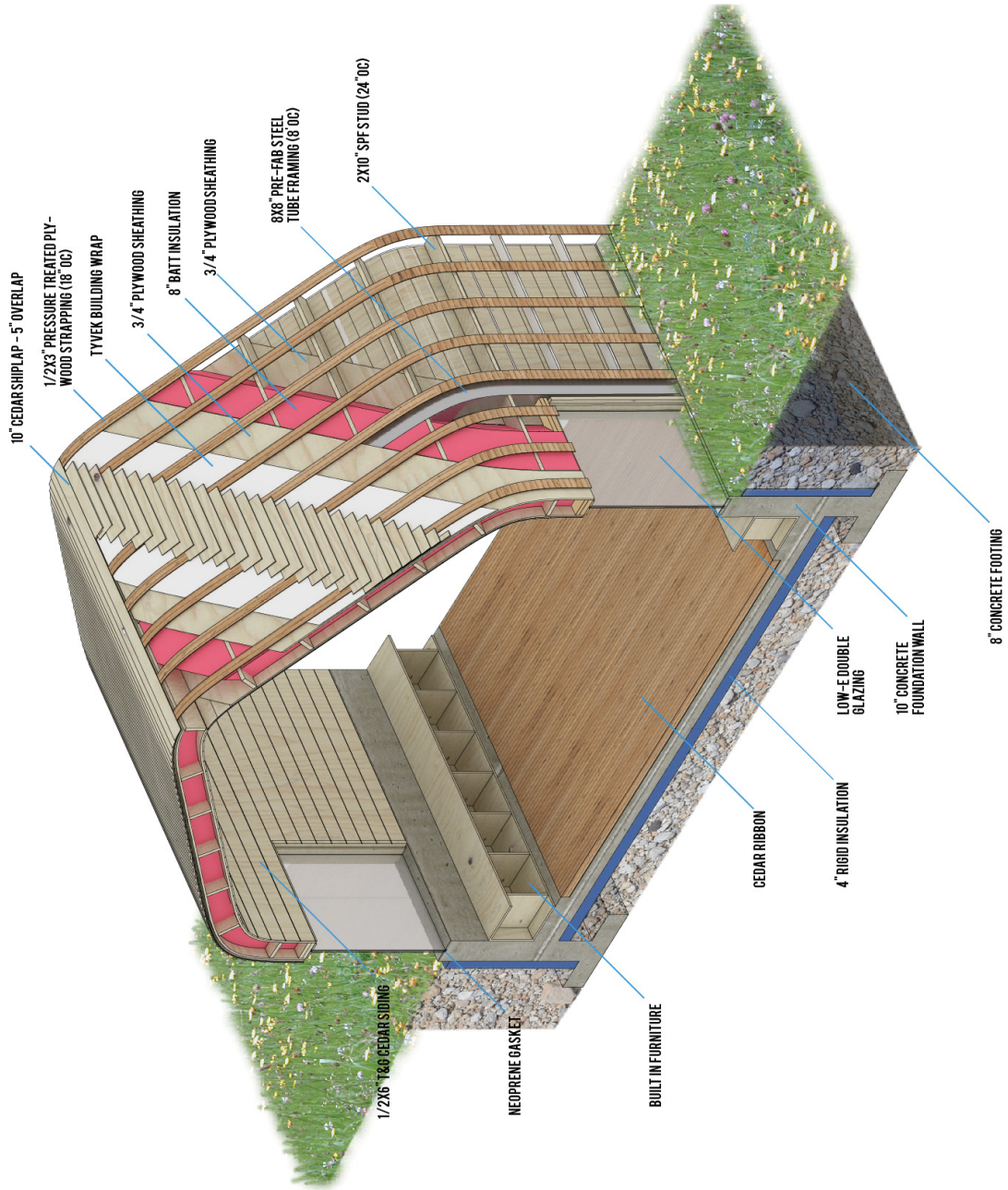


Top to bottom: 1:1000 site plan, 1:100 building section, 1:100 Building plan (Sheet based on 22" wide by 30" tall sheet.)

The depressed main-space allows for the young user to be at eye-level with the ground by looking through the large bay-windows, giving the impression of being in the grass and one with the ground. In this way, the user is aware of both the interior and exterior environments and their coexistence to create that place.



Section through 'On' classroom showing construction and link to nature.



Axonometric showing construction details of 'On' classroom with its extension into nature and the ground.



Top to bottom: 1:1000 site plan, 1:100 building section, 1:100 Building plan (Sheet based on 22" wide by 30" tall sheet.)



View from inside bridge of 'In' building.



View on top of bridge of 'In' building.

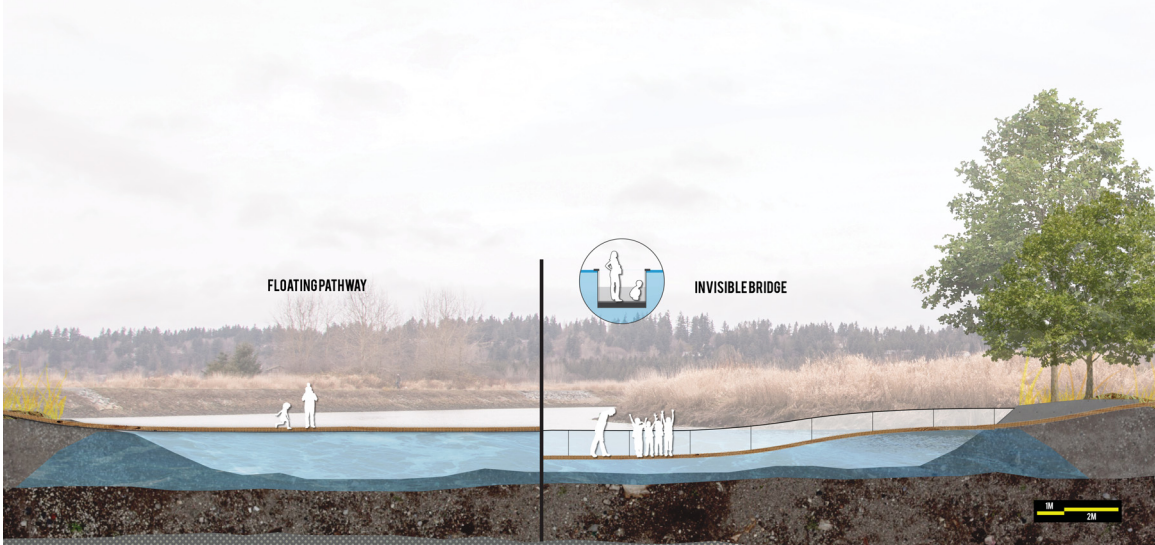
an elevated viewing platform with binoculars to view the local wildlife in their natural habitat without disturbing them.

In

The water-saturated fen within the dyked zone



and the mechanically controlled tidal-river connection on the other side offer a unique water-oriented learning atmosphere. On the wetland side, the user is led into the water, on a sunken pathway with aquarium-like glass handrails, and encouraged to investigate the relationship between water, land and its ecosystem by being able to witness the ecological interactions below the surface of the water. On the river side, the user is led by the path on the river that embodies the natural ebb and flow of its tides by rising and falling with it. As this path lacks guardrails, the users awareness of their relationship with the water is heightened.



Top to bottom: 1:1000 site plan, building section, building plan (Sheet based on 22" wide by 30" tall sheet.)



Looking down to interior of 'Under' building.



View of interior of 'Under' building.



View from archway of 'With' building.



View from garden of 'With' building.



Under

The most unfamiliar atmosphere and therefore most uncomfortable condition is that of being under the earth. Within the riparian zone of the site (the area that acts as a threshold between two different ecological zones, in this case: the river and the wetland) this pavilion will encourage users to retreat and reflect on their experience in the site.

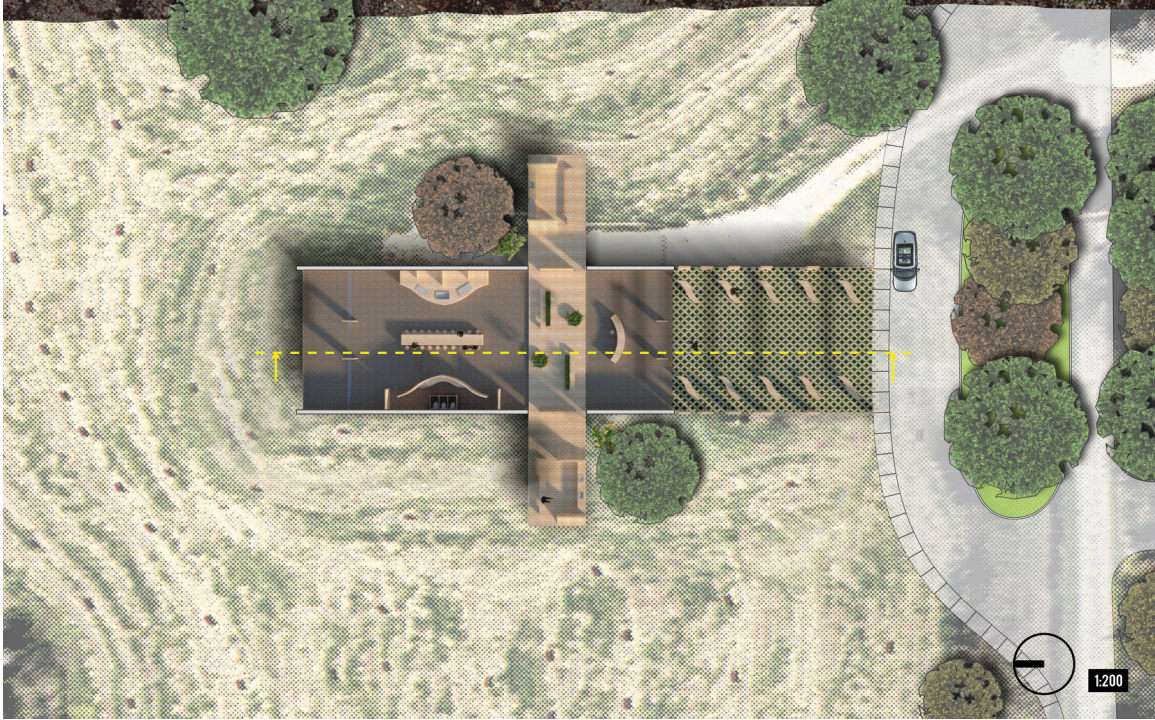


With

The final condition is that of being one with the site by structuring the ability to cultivate the site in a direct manner, namely for agricultural purposes. The relationship of being one with the land is clearly being undermined by processed foods



Top to bottom: 1:1000 site plan, 1:100 building section, 1:100 Building plan (Sheet based on 22" wide by 30" tall sheet.)



Top to bottom: 1:1000 site plan, 1:200 building section, 1:200 Building plan (Sheet based on 22" wide by 30" tall sheet.)

and plastic packaging that intentionally conceals the nature and origin of the primary products. Here, the user will be encouraged to identify with the products they are harvesting through the nature of the relationship with the site.

Program: The Outdoor Kindergarten

The primary focus of the educational environment will be outdoors and the architecture will serve to enhance that experience. At each site condition, the students will benefit from the architectural experience as it enhances their environmental education.

Their Story: A Student's Recollection of The Serpentine Kindergarten

When we arrived at school in the morning we would hang our backpacks in the homeroom and we would prepare for our day, dressing appropriately for the weather. Sometimes in the morning I dreaded the rain and my cold fingers but soon was distracted from this when splashing in mud puddles and finding the robin rustling in the bushes beside the boardwalk-trail to our classroom. I don't really know how far it was from homeroom to the class but as a young child, it was an adventure. Though I do remember that when we went to the class in the meadow it took less time than going to the classroom underground. We split up into two groups of about fifteen kids each with two teachers; one went to the meadow class and one went to the underground class.



Conceptual rendering of 'With' condition: entry building and homeroom.



Model of wood ribbon interacting with site.

If we travelled along the meadow, our day would be inspired with stories the teacher told us. We just stayed outside the class and looked for bugs in the grass and watched bees buzz from flower to flower collecting pollen. We would collect leaves and long shoots of grass, or a four-leaf clover if we got lucky and make drawings and diorama's imagining we were the bugs that we saw in the grass. I always came home with bits in my pockets.

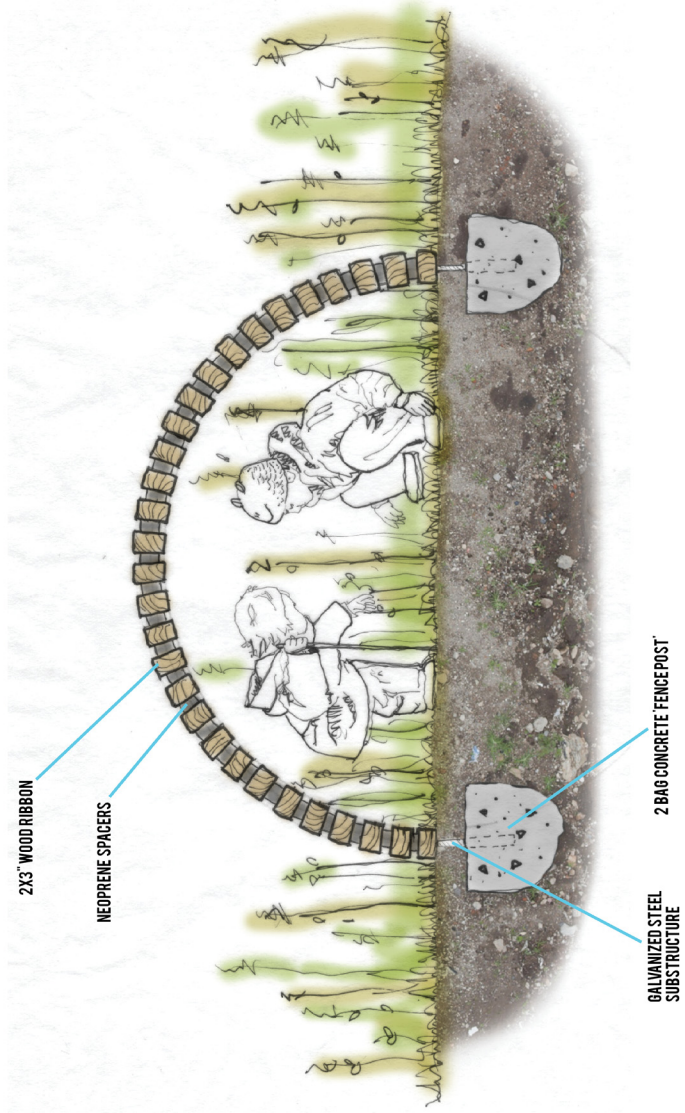


Site photo (2012).



Conceptual rendering of 'On' condition: the meadow classroom.

By providing opportunities outside the interior environment for the architectural element to interact with the ground, the user enters spaces framed for certain scales of activity. Here, the students are compressed down and encouraged to investigate the spaces in between the blades of grass and discover the array of organisms that inhabit this area.



1:10 Section drawing of play structure.

Usually we would eat lunch outside, but if the weather was really poor we would eat inside. We had a brief nap after lunch then our teacher gathered us for another adventure, this time to the towering jungle gym in the trees. This was an exciting place to play in; the inner structure was full of nets, ropes and bars to climb up on to get to the top. Sometimes we would pretend we were birds nesting and make cawing noises when we saw predators (the teachers) approaching. We used binoculars to look around the site from the top of the structure at the edge of the walkway. The teachers would ask us to name the different birds we saw, from mallard ducks and red-winged blackbirds, to great blue herons and bald eagles.

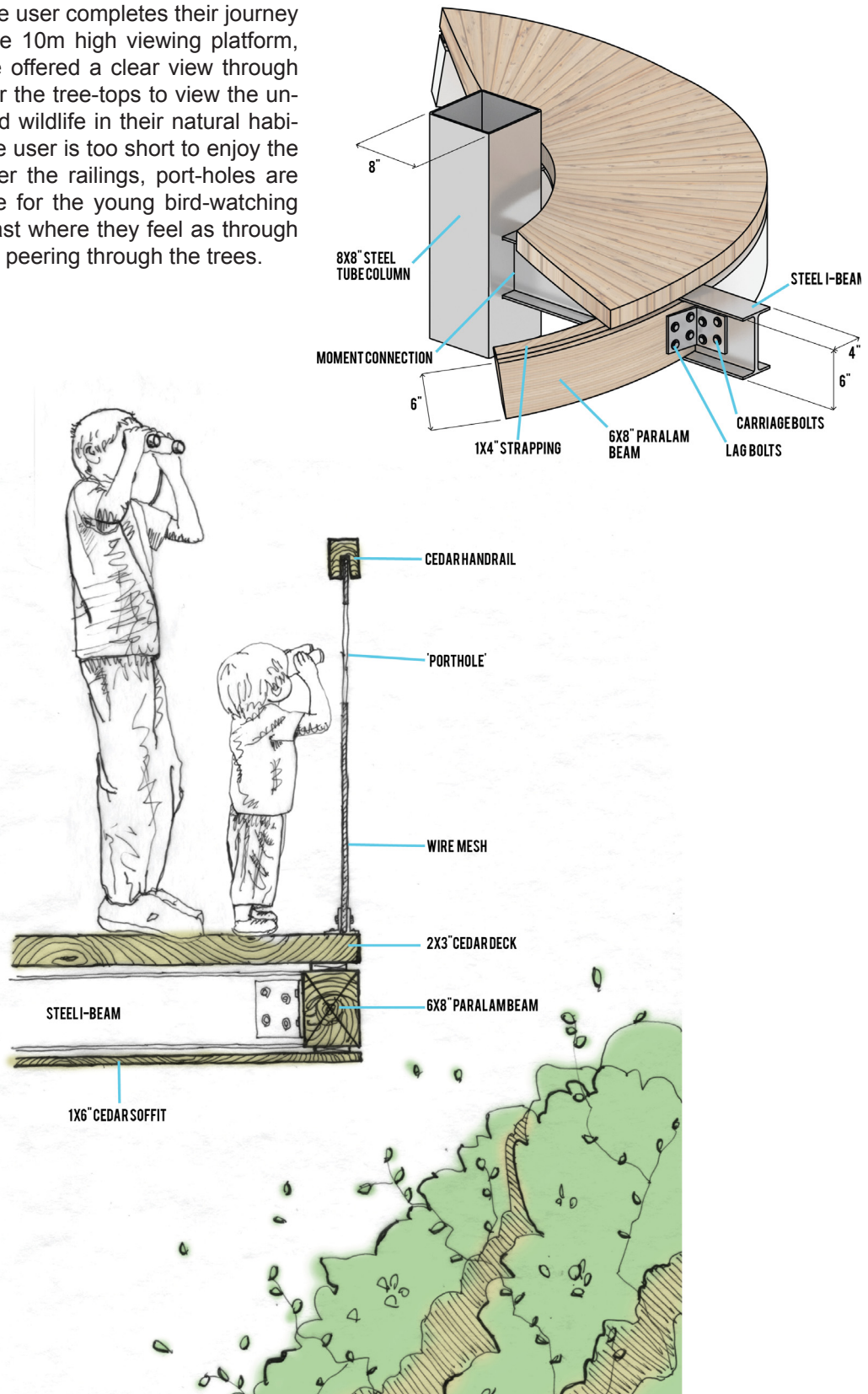


Model of elevated play structure.



Conceptual rendering of 'Above' condition: the jungle gym and birdwatching platform building.

Once the user completes their journey up to the 10m high viewing platform, they are offered a clear view through and over the tree-tops to view the undisturbed wildlife in their natural habitat. If the user is too short to enjoy the view over the railings, port-holes are available for the young bird-watching enthusiast where they feel as though they are peering through the trees.



(Top) Axonometric drawing of 'Above' pavilion construction and (Bottom) section drawing of bird-watching platform



Conceptual rendering of 'Under' condition: the underground science labs.

On alternating days we would make our way to the underground classroom to the north east. We learned to look to the mountains to find North. This classroom was a bit different than the one in the meadow mostly because it was half-underground, but both were very comfortable to be in with the wood-clad interiors. The underground class was more like a lab environment where we would take the things we collected on the way to the class and assemble them in the terrariums to observe. We would also dissect parts of plants and seed pods like pinecones and use microscopes to look really closely to see cell structures and tiny living things. It was amazing to see the amount of diversity of life in a small handful of soil from the forest or in a cup of water from the marsh.



Section model of underground classroom.

Like at the meadow classroom, we would usually have lunch outside and a nap afterwards. Then we would all walk to the underwater bridge and river dock. In the spring time, sometimes we would find where frogs and salamanders laid their eggs in the water against the glass railing. During the spring we could watch the salmon swimming up the river to spawn.

At the end of the day we would make a seemingly long trek back to homeroom to meet up with our parents to go home. I always looked forward to coming back the next day.

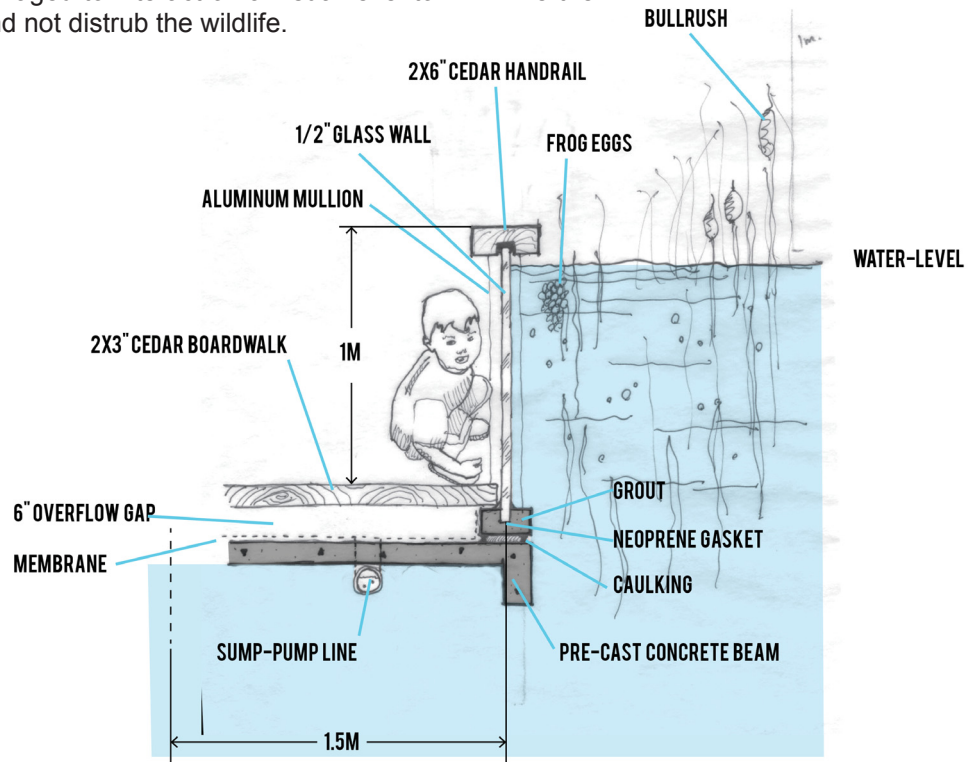


Model of the underwater bridge.

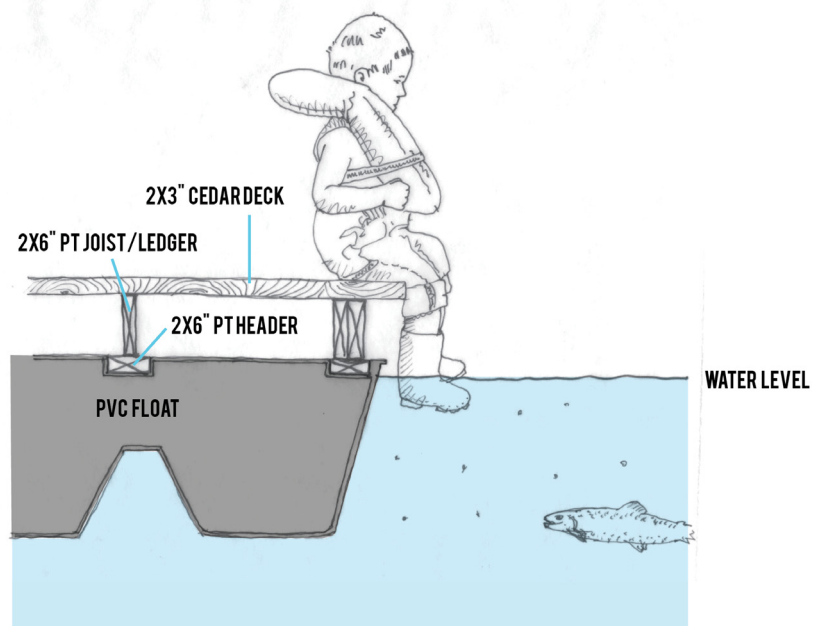


Conceptual rendering of 'In' condition: the submerged bridge.

As the user is engaged by the architecture, the underwater world is presented in a manner that is otherwise overlooked. Kids are able to witness the rich ecology of this condition and are encouraged to interact on a visual level to minimize their impact and not disturb the wildlife.



With the lack of hand-rails, the tension of being on the water and in the water is accentuated and helps to encourage safety while allowing the user to interact with the surface of the water.



(Top) 1:10 section drawing of underwater-bridge and (Bottom) 1:10 section of floating pathway.

CHAPTER 3: CONCLUSION

The intention of this thesis was to provoke concern over early childhood environmental education and the role that architecture has in the development of younger generations and their connection with the natural environment. Rather than adopting ideas of 'sustainability' into the building itself, such as adhering to LEED standards or attempting the Living Building Challenge, the architecture serves to promote a long lasting impression of environmentalism in the user whose personal environmental impact would out-weigh the impact of the architecture.

Tell me, and I will forget;
show me, and I may remember;
involve me, and I will understand.
(Confucius 450BCE)

The proposition that architecture can afford the ability for the user to develop a relationship with nature would serve to connect professionals in architecture, education, biology and ecology. The next step of this thesis would begin to identify pedagogical concepts for the development of a curriculum that identifies with and utilizes the architecture for environmental and experiential education specifically.

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