Cultivating the Next Generation of Environmentally-conscious Citizens: Playful Public Education Design Framework

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Abstract

Cultivating the next generation of Environmentally-conscious citizens:
Playful Public Education Design Framework

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What kind of built environment can we create if we can equally love white storks and blue angel super hornets? How can we acknowledge and respect both the natural world and human aspirations, without compromising the two seemingly contrasting interests and priorities? How can I as a burgeoning landscape architect help local communities to cultivate the next generation of environmentally-conscious citizens to confront the unending extractive economy mode of standardized mass-production, and instead echo the world-wide Child-Friendly Cities initiatives?

Ecological literacy begins in childhood. This thesis focuses on how a natural school, with emphasis on mycoremediation and playful edible landscape, can be layered onto Seattle's post-industrial Georgetown neighborhood as a ready-made laboratory for innovation. I explore this potential using a tangram as a framework of interrelated themes: ecological literacy, effective altruism, emotional awareness, play, waste & reuse, mycofiltration & biodegradation and edible landscape.

Chapter 1 provides an overview of my thesis scope, goals and concepts. Chapter 2 dives into the books that support the playful public education design framework. Chapter 3 presents an analysis of Georgetown, the chosen site, my active engagement experience with the community, and conveys my design proposal for this site and incorporating the tangram framework. In Chapter 4, I introduce graphic novels to engage and educate youth about the ecological systems and processes found in my site design. In Chapter 5, I conclude with reflections on the effectiveness of my tangram framework in creating my design and communication approaches, and its potentials for application in other contexts. I also identify future opportunities to bring my multimedia works to life, beyond this thesis.

ACKNOWLEDGMENTS

To Julie and Ken—

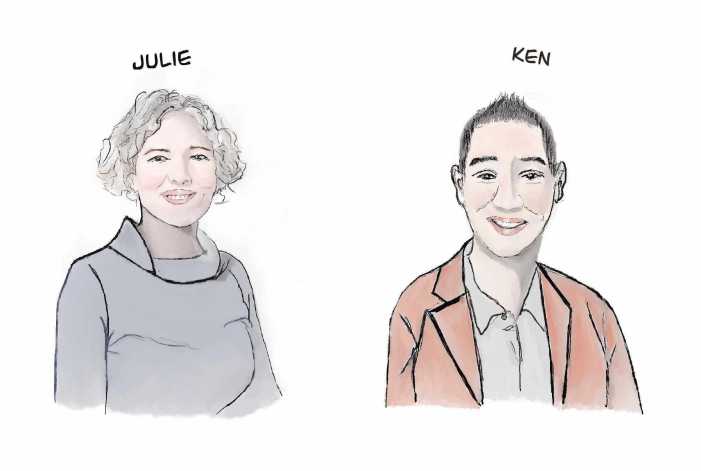

Figure 0-1: Hand-drawn Portraits of “Julie and Ken”

Thank you so much for granting me the autonomy to pursue my passion in this thesis project and for providing valuable advice on framing my work in a timely manner.

To my family and friends—
Thank you for your unwavering support and patience throughout this journey.

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Chapter 1 Introduction

1.1 Primary Thesis Questions

What kind of built environment can we create if we can equally embrace white storks and blue angel super hornets?

How can we acknowledge and respect both the natural world and human aspirations, without compromising the two seemingly contrasting interests and priorities?

How can I as a burgeoning landscape architect help local communities to cultivate the next generation of environment-conscious citizens to confront unending extractive economy mode in a standardized mass- production?

How can we cultivate a sense of ecological literacy, to treat our land as a library? The self-awareness that we are an integral part of nature and that being respectful stewards is as natural as taking care of ourselves (Goswami, 1995; Venkatramaiah, 1936) will build communities with a sense of solidarity, of sharing, of a collective mission to care for each other and for the planet (Kimmerer, 2013). Ecological compassion might have the potential to also extend to other aspects of life.

This thesis engages these questions by developing a playful public design framework and applying this framework to Seattle's industrial Georgetown neighborhood through the design of a natural school site that would be part of a collection of learning spaces throughout the neighborhood. In developing this framework, I, a sustainability research nerd, reflective thinker, street breaking dancer and self-claimed landscape 'game' designer try to bridge edible landscape with a broader audience in a playful platform. Within my pursuit, I would love to emphasize " playfulness". Play is a learning enhancement, a self-exploration, a place to nurture a child's connectedness and affinity for the world around them, which our society didn't emphasize enough.

To begin, I provide a context for my own journey to the field of landscape architecture, my inspiration from Da Vinci, and my definition of an environmentally-conscious citizen.

1.2 My Journey to Landscape Architecture

There is a saying in the field of architecture: "If you want to be an architect, you must learn how to cook first." My previous food science and engineering background jokingly echoes the saying. Three years ago, if someone asked me why I aspired to become a landscape architect,my narrative would trace back to my childhood play experience under trees and around a military airfield. Then I would fast-forward to the 16-year-old epiphany drawn from an epic food-culture documentary “A Bite of China” (Figure 1-1).Through beautiful cinematography and storytelling, the series highlights the importance of sustainability and responsible food production, covers a wide range of topics related to food, including the history and origins of various dishes, the cultural significance of different ingredients and the people behind the food.

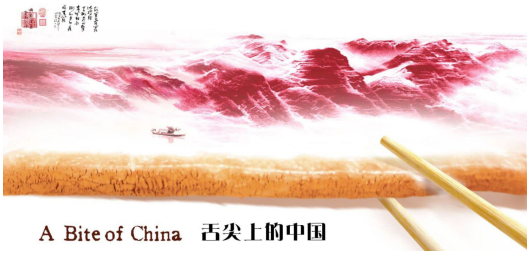


Figure 1-1: A Bite of China Documentary
(Source: A Bite of China (TV Series 2012) - IMDb)

Epiphany drawn from an epic food-culture documentary at the age of 16. How can I create a platform for urban kids to see the story, the social fabrics, the people behind food? A video to capsule my journey can be found here.

Then I would foray into the food and agriculture arena as a senior microbiologist/analytical chemistry/ food scientist at Beyond Meat R&D Innovation center and the solution-driven, problem-solving advocate personality revealed by climate activism volunteer works and participation in the grassroot Sunrise Movement Los Angeles Chapter hub. They are all still valid.

In fact, connecting random past dots in one’s life and spinning a good story based on that is so tempting and powerful. People love to hear those finding-passion, trusting-in-your-guts stories. Because in any era, having faith and taking actions are necessary and much needed. My choice to step out of the science and engineering tech-driven solution dominated world has nothing to do with frustration or condescension. Merely I found that my personality resides better in the all-encompassing quality and openness in the landscape architecture field to explore ecological literacy and edible landscapes in a playful advocacy manner.

Food grounds people, creating a sense of place and identity for the community, qualities which oftentimes also motivate landscape architects to design public places.

The documentary "A Bite of China" explores Chinese food culture through the lens of various regions, ingredients, and cooking techniques. While the documentary is a modern representation of Chinese food culture, it is rooted in the

country's long history and the literati's writings about food. In various historical stages of China, there are always literati of enthusiasm to promote and advance food culture.

During the Tang Dynasty (618-907), the poet and gastronome Bai Juyi was known for his love of food and his efforts to promote the culinary arts. (Lin, 1996) He wrote numerous poems about food and created a number of new dishes: osmanthus cake, fish and tofu hot pot and Drunken chicken, some of which are still enjoyed today. "Record of Eating" (饮食录) is a book written by Su Dongpo (also known as Su Shi), a famous poet, scholar, and gastronome during the Song Dynasty in China. He was a skilled cook and invented a number of new dishes, including the popular dish Dongpo Pork. (Lin, 1996)

In Qing Dynasty China, a hedonistic elite scholar and gastronome Yuan Mei (袁枚) condensed 40 years of his gastronomic experiences into one of China's most fascinating and important food manuals: Recipes from the garden of contentment : Yuan Mei's manual of gastronomy (隨園食單). (Chang, 1997)

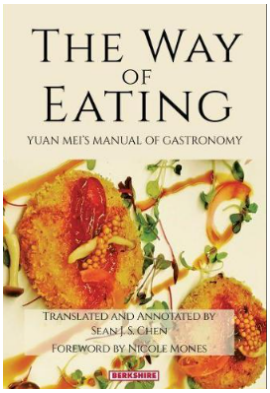


Figure 1-2: The Way of Eating Book by Yuan Mei (Google Image)

Chinese literati have a long tradition of expressing their interests and ideals through food. In many cases, they viewed food not just as a means of sustenance, but as a way to explore and express their cultural identity and values (Lin, 1996).

The story of people behind food unveiled by the documentary and the books is captivating. As I kept exploring, I realized that food and landscape merged on the concept of "land community" introduced by Aldo Leopold, which recognizes the interconnectedness and interdependence of all living organisms within an ecosystem, including humans. It emphasizes the idea that humans are not separate from nature but rather an integral part of it. It also involves recognizing the impacts of our daily choices on the environment and the well-being of communities.

Sustainable agriculture is “rooted in the metaphor of ecology” co-evolute with nature (Orr,1992). By embracing the concept of "land community," I wish to foster a deeper appreciation for the individuals and communities involved in food production and develop a more holistic understanding of food systems and go beyond. Landscape architecture offered me the opportunity.

1.3 My Inspiration from DaVinci

Leonardo da Vinci, the Italian polymath of the High Renaissance who was active as a painter, draftsman, engineer, scientist, theorist, sculptor and architect, has inspired me. Leonardo da Vinci's multifaceted genius extends beyond his artistic masterpieces, providing inspiration that transcends disciplines.

In the realm of landscape architecture, sketches was a highly-praised tool to document the way of seeing. While Leonardo da Vinci's notebooks are famous for their extensive collection of detailed drawings, sketches, and writings. He documented his observations, inventions, and ideas in a systematic and meticulous manner and connected dots between human creations and the natural world.

1.3.1 Parallels between Landscape Architecture and Leonardo da Vinci

The reason I think landscape architects should be out in front to promote “environmentally-conscious citizens” is that landscape architects, as versatile professionals, often resort to a multidisciplinary approach and collaborate with experts from other fields. I found so many parallels between our profession and my ideal Leonardo da Vinci.

- Design Principles: Da Vinci's artistic and design principles, such as proportion, harmony, and balance, are relevant to landscape architecture. Landscape architects, like da Vinci, strive to create visually pleasing and harmonious outdoor spaces that are in balance with nature and human needs.

- Observations on Nature: Da Vinci's meticulous observations of nature, including his studies of landscapes, plants, and animals, can inspire landscape architects to similarly study and understand the natural environment. Da Vinci's keen eye for detail and his ability to capture the essence of nature in his artworks can serve as a reminder to landscape architects to carefully observe and draw inspiration from the natural world in their design process.

- Interdisciplinary Approach: Da Vinci's multidisciplinary approach, characterized by his curiosity and expertise in various fields, can be a reminder to landscape architects to adopt a holistic approach. Landscape architecture often

involves collaborating with professionals from diverse disciplines, such as architecture, engineering, ecology, and social sciences, just as da Vinci collaborated with experts from different fields in his artworks and inventions.

- Innovation and Creativity: Da Vinci's innovative and creative mindset, reflected in his imaginative inventions and innovative artworks, can inspire landscape architects to think outside the box and come up with unique and inventive design solutions. Da Vinci's emphasis on creativity, experimentation, and pushing boundaries can encourage landscape architects to be innovative and strive for excellence in their designs.

- Sustainability: Da Vinci's deep respect for nature and his understanding of the interconnectedness of ecosystems can resonate with the principles of sustainability in landscape architecture. Landscape architects, like da Vinci, often prioritize sustainable design practices that minimize the negative impact on the environment and promote ecological resilience.

- Art and Aesthetics: Da Vinci's artistic sensibility and his attention to aesthetics in his artworks can also be relevant to landscape architecture, as creating beautiful and meaningful outdoor spaces is an essential aspect of landscape design. Da Vinci's approach to composition, color, and form can inspire landscape architects to create visually stunning and emotionally resonant landscapes.

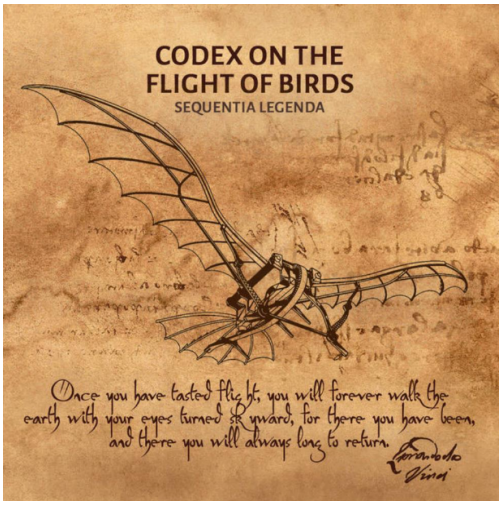


Figure 1-3: Codex on the Flight of Birds by Leonard Da Vinci (Google Image)

1.3.2 The Beauty of Bird Flight & Human Flight Machines

The Codex on the Flight of Birds contains da Vinci's detailed observations, sketches, and diagrams on the anatomy, aerodynamics, and mechanics of bird flight. In this codex, da Vinci documented his keen observations of different bird species in flight, carefully noting their wing shapes, wing angles, tail movements, and other aspects of their flight patterns.

Da Vinci's observations and sketches in the Codex on the Flight of Birds were pioneering in his time and laid the foundation for modern aerodynamics. His insights into bird flight were also integral to his designs for human flight machines, such as ornithopters, which were mechanical devices that mimicked bird flight.

His unrestrained curiosity to connect bird flight and human flight machines coincidently echoes with my leading thesis questions: What kind of built environment can we create if we can equally love white storks and blue angel super hornets? How can we acknowledge and respect both the natural world and human aspirations, without compromising the two seemingly contrasting interests and priorities?

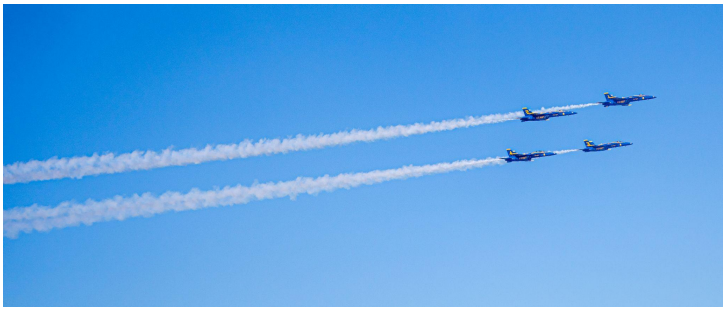


Figure 1-4: Blue Angels Air Show

Figure 1-5: Blue Angels Air Show

Figure 1-6: Blue Angels Air Show

Figure 1-7: Blue Angels Air Show

The smoke is created by injecting diesel fuel into the exhaust nozzles of the planes, which then vaporizes and produces a dense, white smoke trail behind each aircraft.

Bird flight and human flight machines both possess a unique and awe-inspiring beauty that captivates our imagination. The graceful soaring of a bird, with its effortless gliding and intricate aerial acrobatics, has inspired humans for centuries. The idea of being able to fly like a bird has been a dream of humans since ancient times, and has led to the development of increasingly sophisticated flight machines over the years.

Human flight machines, such as airplanes and helicopters, have their own beauty as well. The sleek lines and smooth curves of modern aircraft reflect the ingenuity and creativity of their designers. The power and speed of these machines, as they race through the skies or hover in mid-air, are a testament to human engineering and innovation.

Figure 1-8: My 15-day Chickpea Seed Clock

The next generation of environmentally–conscious citizens can admire the beauty of modern aircraft and appreciate the incredible human ingenuity that went into designing and building them, while also recognizing that they have an impact on the environment. Meanwhile, they can recognize the interconnectedness of all things and marvel at nature, the beauty of a flock of birds soaring overhead, the subtlety of moss touching and the attentiveness of waiting for a chickpea developing its cotyledon (Figure 1-8).

1.4 My Definition of “Environment-Conscious Citizens”

1.4.1 Child-Friendly Cities initiatives

Child-Friendly Cities initiatives are a growing movement that seeks to create urban environments that are safe, healthy, and welcoming for children and families. These initiatives aim to promote the rights of children and improve their well-being by addressing issues such as child-friendly transportation, access to public spaces, and opportunities for play and recreation.

Connecting the cultivation of the next generation of environmentally-conscious individuals with Child-Friendly Cities initiatives worldwide can be a powerful way to promote sustainable and equitable urban development.

1.4.2 My interpretation of nature

What is nature? Normally the raw, untamed wilderness awes us, but doesn't necessarily delight us. My idea of nature as the model (Figure 7) shown involves a self-balanced dynamic that is also responsive to human activities. Human's affinity with nature is not a hard-wired instinctual response. Instead, the inherent tendency to interact with and experience nature relies on types of engaging, immersive and ecologically connected experiences. Meanwhile, people being part of a reinforcing and coherent environment to learn and assist in development, the educated and informed citizen then tend to more readily engage in social planning and mobilize to respond to the climate crisis.

An animated video can be found here:

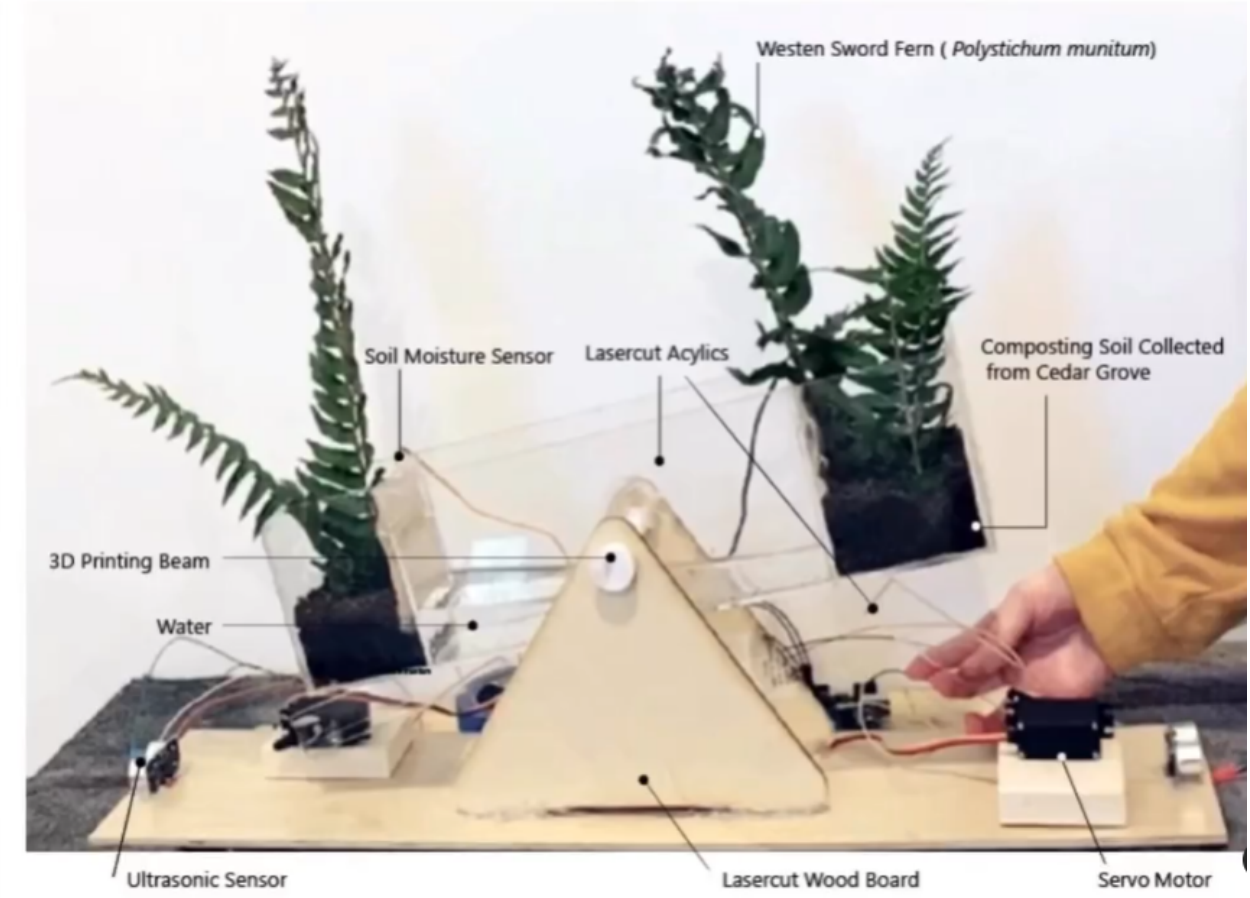


Figure 1-9: My Nature Model

Through my ongoing exploration and understanding of nature, my perspective has evolved beyond mere interpretation. It has transformed into a call to action, urging me to define what it means to be an environmentally-conscious citizen.

As I delved into the intricacies of nature, I recognized that our role as humans extends far beyond observation and appreciation. It is our duty to become active participants in preserving and protecting our natural world. This realization led me to contemplate the qualities and responsibilities of environmentally-conscious citizens.

My definition of environmentally-conscious citizens, as acknowledging and respecting both the natural world and human aspirations, aligns with the principles of sustainability and responsible stewardship of our planet.

Such citizens understand the interconnectedness between the environment and human well-being, recognizing that the two are not mutually exclusive but deeply intertwined. They understand that true sustainability lies in finding a harmonious balance between the needs of our planet and the well-being of humanity.

They strive to minimize their ecological footprint, make conscious choices that reduce waste and pollution, and actively participate in initiatives that promote conservation and restoration of our natural resources.

Moreover, these citizens advocate for systemic changes and support policies that prioritize environmental protection and social equity. They engage in meaningful dialogue, raise awareness, and inspire others to join them in their journey towards a more sustainable future.

Given my view on the potential of landscape architecture to engage both nature and human creations in cultivating environmentally conscious citizens, I have developed a "**playful public design framework**." This framework aims to explore innovative ways to foster a deep connection between people and their environment, inspiring a sense of wonder and stewardship. By integrating elements of play, creativity, and sustainability into public spaces, this framework encourages individuals to interact with and appreciate the natural world while also respecting and nurturing their own aspirations.

Chapter 2 Playful Public Education Design Framework

This chapter will explore the motivation and essence of the Playful Public Education Design Framework, which is an approach aimed at incorporating playfulness and engagement into educational experiences within public education settings.

Figure 2-1

Figure 2-2

"Leave no trace"

2.1 A different way of designing –Dilip Da Cunha

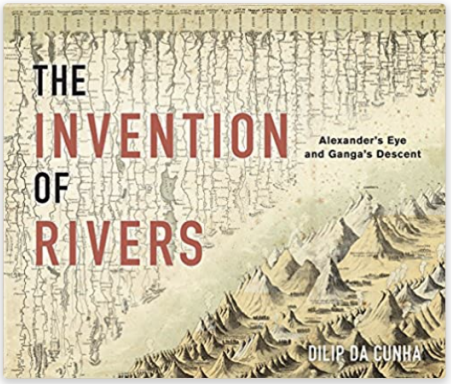
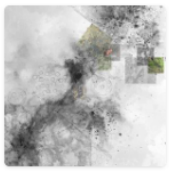


Figure 2-3: The Invention of Rivers by Dilip Da Cunha (Google Image)

Three years ago, I read about Dilip Da Cunha's book The invention of rivers (Figure 2-3), so inspired that I made a podcast (Figure 2-4) to show my appreciation for him for challenging me to think differently about land and water interpreting our world in a frame of wetness gradient, rather than a dichotomy, a strict line. Three years later I met him in person, inquiring about his thoughts on the "sponge city "concept and again he challenged me to think differently about the city. I do believe to design differently, we must learn to see differently and think differently.

ABOUT THIS EPISODE



" A river that flows back onto itself " actually refers to the hydrologic cycle. It envelops the Earth in wetness. This wetness does not flow as water does; it holds, soaks, blows, seeps, osmotes, and transpires ; The sea is very wet, the desert less so.

That is to say, there is no line between land and water, only a coast between rain and tide; Mumbai has the major flood, how to prevent flood? You might say by building an embarkment, a levee, a spillway, a jetty, a revetment, a cutoff, or any geological segments; but how to even separate land from water, especially during a summer monsoon? What's the wetness in the ephemeral and the temporary.

Before structuring a river by construction, before imaging a river by representation lies distinguishing a river. And then we can talk about a mound on an open field, exposed to the flows and floods of a river.

A mound, thus a habitation. Design, rather, crafts a literacy, constitutes the ground of habitation.

Design Arts

Figure 2-4: Podcast Scripts (Source:Ecotone; Wetness; The tide and the rain; Dilip Da Cunha by The Flow and The Flood (spotify.com))

“Ecotone”

It is a pistachio paper-textured tiramisu sided with cookie crumbs, honey syrup, apple stems and cream cheese finished with Gluten-free cane sugar. All materials are compostable! It is an attempt to zoom out on a larger geological scale, introducing ecotone here.

Figure 2-5: My Ecotone Model

Ecotone (Ecology + tone, tone from the Greek tonos or tension, literally refers to a place where ecologies are in tension. The word was coined by Alfred Russel Wallace, a renowned naturalist and biologist, who first observed the abrupt boundary between two biomes in 1859 (Wikipedia, 2022). Ecotones can be found in various landscapes, such as the boundary between a forest and a meadow, a river and a wetland, or the meeting point of a desert and a grassland.

2.2 Tangram Framework

Books & Documentary support **Tangram Framework**

Figure 2-6: Books & Documentaries Support Tangram Framework

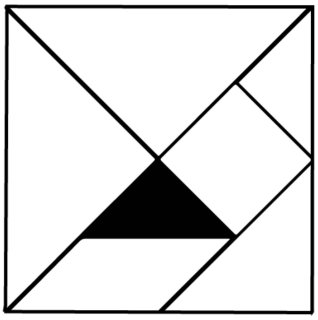


Figure 2-7: Tangram

To summarize my exploration journey on how to cultivate the next generation of environmentally-conscious citizens through my research and reflections: I would like to introduce the " Tangram" framework for playful public design.

Tangram (Figure 2-7) is a traditional Chinese puzzle that consists of seven flat polygons, called tans, which are put together to form shapes using all seven pieces **without overlap**.

The tans are typically made of wood or cardboard and are of different shapes and sizes.

Tangram – **Tans**

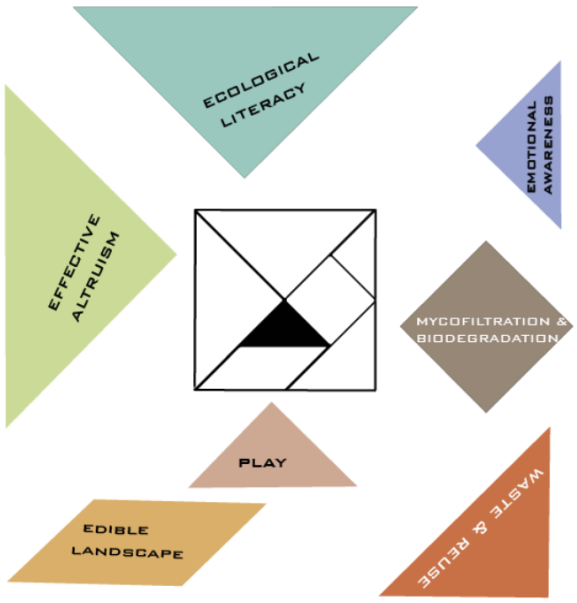


Figure 2-8: My 7 Tans

The tans includes : “play”; “effective altruism”; “ecological literacy”; “emotional awareness”; “mycofiltration & biodegradation”; “ edible landscape”; “ waste & reuse”. (Figure 2-8)

Two biggest elements are the qualities of environmental conscious citizens are “ecological literacy” and “effective altruism”. Two other human qualities are “ emotional awareness” and “play”. And the three “waste & reuse”, “ mycofiltration & biodegradation” and “edible landscape” can be categorized into landscape qualities.

2.2.1 Ecological Literacy is Needed

Ecology is complex, so is the urban environment. Designing for ecology in urban contexts involves integrating ecological principles and considerations into the planning and development of cities and urban spaces. It recognizes the importance of creating sustainable, resilient, and biodiverse urban environments that support both human well-being and the health of the natural world. Ecological literacy is a fundamental component of designing for ecology in urban contexts. It refers to the understanding of ecological systems, processes, and interconnections.

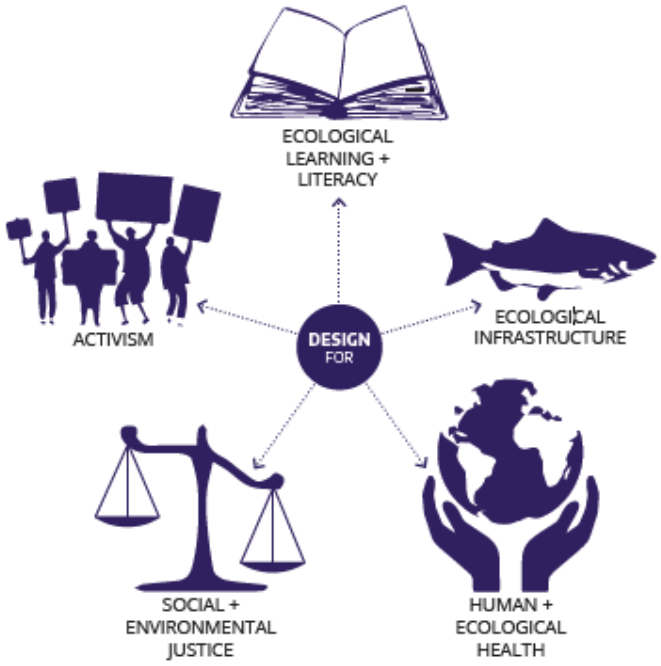


Figure 2-9: Urban Ecological Design Program Pillars at University of Washington Landscape Architecture
Urban Ecological Design - Landscape Architecture (uw.edu)

For more than 15 years the University of Washington's Department of Landscape Architecture has honed into Urban Ecological Design. At its core, urban ecological design is about creating sustainable and livable urban environments that are resilient to the challenges of climate change, resource depletion, and urbanization.

The Department's five pillars are distinctive and inherently integrated, which also manifested in various research and community engagement works across departments. One of the University of Washington's Department of Landscape Architecture pillars is ecological learning and literacy.

David Orr, being a prominent voice in the field of environmental education and sustainability, has written extensively about ecological literacy. In his book ***Ecological Literacy: Education and the Transition to a Postmodern World***, Orr argues that while advancements in science, medicine, and technology have been significant, the most critical discoveries of the 20th century lie in our growing understanding of the earth's finite resources and the urgent need for sustainable development. (Orr, 1992)

In this thought-provoking book, Orr highlights the crucial role that educational institutions, from schools to universities, play in addressing the ecological challenges we face. He poses important questions about the implications of our finite planet and the need for a shift in education to reflect this new awareness. What should individuals know, and how should they learn, in light of the limits and fragility of our environment? (Orr, 1992).

David Orr's concept of ecological literacy and the documentary " A Bite of China" are related in that they both promote a deeper understanding and appreciation of our relationship with the environment, particularly as it relates to food production and consumption. According to Orr, ecological literacy involves three key components: knowledge, ethics, and practice. Knowledge refers to an understanding of ecological systems and the complex interconnections between them. Ethics refers to a deep sense of responsibility and care for the natural world, and a commitment to living in a way that is respectful and responsible toward the environment. Practice refers to the practical skills and knowledge needed to live sustainably, such as the ability to grow food, conserve energy, reduce waste, and use renewable resources (Orr, 1992).

To build on top of David Orr's work, I would like to elaborate on " practical competence" and refer to books like "The Way Things Work" (1988) and "The New Way Things Work" (1998) written by David Macaulay.

"The Way Things Work" was first published in 1988 and has since been updated several times. The book covers a wide range of topics, including simple machines, engines, electricity, and computers. Each concept is explained using Macaulay's signature detailed illustrations and humorous writing style.

"The New Way Things Work" is a revised and updated version of the original book, published in 1998. It includes new information and illustrations about recent technological advancements, such as the Internet, digital cameras, and cell phones.

Individuals can gain a better understanding of the systems that underpin our world, including the natural environment, human-made infrastructure and technological innovation. This understanding can help individuals make more informed decisions about how to interact with the world around them and can inspire them to take actions that are more sustainable and environmentally conscious. This also aligns with the principles of effective altruism, which is maximizing positive impact and doing

the most good in the world. By considering the long-term consequences of our actions and striving to make choices that have a positive impact on both current and future generations, we can integrate sustainability and effective altruism.

2.2.2 Actions leads to effective altruism

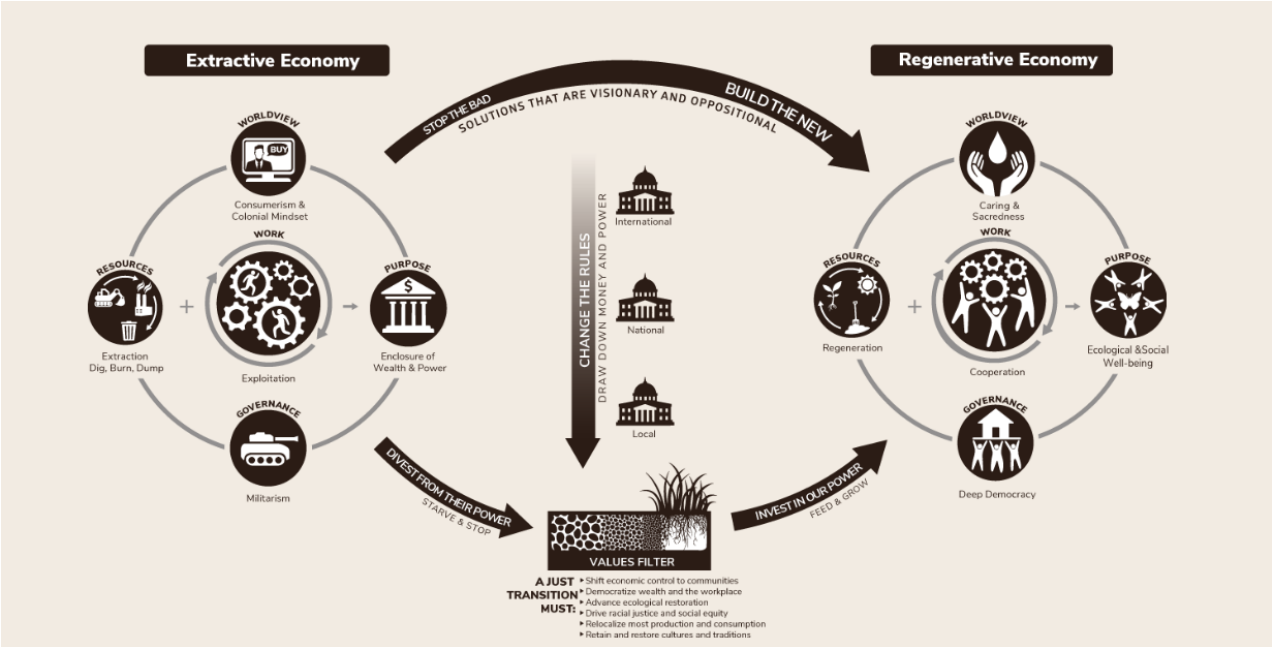


Figure 2-10: Just Transition Framework from Climate Justice Alliance
Source: https://climatejusticealliance.org/

I would love to analyze “giving”, an act of generosity providing some form of benefit to others in the context of Just Transition Framework (Figure 2-10), which encompasses a set of principles, processes, and practices that empower us economically and politically, enabling us to shift from an extractive economy to a regenerative one.

Giving, oftentimes it is complicated by the fact that benefit also flows to the giver (Inaba et al., 2010) The act of giving, whether intentional or not, can bring rewards to the giver, which may include public recognition, professional or social progress, spiritual fulfillment, financial gain, and other forms of personal benefit.

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If an act of giving is never one of pure, absolute altruism, neither is it necessarily one of self-interest above all.

Effective altruism recognizes that balancing self-interest with the pursuit of benefiting others is natural and acknowledges that individuals can lead fulfilling lives while making a significant positive impact on the world.

Two books I listed below support my understanding of “effective altruism” and further inspired me to frame it into tangram concepts.

In "***Doing Good Bette***r", William MacAskill discusses effective altruism as using evidence and reasoning to determine the most effective ways to do good in the world. He encourages readers to think critically about their charitable efforts and to focus on interventions that have the most impact. By doing so, individuals can make a greater positive difference in the world. MacAskill tells us that we have the power to make a meaningful impact in the world by carefully considering our actions and making informed choices.

“***World of Giving***” edited by Jeffrey Inaba and C-Lab (2010), explores the meaning and significance of giving in our lives. The book delves into the spiritual and emotional dimensions of giving, and how it can bring joy and fulfillment to both the giver and the recipient. It also discusses the different forms of giving, including material, emotional and intellectual giving, and the importance of giving without expecting anything in return.

This book delivers a message that giving is a fundamental part of human nature, and that it is through giving that we can find purpose and meaning in our lives. He also emphasized the importance of giving as a way to create positive change in the world, and encouraged readers to develop a giving mindset and incorporate giving into their daily lives.

Both books used evidence and reasoning to determine the most effective ways to improve the world. “ Doing Good Better” encourages individuals to think critically about their charitable giving and to consider supporting causes that have the greatest impact. “ World of Giving” explores the idea of “ strategic giving”. It encourages individuals to think about the long-term impact of their charitable donations and to support organizations that are addressing the root causes of social and environmental problems.

Individual action matters. Taking action is also a crucial aspect of effective altruism. It involves not only making thoughtful decisions about how to use one's resources to do the most good, but also following through on those decisions by actually taking steps to make a positive impact. When individuals actively engage in their communities and work to promote positive change, they are practicing effective altruism. By volunteering, donating to charity, or advocating for policies that benefit society, active citizens can make a tangible impact on the world around them.

Engaging in sustainable actions inspire others to do the same, further creating a ripple effect of positive change. This collective impact ultimately leads to significant positive impacts on a larger scale.

2.2.3. Waste & Reuse & Mycoremediation

At the spine of the Tangram concept, I would like to bring more awareness around waste.

"***Cradle to Cradle: Remaking the Way We Make Things***" is a book written by William McDonough and Michael Braungart. This book presents a new paradigm for designing and manufacturing products that promote sustainability and eliminate waste. The authors argue that instead of relying on the traditional "cradle to grave" approach, where products are designed for disposal after a single use, we should embrace a "cradle to cradle" approach that emphasizes the reuse and recycling of materials.

The book outlines a design framework that incorporates principles such as using renewable energy, designing for disassembly, and using safe and healthy materials. McDonough and Braungart argue that by designing products with the entire lifecycle in mind, we can create a regenerative economy that benefits both people and the environment.

By adopting a "Cradle to Cradle" approach, environmentally-conscious citizens can help to reduce their ecological footprint and contribute to a more sustainable future. This can involve making conscious choices about the products they use, such as opting for products made from sustainable materials that can be easily recycled or repurposed. It can also involve advocating for policies and practices that support Cradle to Cradle principles, such as promoting circular economy models or encouraging manufacturers to use eco-friendly materials and processes.

2.2.3.1 Mushroom Cultivation and Mycelium

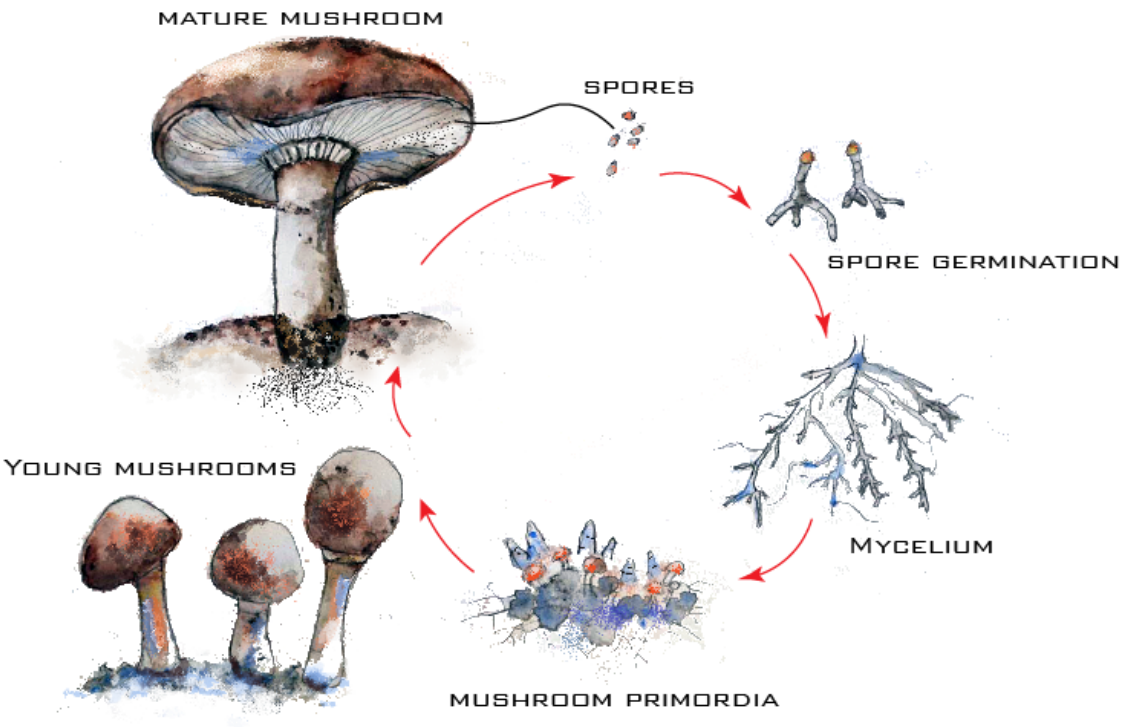


Figure 2-11: Watercolor drawing to illustrate the cyclical nature of mushroom

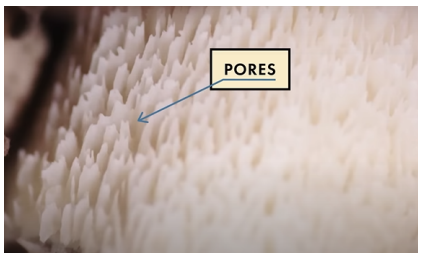


Figure 2-12: Gills create and release spores for reproduction.(Google Image)

"Myco" refers to fungus, mucoraceae. Fungi follow cyclical patterns of life (Figure 2-11). They begin as spores, develop into mycelium, which subsequently give rise to mushrooms. These mushrooms then release more spores (Figure 2-12), initiating the cycle once again (Mycelium 101).

Fungi are inextricably engaged with the world around them. "Lichens are a prime example, each an intimate intertwining of fungus and algae." (Stamets, 2005, P34) Fungi perform important roles in the world's soil ecosystems. They're " the egg in the cake" as mycologist Giuliana Furci puts it (D'Eila, 2021). In the rhizosphere, the hyperactive zone of life that swirls around the roots of plants. "It's a dizzying commotion of life

that's bound up in the hyphae of mycorrhizal fungi." (Stamets, 2005, P56).
Mycorrhizal fungi constitute a considerable sink for carbon in most ecosystems. Mycelium, the vegetative body of a fungus, distinguished itself by performing specialized activities "such as the production of oxalic acids that have the strength to decompose rock, and peroxidase enzymes that break hydrocarbon bonds in complex carbohydrates such as lignin and turn them into simple sugars" (McGaw et al., 2022). Unlike man-made polymers that permanently use fossil fuels, fungi can grow on agricultural waste (husks, sawdust, wood chips, and even coffee grounds) and is biodegradable.

Figure 2-13: Brussels Sprouts Comparison
The Brussels sprouts having contact with mycelium of the elm oyster (Hypsizgus ulmarius) produced much better than the controls. From Book "Mycelium Running" by Paul Stamets

Mushroom cultivation can be a great example to explore waste and reuse. Mushrooms are known for their ability to grow on a wide range of organic waste materials, such as straw, sawdust, and agricultural byproducts. By using these waste materials as a substrate for mushroom cultivation, it is possible to convert them into a valuable and nutritious food source.

Furthermore, after the mushrooms are harvested, the leftover substrate can be used for other purposes such as compost or even as a soil amendment.

In addition, mushrooms have also been used for mycoremediation, which is the process of using fungi to break down and detoxify environmental pollutants such as oil spills, pesticides, and heavy metals.

Mushroom cultivation has a long and fascinating history that dates back thousands of years. The ancient Egyptians, Greeks, and Romans were known to have cultivated mushrooms for their medicinal and culinary properties. In China, mushrooms have been cultivated for over 1,000 years and are an important part of Chinese cuisine and medicine.

In Europe, mushroom cultivation was practiced by monks during the Middle Ages, who used mushrooms both for food and for their medicinal properties. In the 1700s, French farmers began cultivating mushrooms in caves, which provided the ideal conditions for mushroom growth.

In the late 1800s, the cultivation of mushrooms began to shift from small-scale production to larger commercial operations. Modern mushroom cultivation techniques were developed in the early 20th century, and today, mushrooms are grown on a large scale all over the world.

2.2.3.2 Mushroom Culinary & Medicinal Culture Context

In culinary contexts, mushrooms are valued for their unique flavors and textures, as well as their nutritional value. Many species of mushrooms are rich in vitamins, minerals, and other nutrients, and they can be prepared in a wide range of dishes, from soups and stews to stir-fries and salads. Some of the most commonly used culinary mushrooms include button mushrooms, shiitake mushrooms, portobello mushrooms, and oyster mushrooms account for over 90% of mushroom consumption.

Figure 2-14: (From left to right: Portobello, Cremini, White Button) (Google Image)

White Button (AKA champignon mushroom, small to medium size, mild flavor, spongy texture); Cremino (AKA Baby Bella, Small, smooth & brown, mild flavor, meaty texture). Portobello (AKA Larger in size, defined gills, earthy flavor, meaty texture, great as a bread or meat substitute.)

In addition to their culinary uses, many species of mushrooms also have medicinal properties. Traditional medicine systems such as Chinese, Ayurvedic, and Native American have long used mushrooms to treat a range of conditions, including respiratory infections, digestive issues, and immune system disorders. In modern times, scientific research has begun to explore the potential health benefits of mushrooms, with some studies suggesting that certain species may have anti-inflammatory, antioxidant, and anti-cancer properties. In China, for example, Ganoderma species— known there as Lingzhi; In Japan, reishi have for thousands of years served as a traditional treatment for arthritis, cancer, heart disease, hepatitis, and other ailments.

In recent years, there has also been a growing interest in the use of medicinal mushrooms as supplements, which are often taken in the form of powders, capsules, teas, or coffee. These medicinal mushrooms are adaptogenic, which contains bioactive compounds such as polysaccharides, triterpenoids, and beta-glucans that can help regulate the body's immune system, reduce inflammation, and support overall health and well-being. Some commonly used adaptogenic mushrooms include reishi (*Ganoderma lucidum*), cordyceps (*Cordyceps sinensis*), chaga (*Inonotus obliquus*): , lion's mane (*Hericium*

erinaceus), and turkey tail ((*Trametes versicolor*). (Miles, et. al., 2004)

The addition of mushroom extracts or powders to coffee has become a popular trend. It allows people to enjoy their regular cup of coffee while also benefiting from the potential health-promoting properties of mushrooms. The mushrooms are typically processed into an extract or powder form and then blended with coffee.

Figure 2-15: Illustration by Wunderground Coffee Shop
Source: https://wundergroundcoffee.com/

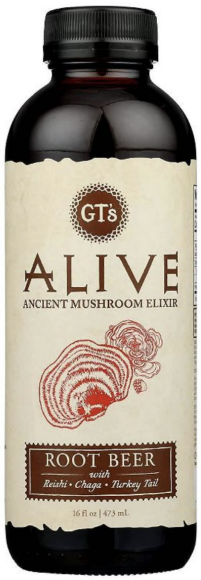


Figure 2-16: GT's Alive Root Beer Ancient Mushroom Elixir

2.2.3.3 Mycoremediation

The book "***Organic Mushroom Farming and Mycoremediation***" by Tradd Cotter describes how mushrooms can be grown on a variety of organic waste materials, such as sawdust, straw, and agricultural waste, and how they can be used to remediate contaminated soils, water, and air (Cotter 2014). By using waste materials as a substrate for mushroom cultivation, we can divert these materials from landfills and turn them into a valuable resource. Additionally, the book discusses how mushrooms can be used to break down and detoxify

pollutants, such as petroleum products, pesticides, and heavy metals, turning them into harmless compounds. This not only reduces waste and pollution but also provides a sustainable and eco-friendly alternative to traditional remediation methods.

There are several types of mycoremediation, including:

- Biodegradation: This involves using fungi to break down organic contaminants, such as petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), and chlorinated compounds.(Cotter 2014).
- Mycofiltration: This is the use of fungi to remove pollutants from water or air by filtering them through mycelium (the vegetative part of the fungus). Mycofiltration can be used to remove heavy metals, bacteria, and other contaminants.(Cotter 2014).

2.2.3.4 Mushroom Dyeing

Mushroom dyeing (Figure 2-17 Figure 2-18) is a traditional practice that has been used by indigenous communities around the world for centuries. By learning about and supporting this traditional practice, environmentally-conscious citizens can help to preserve cultural diversity and promote the value of traditional ecological knowledge.

Figure 2-17 & Figure 2-18: Mushroom Dyeing at PSMS Annual Wild Mushroom Show

This also offers a wide range of unique and beautiful colors that cannot be achieved with synthetic dyes. By incorporating natural dyes into their creative projects, individuals can explore new and exciting avenues for artistic expression (Rice & Beebee, 2007).

2.2.3.5 Mycelium as a new material

Construction and demolition activities account for 40% of the landfill waste in the United States. (Mohammad Farid Alvansaz Yazdi, 2013). For the past 15 years, architects, artists and engineers, citizen scientists around the world have been experimenting with the potential of mycelium as a future building material. The US-based companies Ecovative and MycoWorks were early leaders. Ecovative now dominates the US patents landscape (Cerimi et al., 2019) and has a contract to supply the multinational furniture giant, IKEA, with a bio-substitute for polystyrene packaging (Steffen, 2019) Mycelium-based experimentation and prototyping has pursued four lines: Flat hardboard products for building panels; flexible leather substitutes; disposable packaging; architectural fittings and homeware.

Figure 2-19: Installation “Mycotecture” used mushroom bricks made from Reishi mushroom cultures by Phil Ross.

Mycelium is the vegetative part of a fungus that consists of a mass of branching, thread-like structures called hyphae. In recent years, mycelium has emerged as a promising new material with a wide range of potential applications in various industries.

One of the most notable applications of mycelium is in the field of sustainable materials. Mycelium can be grown into a strong and durable material that can replace plastics, leather, and other materials that have a significant environmental impact. The mycelium-based material is often referred to as "mycelium leather" or "mushroom leather" and has been used in fashion, furniture, and packaging industries. Mycelium can also be used as an insulation material, bricks and panels, or composite materials combined with other materials like straw, wood chips, and hemp for building.

During the email correspondence with Vera Meyer, an artist and a professor for fungal biotechnology at TU Berlin, based on her current research on mycelium, none of the mycelium-based structures is waterproof.

Figure 2-20: Vera Meyer’s My Co-Build Project
Source: NEU! MY-CO BUILD - Futurium

Figure 2-21: Documenting the white, fluffy and compacted mycelium growth of oyster mushrooms, which are commonly used for Mycoremediation. A video can be found here

The process of growing mycelium-based materials typically involves growing mycelium on a substrate, such as agricultural waste or sawdust, in a controlled environment. Over time, the mycelium forms a dense network that can be harvested and processed into a variety of shapes and sizes. Figure 2-21 shows the white, fluffy and compacted mycelium growth of oyster mushrooms I grew at home.

2.2.3.6 Ecovative Company & Mycelium Product

Founded in 2007 by Eben Bayer and Gavin McIntyre, Ecovative aims to provide sustainable alternatives to conventional manufacturing materials. Their flagship product, called MycoComposite™, utilizes mycelium to create a foam-like material that can be molded into various shapes and used for packaging, insulation, and other applications.

Ecovative's approach involves growing mycelium on agricultural waste, such as corn stalks or hemp fibers, which serves as a nutrient source. Over time, the mycelium binds the waste particles together, forming a solid and biodegradable material. This process requires minimal energy and produces significantly less carbon emissions compared to traditional manufacturing methods.

Figure 2-22: Mycelium Insulation Material

Figure 2-23: Ecovative's Mushroom Tiny House to demonstrate the use of their mycelium insulation material

The process can be broken down into three distinctive steps in the manufacturing process: mixing the agricultural substrate with the mycelium and water, forming the material into a pre-formed mold and then storing that material mixture in the mold for several days while the material naturally forms and binds together, and the last step would be drying the material out in an oven and doing any type of post-processing on the material.

Figure 2-24 below shows images of what these three distinctive steps look like in the current factory of Ecovative. One thing that this current factory does not do is grow and compost the material on the site.

Figure 2-24: Ecovative Factory Process & Equipments

Figure 2-25: Beam, Panel produced by Ecovative company

In Dougound 's thesis (2018), he also mentioned that Ecovative's current research on mycelium, is focusing on using a variety of substrate materials (hemp, kenaf, flax and aspen) to bind with mycelium. Built upon this, the Ecovative company is also dedicated to manufacture 50 psi compressive strength "beam" and "panel" products (Figure 2-25) and are used as material for furniture, doors, building assemblies and structural panels.

In Dougoud's thesis (2018), he also mentioned that in a series of structural tests (Figure 2-26 & Figure 2-27) conducted by ARUP and Columbia University Laboratory, the mushroom bricks can only withstand 30 psi (0.2 MPa) compared to concrete it is 4000 psi(28 MPa) - 10,000 psi(70 MPa) However the mushroom bricks are much lighter than concrete. "Mushroom bricks weigh 43 kg/m3 and concrete weighs 2,400 kg/m3 ". (Interesting Engineering, 2017)

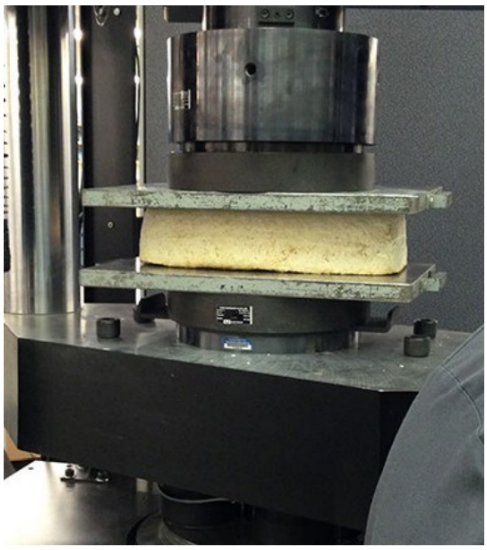


Figure 2-26 (left): Fire resistance testing at Ecovative; Figure 2-27 (right): Testing the compressive strength at Columbia University Laboratory.

2.2.4 Edible Landscape

Cultivating the environmentally-conscious citizen requires us to rethink our relationship with the natural world and to consider new ways of engaging with and caring for the earth. Learning about edible landscapes and foraging in the city is important for environmentally-conscious citizens to promote food security by enabling individuals to access fresh, healthy, and locally-sourced food, encouraging sustainable agriculture practices, reducing the carbon footprint associated with food transportation and preserving natural resources. In all, it promotes a deeper connection to nature and improves overall health and well-being and helps to reduce waste by utilizing local resources that would otherwise go to waste.

There are several different modes or approaches to creating edible landscapes, each with its own unique characteristics. Here are a few examples:

Traditional Food Gardens: This mode involves dedicating specific areas of the landscape exclusively for growing edible plants, such as vegetable gardens, herb gardens, or fruit orchards. These gardens can be organized in rows or beds and often require regular maintenance and cultivation.

Permaculture Gardens: Permaculture is a design philosophy that aims to create sustainable and self-sufficient systems. Permaculture gardens mimic natural ecosystems, emphasizing diversity, companion planting, and using organic and regenerative practices. Food-producing plants are integrated with other elements such as trees, shrubs, and water features to create a resilient and harmonious system.

Food Forests: Food forests, also known as forest gardens, mimic the structure and functions of natural forests. They consist of multiple layers of plants, including canopy trees, shrubs, herbaceous plants, groundcovers, and root crops. This layered approach maximizes productivity and ecological interactions while providing a variety of edible produce.

Vertical Gardens: In limited space situations, vertical gardens offer a practical solution. These gardens utilize walls, trellises, or other vertical structures to grow edible plants vertically, such as vine crops or espaliered fruit

trees. They optimize space utilization and can be suitable for balconies, rooftops, or small urban areas.

Edible Landscaping in Ornamental Gardens: Edible plants can be incorporated into ornamental gardens, blending them with traditional flowers, shrubs, and trees. This approach focuses on incorporating edible plants with attractive foliage, flowers, or fruits that enhance the overall aesthetic appeal of the landscape.

Container Gardens: Container gardening involves growing edible plants in pots, planters, or containers. It is suitable for small spaces like balconies, patios, or window sills. Various edible plants can be cultivated in containers, including herbs, salad greens, strawberries, and even dwarf fruit trees.

2.2.4.1 Edible Landscapes VS Urban Farms

I want to differentiate edible landscapes from urban farms. While both edible landscaping and urban farming involve growing food, there are some key differences between the two concepts:

Purpose and Scale:

Edible Landscaping: formerly known as urban horticulture (Xie Q, Yue Y, Hu D. 2019), focuses on integrating edible plants into the overall design of a residential or commercial landscape or public spaces (such as city parks and community gardens. The primary purpose is to create an aesthetically pleasing space while incorporating functional elements such as fruit trees, vegetable beds, or herbs. Edible landscaping is typically on a smaller scale and emphasizes the dual purpose of beauty and food production.

Urban Farming: on the other hand, is primarily focused on food production and often involves larger areas or dedicated spaces solely for growing food. It can include rooftop gardens, community gardens, or vacant lot conversions. The goal of urban farming is to produce a significant amount of food within an urban environment and may involve intensive cultivation techniques. Although urban farming can also be operated in a small space, such as container gardening, vertical farming, hydroponics to maximize productivity in limited areas.

edible landscapes (formerly known as urban horticulture) have been encouraged and promoted in both urban

public and private spaces, for they play a vital role in providing food products and improving food quality for urban dwellers

Design and Aesthetics:

Edible Landscaping: Edible landscapes prioritize the integration of edible plants within a visually appealing design. The emphasis is on creating a harmonious balance between ornamental plants, hardscaping features, and edible elements. The overall aesthetic and functionality of the landscape are equally important.

Urban Farming: Urban farms tend to have a more utilitarian design, with a primary focus on maximizing food production. The layout and organization of the farm are geared towards efficient cultivation and high yields. Aesthetics are important to some urban farms, but they generally take a backseat to productivity.

Maintenance and Management:

Edible Landscaping: Edible landscapes are often designed to be low-maintenance and require less intensive management. They are typically integrated with other landscaping elements, which can help reduce maintenance needs. Edible plants are incorporated into existing landscapes, and care is taken to ensure they fit within the overall maintenance requirements of the space.

Urban Farming: Urban farms require more intensive maintenance and management due to the focus on food production. The cultivation of crops and management of pests, watering, and soil fertility often require regular attention. Urban farms may also involve community involvement or specialized farming techniques to optimize production.

2.2.4.2 Compost Connection Leads to Soil Health

David Montgomery in his book ***What your food ate : how to heal our land and reclaim our health*** discussed the health of the soil ripples through to that of crops, livestock and ultimately us. While “improving soil health is fundamentally about getting communities of soil life to build up their populations in ways that benefit rather than sap crop health.” (Montgomery, 2022). Edible

landscapes offer multiple benefits beyond simply providing food. One of the significant advantages is their positive impact on soil health.

Organic Matter: Edible landscapes often involve growing a variety of plants, including vegetables, fruits, and herbs. These plants contribute to the organic matter content in the soil when their leaves, stems, or fruits are pruned or harvested and returned to the soil. Organic matter improves soil structure, moisture retention, and nutrient availability. “Organic matter-based fertility amendments like manure, biochar(charcoal) and of course compost increase soil microbial activity and that reduces pathogen populations.” (Montgomery, 2022, p59)

Nutrient Cycling: Growing edible plants in a landscape allows for nutrient cycling within the soil. As plants grow and their roots absorb nutrients from the soil, those nutrients are then returned to the soil when the plant residues decompose. This cycling of nutrients helps maintain a balanced nutrient supply in the soil and reduces the need for synthetic fertilizers.

Cover Crops and Mulching: Edible landscapes can incorporate cover crops and mulching techniques. Cover crops such as legumes, clovers, or grasses can be planted in between edible plants during fallow periods. These cover crops help prevent soil erosion, suppress weeds, and add organic matter when they are incorporated into the soil. Mulching with organic materials like straw, wood chips, or leaves helps retain soil moisture, reduce weed growth, and gradually add organic matter to the soil as it breaks down.

Composting: Edible landscapes provide a natural opportunity for composting. Kitchen scraps, fallen leaves, and plant residues from the edible plants can be collected and composted. Composting transforms these organic materials into nutrient-rich compost that can be added back to the soil, enriching its fertility and improving its overall health.

Soil Microorganisms: Healthy soil is teeming with beneficial microorganisms that play crucial roles in nutrient cycling, disease suppression, and plant growth promotion. Mycorrhizal fungi are indeed part of the soil microorganism community. They form a mutualistic symbiotic relationship with plant roots, benefiting both the

fungi and the plants. Inoculating crops with mycorrhizal fungi or adopting farming practices that promote the growth of fungi already in the soil can kick-start biological processes at the root of soil health. (Montgomery, 2022, p135)

2.2.5 Emotional Awareness

Emotion in education is a complex area due to the diverse subjective psychological aspects, such as preferences, social conventions, attitudes, personality, etc. (Spielberger et al., 1976). However, cultivating empathy with nature can be a powerful way to develop emotional awareness and deepen our understanding of ourselves and our place in the world. It can help us to become more attuned to the needs and feelings of the natural world, and to recognize the impact that our actions and choices have on the environment.

2.2.5.1 Promoting waste awareness and sustainability

Emotional awareness plays a vital role in the educational aspect of environmental promoting waste awareness and sustainability. When it comes to raising awareness about waste and its impact on the environment, emotions can be powerful catalysts for change, and so cultivate the development of an environmentally-conscious citizen. Researchers have identified several outcomes/benefits of emotional awareness:

Empathy and Compassion: Emotional awareness helps individuals develop empathy and compassion towards the planet and all its inhabitants. By understanding the consequences of waste on ecosystems, wildlife, and communities, people can cultivate a deep sense of care and concern. This emotional connection drives them to take action and make sustainable choices. Environmental decisions are guided by emotional experiences which lead individuals to be more respectful and generous to nature beyond self-interest (Olivos et al., 2011).

Emotional engagement to overcome apathy : Educational initiatives that evoke emotions have a higher

chance of resonating with individuals. Incorporating storytelling, personal anecdotes, and visual representations can evoke emotions such as sadness, empathy, inspiration, or even hope. Emotional engagement helps to capture attention, create a lasting impact, and motivate individuals to change their behaviors.

Emotional awareness and self-compassion are closely related: In the book "***The Mindful Path to Self-Compassion***" by Christopher K. Germer provides tools for developing emotional awareness, recognizing the interconnectedness of our emotions with our thoughts and actions, and learning to respond to our emotions with kindness and acceptance. By cultivating emotional awareness and self-compassion, we can foster a healthier relationship with our emotions and enhance our overall well-being. This introspection helps us understand our values, priorities, and motivations, aligning our actions with our intentions. By cultivating this self-awareness, we can make more sustainable choices in our daily lives.

2.2.5.2 Leads to prosocial behaviors

According to the research by Van Cappellen and Saroglou (2012), being exposed to awe-inspiring natural environments can elicit positive emotions, which in turn influence prosocial behavior. The emotions experienced in such contexts are often characterized by feelings of unity and connection with others, as described by Rudd et al. (2012). Among these emotions, awe, gratitude, and compassion are considered to be the primary prosocial emotions, as noted by Stellar et al. (2017). These emotional states have been linked to increased prosocial behavior, such as acts of kindness, cooperation, and helping others.

By being fully present and attentive to the natural world, we can develop a sense of wonder and reverence that can help us become more empathetic, reflective, and emotionally aware.

2.2.5.3 Reciprocity & Gratitude in building emotional connections

Martin Buber, a prominent Jewish philosopher, theologian, and educator, in his book “I and Thou” explores the nature of human relationships and the concept of encounter or dialogue between individuals. Buber distinguishes between two fundamental modes of relating to the world and others: the "I-It" and the "I-Thou" relationships. The "I-It" relationship refers to a mode of interaction where individuals perceive others as objects or entities to be used, observed, or manipulated. This mode of relating involves a sense of separation and objectification, where one's own needs and desires take precedence over genuine connection and understanding.

On the other hand, the "I-Thou" relationship is characterized by genuine encounters and dialogue. In this mode, individuals perceive and relate to others as unique individuals with inherent value and dignity. It involves a deep recognition of the other's subjectivity and a genuine willingness to engage in a mutual, empathetic, and authentic connection. The "I-Thou" relationship fosters a sense of unity, respect, and shared humanity.

I found the reciprocity also is emblematic of three books “The Mushroom at the End of the World” and “Gathering Moss” and “The Hidden life of trees” respectively featuring mushroom, moss and tree, which later inspired me to create three personalized characters in Chapter 4 to graphic represent the relationship:

Kimmer in her book "Gathering Moss" argues that cultivating a deep connection to the natural world, including mosses, can foster emotional awareness, empathy, and a sense of belonging. "To enter into a relationship with a place, we must begin by paying attention to it. We must look deeply into its stories and its ecology, its topography and its history, its presence and its memory. Attention is the beginning of devotion." She also emphasizes the importance of reciprocity and gratitude in building emotional connections with the natural world. She describes how indigenous cultures have long recognized the importance of reciprocity in their relationships with the land, and how this mindset can help us develop a deeper sense of interconnectedness and emotional awareness.

Moss Touching: To be a human in the world is to be tactile, to always be touching and touched. #Moss is touch. How different it would be from a child's touch?

Figure 2-27:Watercolor drawing, sketch on moss and me touching moss

Mosses are often overlooked and undervalued in the scientific community, despite their important ecological functions and cultural significance. The author suggests that being human is also inherently tactile, that we are always in contact with the world around us, whether we realize it or not. Touch is one of our primary senses, and we use it to explore and navigate the world, to communicate with others, and to form relationships.

Moss, with its soft and delicate texture, reminds us of the importance of touch and the ways in which it connects us to the natural world.

In "The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins" by Anna Lowenhaupt Tsing, the author explores the world of the Matsutake mushroom and its complex relationship with humans and the environment. The author calls us attention to the emotional and ecological resilience of mushrooms, and suggests that we can learn from their ability to adapt and survive in challenging circumstances.

"The Hidden Life of Trees" is a book by the author Peter Wohlleben that explores the complex and interconnected world of trees. The book draws on Wohlleben's experience as a forester and his observations of forests in Germany, where he has spent his career working in forestry management. Trees are social beings that communicate with each other and form complex

relationships in the forest. Wohlleben argues that trees can recognize and respond to one another, sharing resources and even nurturing one another's young. He draws on scientific research to support his claims and provides numerous examples of the ways in which trees exhibit social behavior and cooperate with one another.

2.2.6 Play

In exploring the concept of play, my focus will be on two interconnected aspects: playful learning, which emphasizes the educational dimension of play, and dance, which embodies the expressive and physical nature of play. The following sections will delve into each of these facets, highlighting their unique characteristics and the benefits they bring to individuals and communities.

2.2.6.1 Playful Learning

Playful learning can take many forms, such as games, puzzles, role-playing, storytelling, and hands-on activities. These activities are designed to be enjoyable and engaging, while also providing opportunities for children to explore new concepts, develop new skills, and make connections between what they are learning and their own experiences.

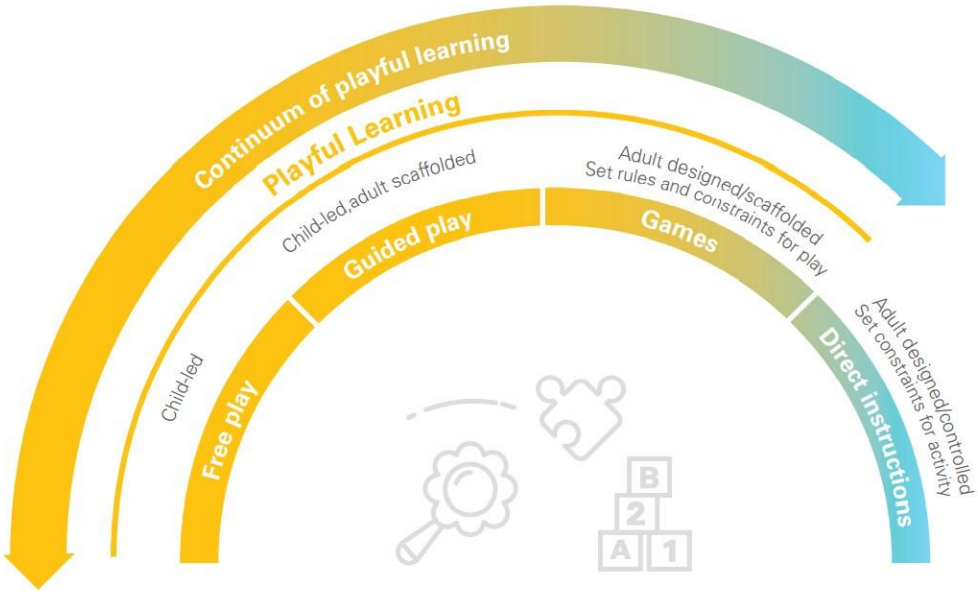


Figure 2-28: Source: Adapted from Zosh, Jennifer N. et.al.”Learning through play: a review of the evidence”. LEGO Foundation, 2017

The "Learning Through Play Framework" (Figure 2-28) developed by the LEGO Foundation is a well-known model that highlights the importance of play in children's learning and development. The framework emphasizes that when children are fully engaged in an activity and motivated by their own interests and curiosity, play becomes an active form of learning.

When children are fully engaged in activities like woodworking or metalworking and are motivated by their own interests and curiosity, play becomes active learning. Engaging in creative and hands-on activities like woodworking or metalworking can be a great way to relax, unwind, and tap into their creativity.

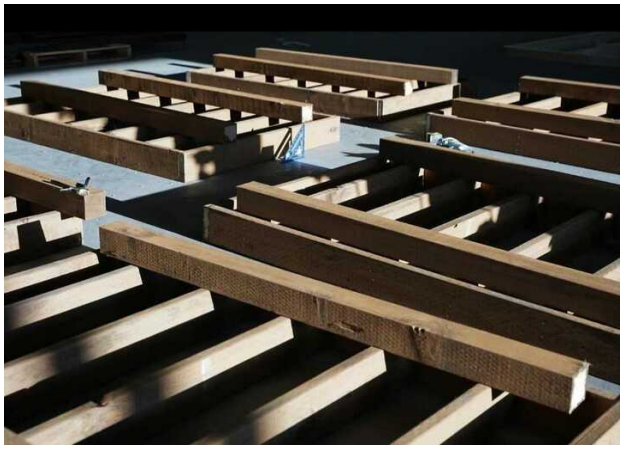


Figure 2-29: Sawhorse Revolution | Design-Build Youth Mentor Program: teaching teenagers about carpentry work to build a mobile kitchen for homeless people. (Top left: use nail gun; Top right: shadow dabbled across frameworks at a sunset moment; Bottom left: teenagers are learning about applying wood filler; Bottom middle: mobile kitchen build progress; Bottom right: wood filler texture).

Urban Thinkscape is a project that aims to transform public spaces, such as bus stops, into interactive learning environments. It combines the elements of play and learning to create engaging experiences for individuals and families in urban settings. The project incorporates puzzles with movable parts into benches at bus stops, providing opportunities for people to develop spatial skills and engage with language, color, and numbers. Additionally, on-site signage and a dedicated website offer further information and resources about the connection between play and learning. The goal of Urban Thinkscape is to reframe public spaces as more than just functional areas, but as places that foster creativity, curiosity, and continuous learning. (Urban Thinkscape)

Figure 2-30: Playful learning in public space designed by Urban Thinkscape;
photo: Sahar Coston-Hardy

2.2.6.2 Dance is Play

Dancing provides a sense of liberation and joy, allowing us to express ourselves creatively and freely. I would love to share my dance interaction with moss, mushroom and tree here (Figure 2-30 & Figure 2-31)

Figure 2-31: My face amongst a spruce tree and some mischievous weeds;
Figure 2-32: Immerse myself in an epiphytic day with moss as this video

Here is a description of what it might be like to engage in such an enchanting activity:

You can just pause for a moment, closing your eyes and breathing in deeply, allowing the peaceful energy of the forest to envelop you.

And open your eyes and breathe in deeply;

As the soft rays of the sun filter through the verdant canopy above, you find yourself in a magical forest filled with an abundance of lush moss. You begin to move, slowly at first, your body mimicking the gentle sway of the moss. Its cool, velvety texture brushes against your skin, sending shivers of delight down your spine. The vibrant green hues of the moss seem to come alive as you move, radiating a vibrant energy that merges with your own.

Your arms extend gracefully, your fingertips grazing the mossy surfaces, as if tracing the intricate patterns that nature has woven. As you spin and twirl, your senses become attuned to the rhythm of the forest, the rustling of leaves, and the melodious songs of the birds.

The air is fresh and filled with a subtle earthy fragrance, inviting you to explore this ethereal realm. With every step you take, the ground beneath your feet feels cushioned, carpeted with a velvety carpet of moss.

In this serene and symbiotic dance, you become one with the moss, sharing its peaceful existence for a fleeting moment. The forest applauds your joyful expression, with dappled sunlight casting an ethereal glow upon your dance floor of moss. As the day draws to a close, you slowly bring your dance to a gentle halt. Standing amidst the moss-covered forest floor, you feel a deep sense of tranquility and rejuvenation. The memory of your dance with the moss lingers in your heart, reminding you of the beauty and harmony that exists in the natural world.

With a newfound appreciation for the delicate wonders of nature, you carry this experience with you, knowing that you can always return to the moss for another dance, whenever your soul yearns for a moment of pure connection and joy.

Figure 2-33: Empathy with nature is the capacity to share the emotional experience of the natural world. #play with yellow gabion mushrooms (*Dictyophora duplicate*). Video link can be found here.

Chapter 3 Applying the Framework to Georgetown

Figure 3-1: Watercolor drawing collaged with home-made mushroom-shaped bakery to illustrate playful edible landscape to balance out the tension between man-made environment and nature

Figure 3-2: Literally “edible” landscape (Home-baked mushroom-shaped baguettes)

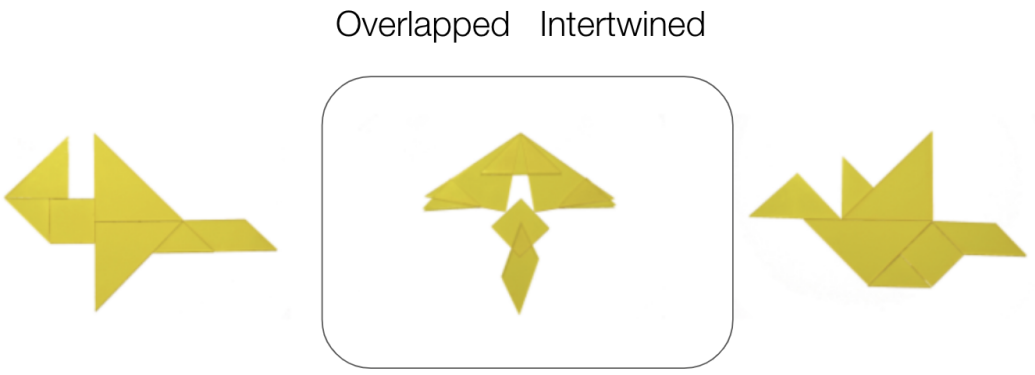


Figure 3-3:Using tangrams to form the shape of an airplane, a mushroom and a bird from left to right.

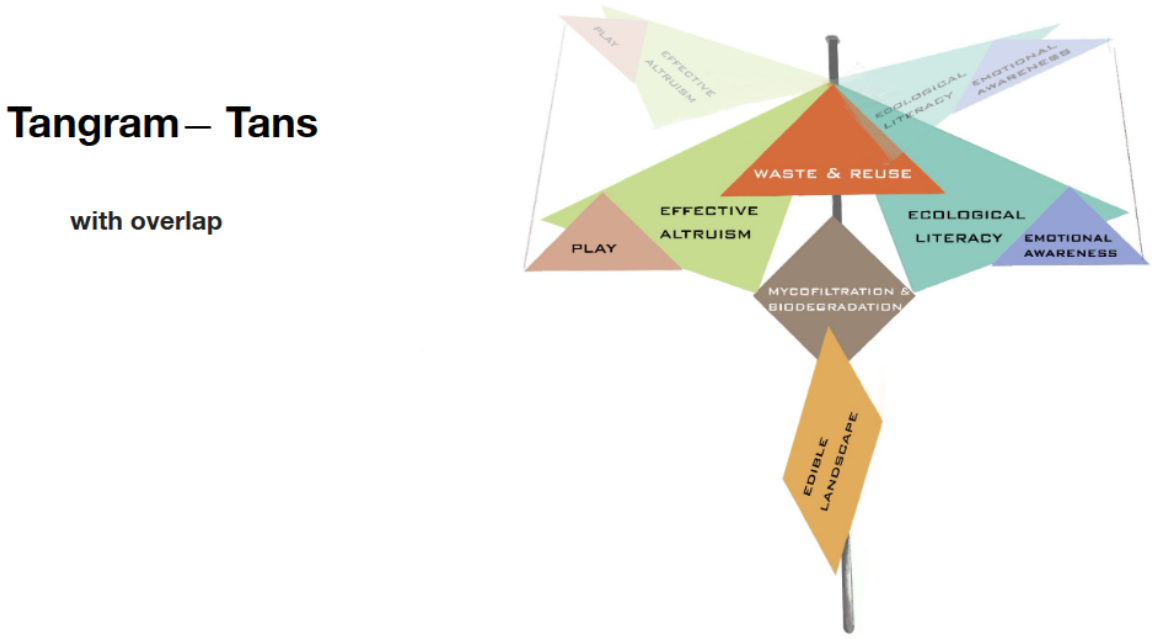


Figure 3-4: Tangram arrangement applied in Georgetown, Seattle; An animated video that showcases how these tans are organized can be found here.

When I applied the tangram framework onto Georgetown, I decided to arrange the 7 tans in an organic manner with overlap. In the middle spine, the substance components laid out are "Waste & Reuse," "Mycofiltration & Biodegradation," and "Edible Landscape." These elements pertain to tangible and physical aspects of the ground design framework.

On the two wings, the listed components are "Effective Altruism" and "Ecological Literacy," which can be interchangeable. These are conceptual ideas or abstract concepts that contribute to the overall framework. Additionally, "Play" and "Emotional Awareness" are non-physical aspects with a focus on feelings. These elements emphasize emotional and experiential dimensions rather than tangible or material components.

3.1 Background-Georgetown Site Situation

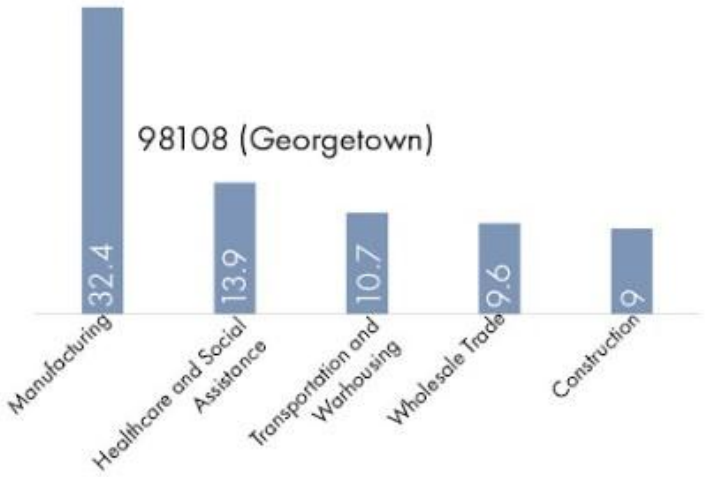


Figure 3-5 Main Industry in Georgetown (Source: Seattle Gov.)

Global environment sculpted by constant human activities pose some serious challenges to our society today. Arbitrarily human behaviors often take the opposite ground of stewarding the land, intensive farming, transgenic plants, abuse of chemical fertilizers, industrialization and urbanization.

Georgetown Seattle is a neighborhood in the south of Seattle, Washington, just a few miles south of downtown, that has a long history of industrial development. It's bordered by the Duwamish River to the west and south,

Beacon Hill to the north, and Boeing Field to the east. The neighborhood is known for its industrial character, as it was once home to many manufacturing plants and warehouses, and for its vibrant arts and culture scene. Over the years, various industrial activities have led to contamination (Figure 3-6) of the soil and groundwater in the area. As a result, Georgetown has been designated as a Superfund site by the US Environmental Protection Agency (EPA). Fungi are an ideal candidate for the remediation of various pollutants.

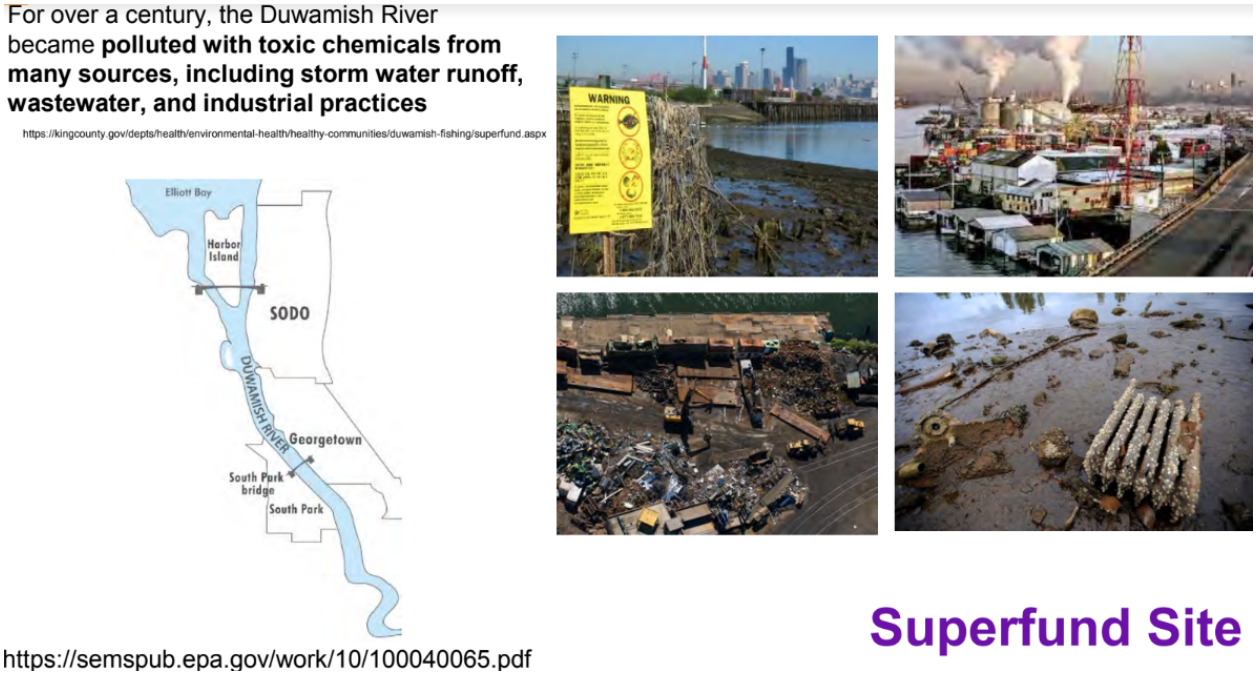


Figure 3-6: DRCC Youth Build Program Slide made by Bernadette Labuguen

In the past, “the Duwamish River was not an industrial waterway, but part of a vast complex of marshes, wetlands, side channels and sloughs. The Duwamish people had some 17 villages and 93 buildings including longhouses on the banks of rivers, lakes, and bays, homes to families linked by alliances of trade and Marriage.” (Mapes, 2022)

“The Dkhw’Duw’Absh traditionally used the river to hunt ducks and geese, fish for salmon, cod, and halibut, harvest clams, and gather berries, camas, and other plants for food and medicinal purposes.” (Duwamish River - Alchetron, 2022)

Starting in the early 1900s, the Duwamish River became a major industrial waterway, with numerous factories, mills, and shipyards lining its banks. The river was dredged and straightened to accommodate larger ships, and the resulting

pollution from industrial activities had a significant impact on the river's ecosystem and the health of the surrounding communities.

In recent years, efforts have been made to clean up the Duwamish River and restore its ecological health. However, the legacy of industrial pollution remains a significant challenge for the river and its surrounding communities.

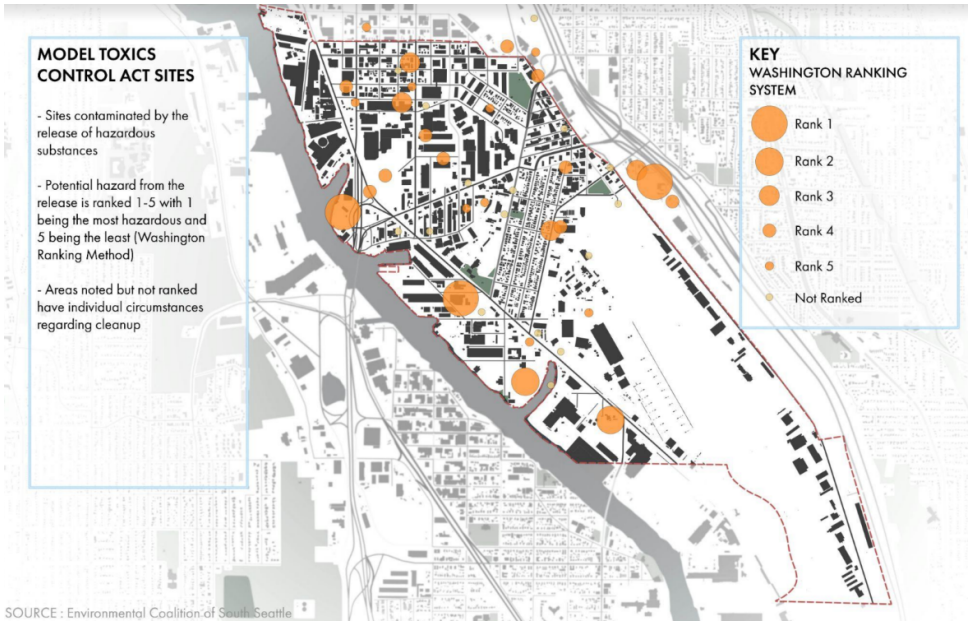


Figure 3-7: Sites contaminated by the release of hazardous substances on a rank 1-5 (Source: adapted resource from Environmental Coalition South College)

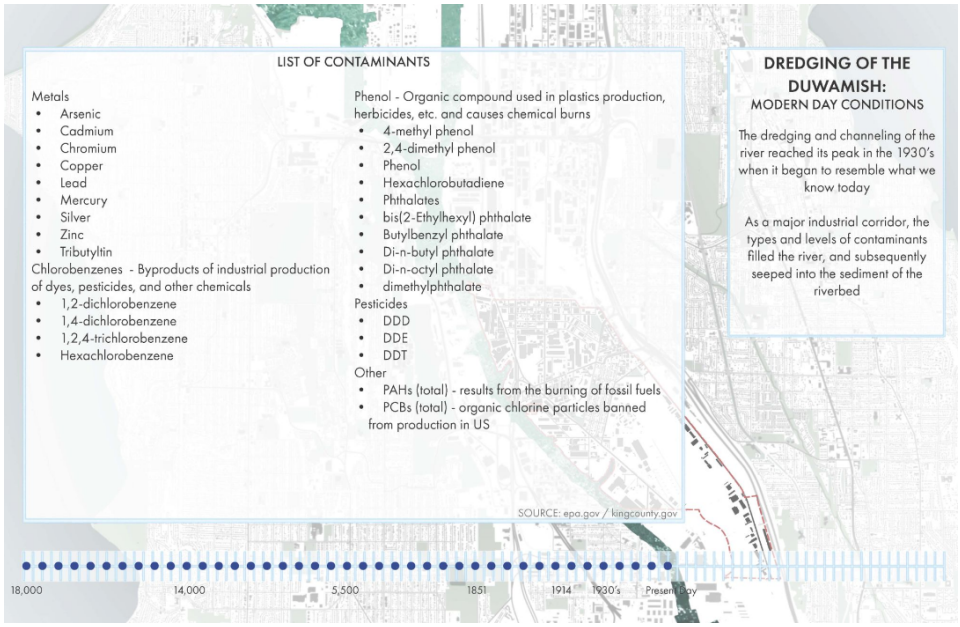


Figure 3-8: List of contaminants can be found in Georgetown,Seattle; (Source: adapted resource from EPA.)

With the influx of businesses and residents, the neighborhood has become a thriving hub for artists, musicians, and creative individuals. The presence of numerous galleries, studios, and live music venues reflects the area's strong artistic community. Additionally, Georgetown has seen a rise in its food and beverage scene, with breweries, distilleries, and restaurants contributing to the neighborhood's culinary offerings.

Despite these changes, Georgetown has managed to preserve much of its historic charm and gritty atmosphere. Many of the former industrial buildings have been repurposed to accommodate art galleries, offices, and event spaces, demonstrating the neighborhood's adaptive reuse approach. Although Georgetown's popularity has increased, it still maintains an off-the-beaten-path vibe, attracting those seeking an alternative and distinctive experience.

According to the U.S. Census Bureau data from 2020, Georgetown's population was approximately 12,000 people. While comparatively smaller than other Seattle neighborhoods, Georgetown encompasses a diverse population in terms of ethnicities and income levels. It comprises a mix of long-time residents and newcomers who are drawn to the neighborhood's unique character and the vibrant arts scene it offers.

Out of curiosity, I seek out local resident's opinions on the issues and needs of Georgetown. They brought up some insights, like providing more food access or not

Figure 3-9: Trailer-Park Owner's sharing; Site visit video can be found here

They (Figure 3-9) brought up some insights, like need more food access or activating more sites besides Airport Way to connect commercial "pockets" and provide more walkable bikeable access to this truck-dominated region.

Figure 3-10: Georgetown Art Attack Map (Airport Way is aligned with I-5 highway).

Georgetown does not have its own distinct educational system. Instead, its residents would attend schools within the Seattle Public Schools district. Such as:

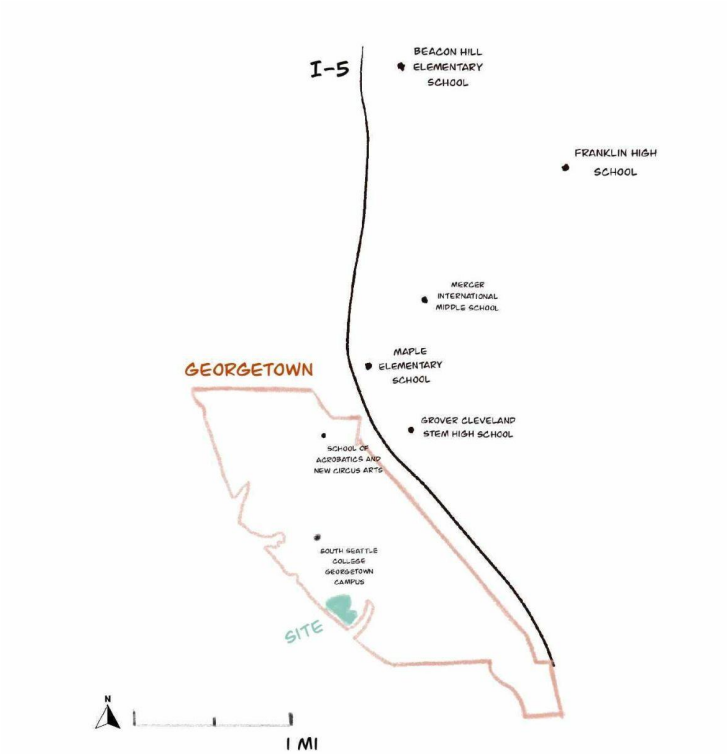


Figure 3-11: School System near the Site (Gateway North Park)

Maple Elementary School: Located in the nearby Beacon Hill neighborhood, Maple Elementary School serves students from pre-kindergarten through fifth grade. The school emphasizes a focus on academic rigor and multicultural education.

Beacon Hill International Elementary School: offers a dual language program in which students learn in both English and Spanish.

Mercer Middle School: Mercer Middle School is located in the Beacon Hill neighborhood and serves students in grades six through eight. The school offers a range of academic programs and extracurricular activities, including music and sports.

Cleveland High School: Located in the nearby Beacon Hill neighborhood, Cleveland High School serves students in grades nine through twelve. The school has a diverse student body and offers a range of academic programs, including International Baccalaureate and Advanced Placement courses.

Franklin High School: Another high school option nearby, Franklin High School is located in the nearby Mount Baker neighborhood and serves students in grades nine through

twelve. The school offers a range of academic programs, including an International Baccalaureate program and a STEM program.

Georgetown is shaped by various influential groups that represent different interests and contribute to its development. Commercial entities like Boeing, a prominent aerospace company, have a significant impact on the local economy, providing employment opportunities and driving economic growth. Environmental organizations, such as the Duwamish River Community Coalition, play a crucial role in advocating for the protection and restoration of the natural environment in Georgetown. Advocacy groups like the Georgetown Community Council (GCC) act as a voice for the neighborhood's residents and businesses.

3.1.1 Boeing

Boeing is a multinational aerospace company that has a significant presence in the state of Washington, including the city of Seattle and the nearby city of Renton, which is home to a major Boeing manufacturing facility. The company also has a facility in Georgetown, which is located on the south side of Seattle.

The Georgetown facility is primarily used for manufacturing and assembly of parts for Boeing's commercial aircraft. (Kershner, 2015) The facility was originally built in the 1940s and has undergone several expansions and renovations over the years. Today, it covers an area of approximately 1.1 million square feet and employs around 2,500 workers. (Wikimedia Foundation, 2023)

3.1.2 Duwamish River Community Coalition (DRCC):

The Duwamish River Community Coalition (DRCC) is a community-based organization focused on protecting and restoring the health of the Duwamish River in Seattle, Washington. The Duwamish River is an important waterway in the area, but it has faced significant environmental challenges due to industrial pollution and other factors. ( )

The DRCC works collaboratively with community members, environmental organizations, government agencies, and other stakeholders to advocate for a clean and healthy Duwamish River ecosystem. Their efforts include raising awareness about the environmental issues affecting the river, conducting research, implementing restoration projects, and engaging in policy advocacy to improve the

overall conditions of the river and its surrounding communities.

The DRCC plays a crucial role in promoting environmental justice and community empowerment, working towards a sustainable and equitable future for the Duwamish River and its residents. They provide a platform for community voices to be heard and work towards achieving a healthier and more resilient river ecosystem.

3.1.3 Georgetown Community Council (GCC)

The Georgetown Community Council (GCC) is an organization that is committed to representing and advocating for the Georgetown neighborhood in Seattle, Washington. The primary focus of the GCC is to address matters related to land use, development, transportation, public safety, environmental stewardship, and cultural preservation. By engaging residents, businesses, and stakeholders, the council aims to maintain and enhance the unique character and vitality of Georgetown.

Georgetown Community Council (GCC) organizes and supports various events in the Georgetown neighborhood of Seattle, including the popular "Art Attack" event. Art Attack is a recurring art walk that takes place on the second Saturday of every month.

During Art Attack, numerous art galleries, studios, and creative spaces in Georgetown open their doors to the public. It provides an opportunity for visitors to explore the vibrant arts scene in the neighborhood, meet local artists, and engage with a wide range of artistic mediums such as painting, sculpture, photography, and more. The event often includes art exhibitions, live music performances, interactive installations, and food and beverage offerings.

Georgetown Carnival: This annual community festival features live music performances, art installations, street vendors, food trucks, games, and activities for all ages. It celebrates the vibrant culture and artistic spirit of Georgetown.

Garden Walk: The Garden Walk event showcases the neighborhood's beautiful gardens and green spaces. Participants can explore a variety of gardens, learn about urban gardening techniques, and get inspiration for their own green spaces.

Holiday Open House: During the holiday season, Georgetown's businesses and studios open their doors to

welcome the community for a festive open house. Visitors can enjoy holiday-themed activities, shop for unique gifts, and experience the neighborhood's warm and welcoming atmosphere.

Clean-up and Beautification Days: The GCC organizes community clean-up and beautification events where volunteers come together to clean up public spaces, plant flowers, and improve the overall appearance of the neighborhood.

3.2 Main Campus Choice and Satellite Outpost

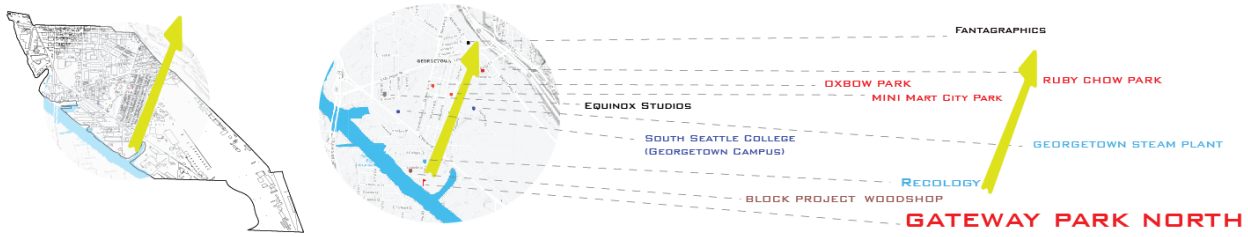
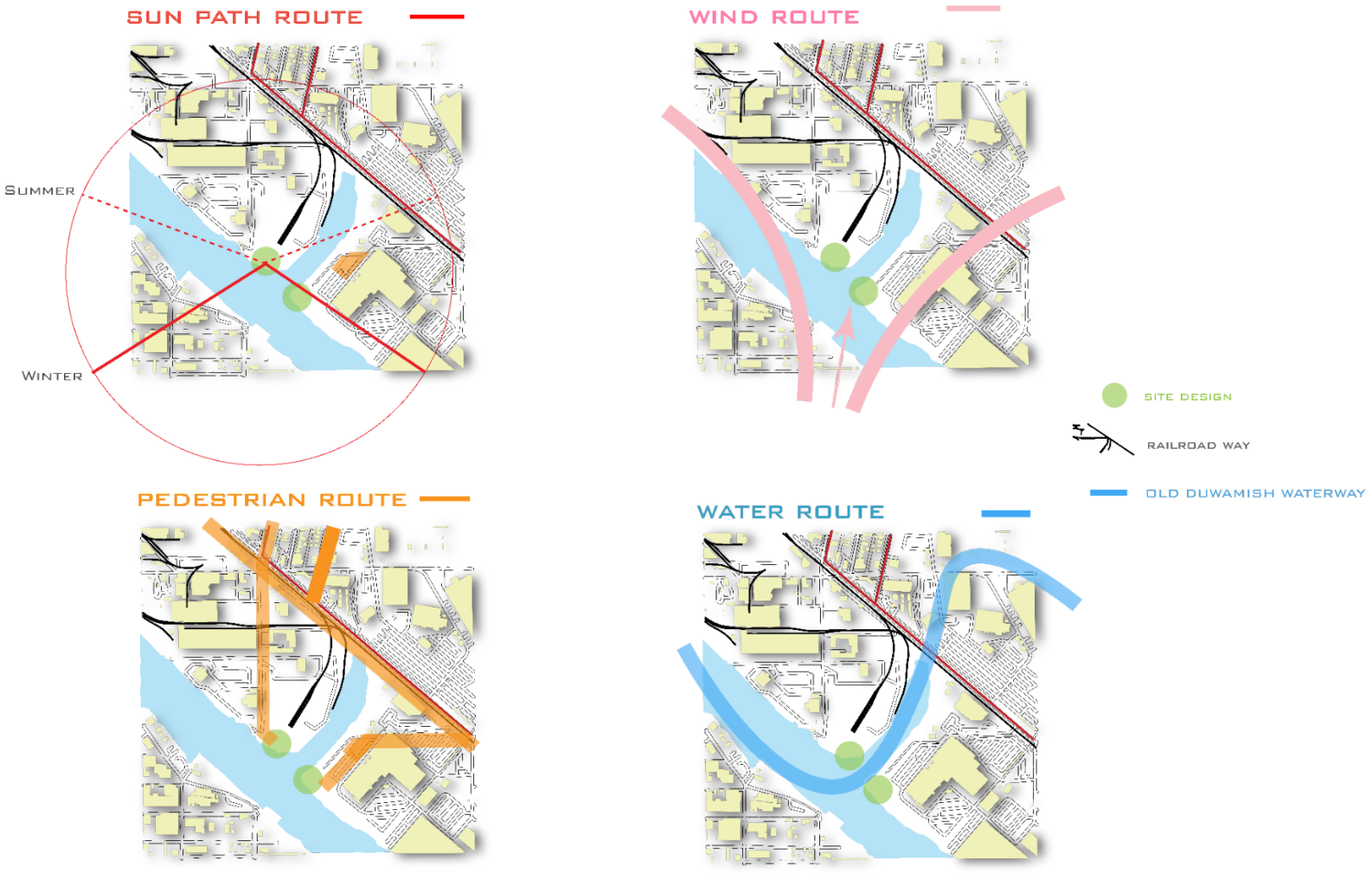


Figure 3-12: **Gateway Park North** —Main Campus; Other locations—Outposts/ Satellite campus
Figure 3-13: The Site Analysis Maps (Base map adapted from GIS) (Below)



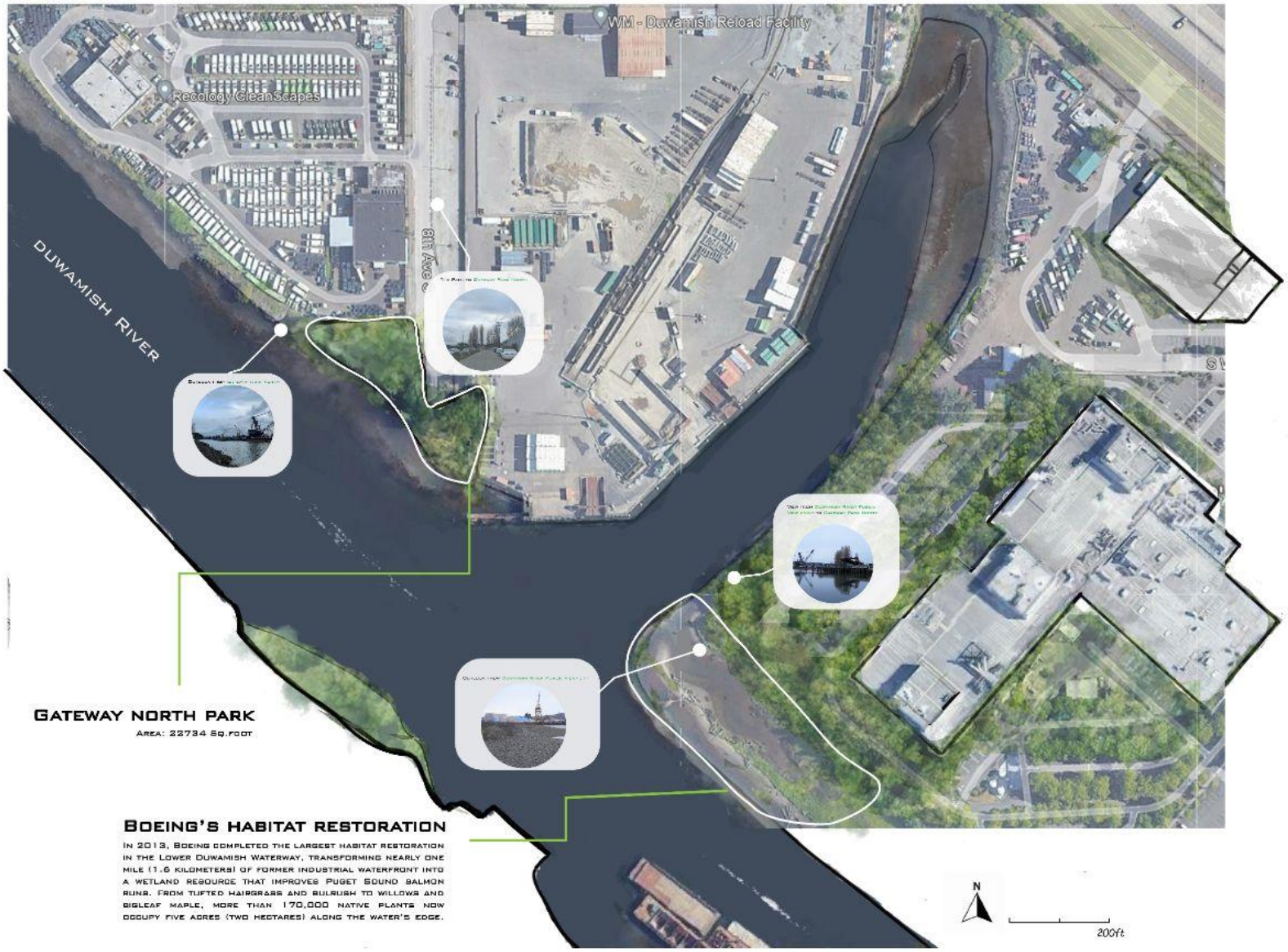


Figure 3-14: Boeing's Habitat Restoration Sites near Gateway North Park (Base map is adapted from Google Earth).

I chose the Gateway North Park as the main campus because it straddles between land and water. (Figure 3-13) can also indicate that a Duwamish River reroute happened nearby (Figure 3-14).

Waste management (like Recology etc.) facilities (Figure 3-15) are around Gateway North Park, which will call the attention to the waste. I wish to apply tangram concepts on the main campus and various outpost locations.

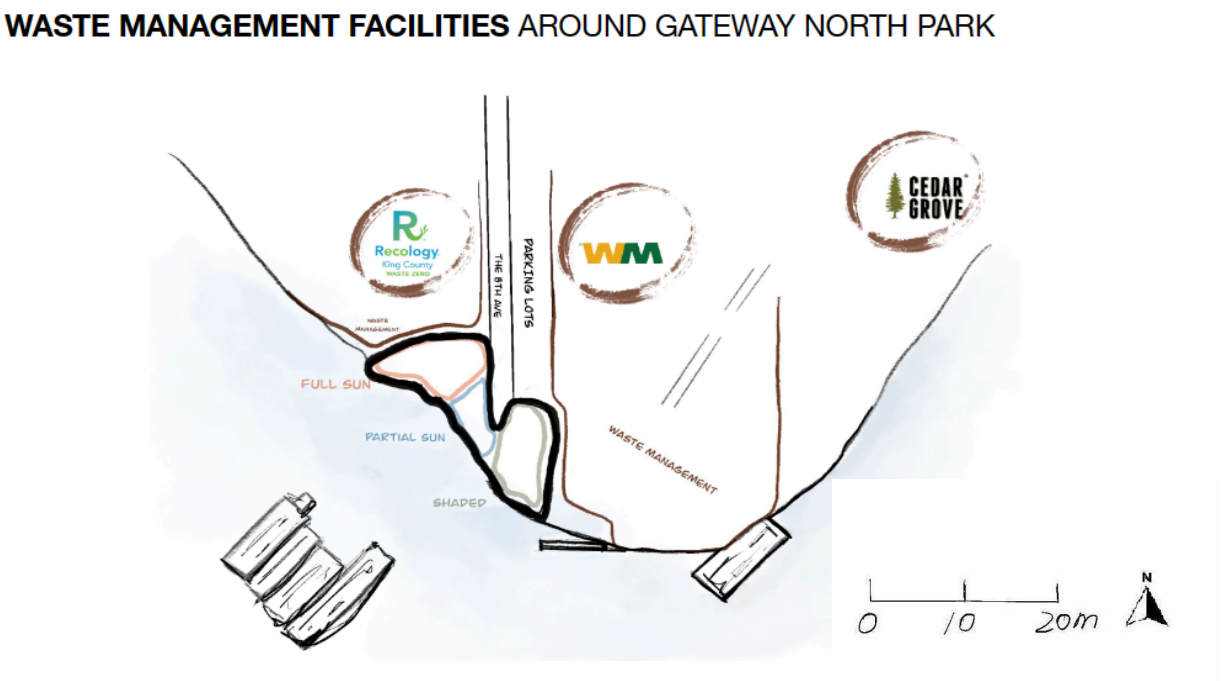


Figure 3-15: Waste Management Facilities around Gateway North Park

3.3 Mobile Format (Multi-purpose Truck & Kayak)

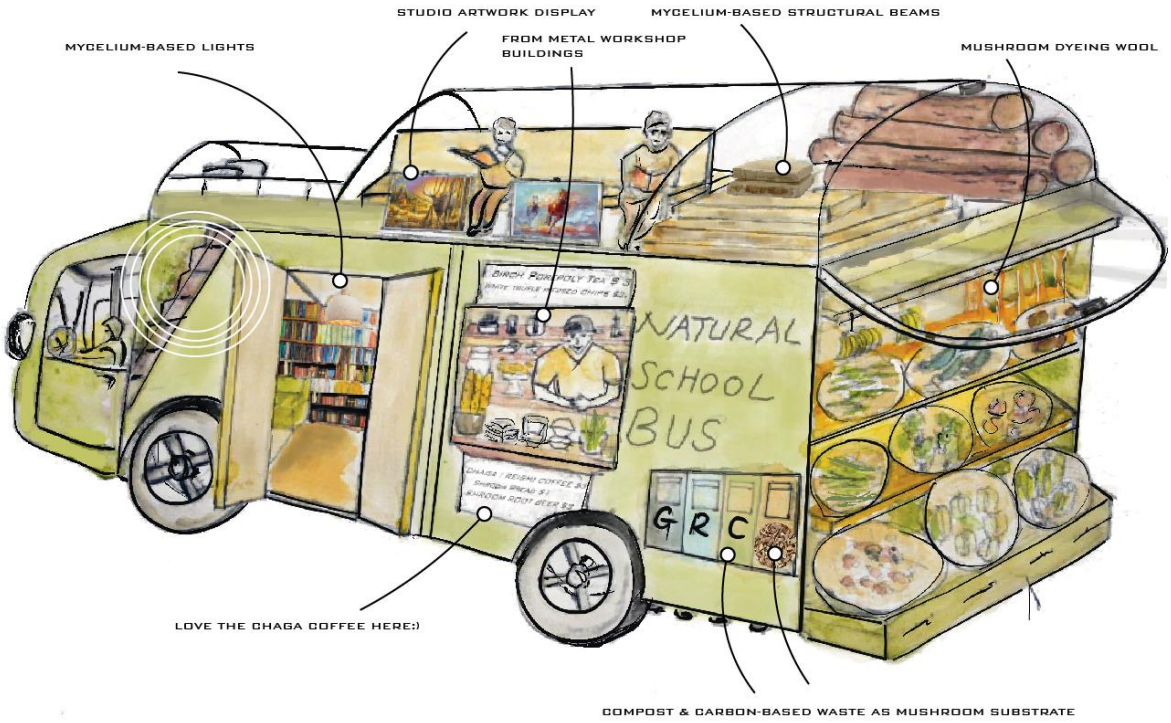


Figure 3-16 Mobile Multi-purpose Truck Watercolor Drawing

The mobile food-book truck equipped with book-reading spaces and material loading spaces will connect various outpost locations with the main campus. And the garbage can on the truck has a distinguished category for collecting waste for mushroom cultivation.

The kayak connects the main campus to the Boeing restoration site via water route. Oru Kayak offered some foldable kayak options as below (Figure 3-18).

Figure 3-17: Oru Foldable Kayak
Source: [Folding Kayaks That Go Anywhere | Oru Kayak]

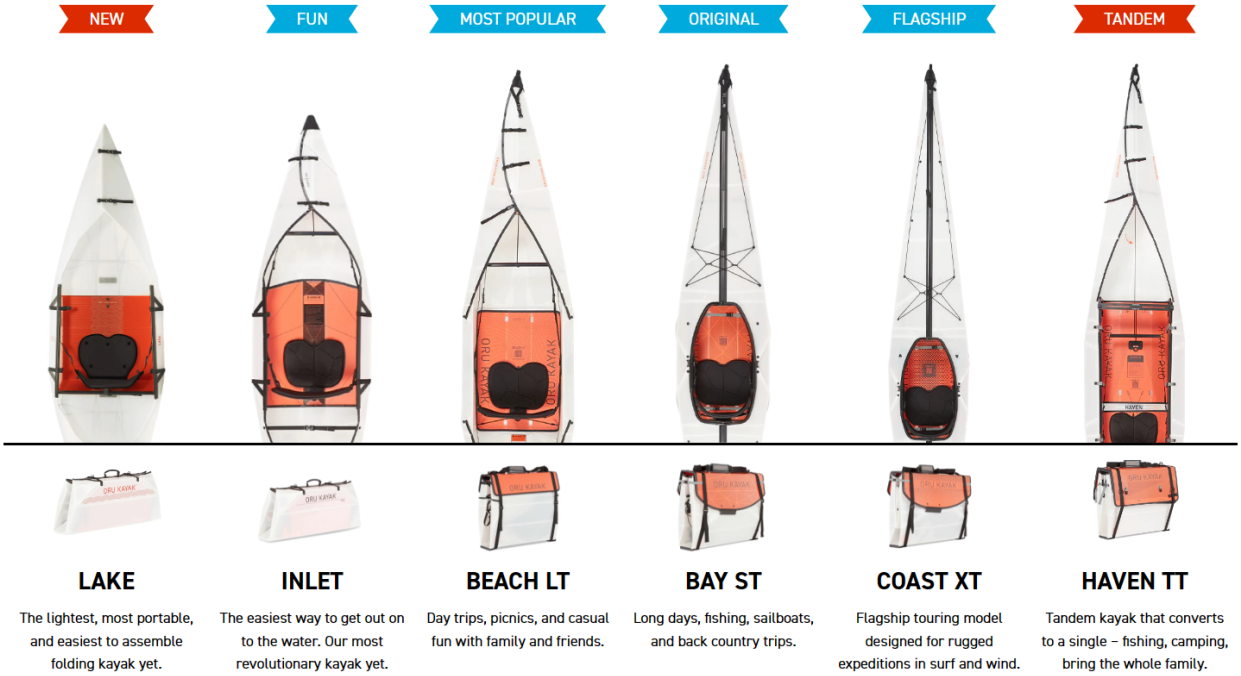


Figure 3-18: Different Types of Oru Kayak Form Provided by Oru
Source: [Folding Kayaks That Go Anywhere | Oru Kayak]

3.3.1 Fantagraphic store:

Fantagraphics is a prominent independent publisher of comics and graphic novels known for its commitment to showcasing diverse and groundbreaking works in the medium. Since its inception in 1976, Fantagraphics has played a significant role in shaping and promoting the world of comics as an art form. Its contributions to the industry and dedication to publishing alternative and innovative comics have garnered critical acclaim and a devoted following. (Publisher of the World's greatest cartoonists)

In 2006, Fantagraphics expanded its reach beyond publishing by opening its own retail store, Fantagraphics Bookstore & Gallery, located in Seattle's Georgetown neighborhood. This physical space serves as a hub for comic enthusiasts, art lovers, and the local community to explore and engage with a wide range of comics, graphic novels, and related artwork. The bookstore and gallery not only provide a platform for Fantagraphics' own publications but also feature works from other independent creators, further supporting and championing the comics medium as a whole. (Publisher of the World's greatest cartoonists)

I believe having this store plugging into “ecological literacy” tan by providing kids access to various visually appealing books on environmentalism-related content, the bookstore can capture the attention of children and spark their interest in environmentalism. This can lead to increased awareness, understanding, and a sense of responsibility towards the natural world. Through the power of storytelling and visual narratives, Fantagraphics can effectively communicate environmental messages and inspire young readers to take action.

Moreover, by featuring works from other independent creators alongside Fantagraphics' publications, the bookstore can provide a broader perspective on environmental issues and highlight a variety of artistic styles and storytelling approaches. This diversity can further enrich the experience of readers and contribute to a more comprehensive understanding of ecological topics.

In addition, Fantagraphic can serve as a hub for community salons, creating a space where people can gather and engage in meaningful discussions on various topics related to comics, graphic novels, art, and environmentalism. Through community salons, the Fantagraphics Bookstore & Gallery can encourage dialogue, critical thinking, and the exploration of diverse viewpoints. It can provide a space where individuals can deepen their understanding of comics as an art form, delve into environmental topics, and build connections with like-minded individuals.

3.2.2 Equinox Studios

Equinox Studios offers a collaborative environment for artists to work, create, and exhibit their artwork. The complex comprises multiple buildings and warehouses, housing a diverse range of artistic disciplines such as painting, sculpture, metalwork, woodworking, ceramics, photography, and more.

The Equinox Studios, with its collaborative environment for artists to work, create, and exhibit their artwork, can be linked to the concept of playful learning.

The diverse range of artistic disciplines present at Equinox Studios can inspire cross-disciplinary learning. Artists from different backgrounds and mediums can come together, explore connections between their practices and engage in interdisciplinary collaborations. This interdisciplinary

approach encourages a playful and innovative mindset, as artists experiment with new ways of combining and integrating various artistic techniques and concepts.

The mobile food-book truck can be transformed into a traveling gallery or art market, showcasing and selling the diverse range of artworks created within Equinox Studios. It can be equipped with display walls, shelves, and proper lighting to exhibit the artworks in an appealing and professional manner.

By taking the mobile store to different locations, such as local events, festivals, or community gatherings, artists have the opportunity to reach a wider audience and engage with potential buyers directly. This direct interaction between artists and customers adds a personal touch and creates a unique experience for art enthusiasts.

Moreover, the mobile store can contribute to the promotion and visibility of Equinox Studios as a creative hub. As the truck travels to different locations, it can generate interest and curiosity about the artistic community and the unique artworks being produced at Equinox Studios.

Additionally, the mobile store can serve as a platform for artists to receive feedback, engage in conversations with customers, and establish connections with fellow artists and art enthusiasts. It creates opportunities for networking, collaboration, and building a supportive artistic community.

Figure 3-19: Sawing, filing, drilling, forging, casting, and enameling metal at Equinox Studios

3.2.3 Block Project Woodshops at Facing Homelessness

Figure 3-20: Using Crane to Transport the Standard Wall Facing Homelessness

Given that Block Project Woodshops is a place to build prefabricated houses (Figure 3-20) championed by the non-profit organization facing homelessness, integrating a mobile bus to connect with the site can certainly tie back to the principles of "effective altruism" and "practical competence," especially when involving kids in the learning process.The mobile truck can transport goods and by-products to the main campus for mushroom cultivation.

3.2.4 Oxbow Park

Figure 3-21: The hat and the boots at Oxbow Park

The 44-foot-wide hat was designed to hold the gas station's office while the 22-foot-tall boots served as the restrooms.

Oxbow Park at Georgetown, Seattle, with its community garden on-site, provides an opportunity to broaden the concept of the edible landscape. The presence of a community garden adds a distinct element to the overall landscape, offering a different approach compared to the food forest mode found at the main campus site.

By converting the mobile bus into a mobile market or farm stand, it can travel to different locations within the community, bringing fresh produce directly to residents. This initiative aligns with the principles of food access, community engagement, and supporting local agriculture.

In addition to the community garden, food forest, and the mobile bus initiatives, encouraging people to cultivate a citizen scientist mindset by conducting soil testing at home can further enhance community engagement and environmental awareness.

Soil testing at home involves individuals collecting soil samples from their gardens or nearby areas and analyzing them for various parameters such as nutrient levels, pH, organic matter content, and contaminants. This process provides valuable insights into the health and quality of the soil, which in turn affects plant growth, food production, and environmental sustainability.I was able to collect soil samples from Oxbow park and did some soil testing at home (Figure 3-22 & Figure 3-23).

Figure 3-22: Soil testing (left:at home using the anthocyanin from purple cauliflower to test out

pH; A video can be found here; right: testing kits to test out nitrogen, phosphorus, and potassium (“N-P-K”)

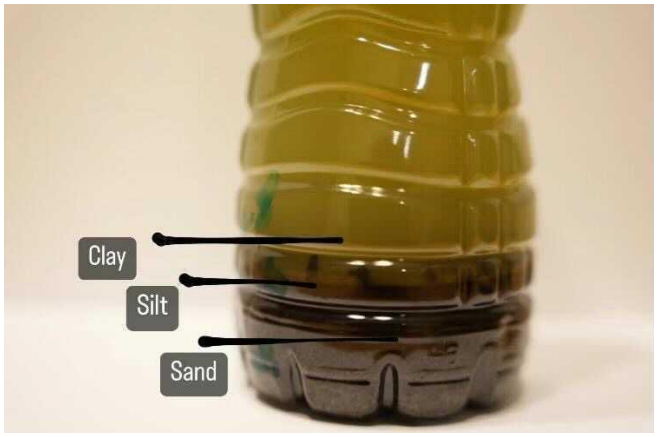


Figure 3-23: Soil Texture Analysis to determine the proportions of clay, silt and sand in soil

Figure 3-24: A tour at Mini Mart City Park

3.2.5 Mini Mart City Park, Mycoremediation, Air Sparing,

A group of three Seattle based artists—John Sutton, Ben Beres, and Zac Culler transformed a former gas station into a pocket park and cultural center in Georgetown across the street from Boeing Field on Ellis Avenue South. After 10 years of planning and environmental work, they broke ground in July 2018 and completed construction in 2021 and opened to the public in 2022.

I would love to discuss a place change in the current Mini Mart City Park (MMCP) site in Georgetown, Seattle as a successful grassroot community revitalization effort. More details related to on-site interview and air sparging methods can be found in this video link.

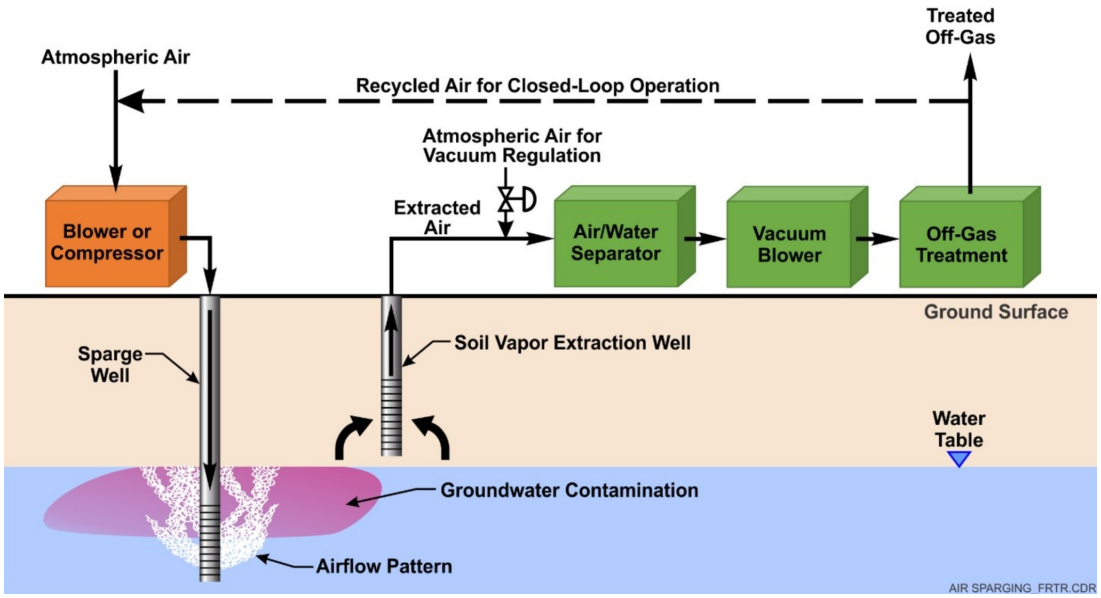


Figure 3-25: Air Sparging Diagram (Source: [Technology Screening Matrix | Federal Remediation Technologies Roundtable (frtr.gov)]

Figure 3-26: Mini Mart City Park (Top: Old Mini Mart City Park; Bottom: Current Mini Mart City Park(Image Source: [Mini Mart City Park])

Artist collective SuttonBeresCuller (SBC), a group of three Seattle based artists—John Sutton, Ben Beres, and Zac Culler transformed a former gas station into a pocket park and cultural center in Georgetown across the street from Boeing Field on Ellis Avenue South. After 10 years of planning and environmental work, they broke ground in July

2018 and completed construction in 2021 and opened to the public in 2022.

The inclusion of educational components within the MMCP site can further cultivate a sense of hope and engage the community in environmental stewardship. Workshops, interpretive signage, and educational programs can inform visitors about the remediation process, the significance of environmental conservation, and the power of community-led initiatives.

3.2.6 Duwamish River & Boeing Restoration site

Boeing, in collaboration with NOAA and other partners, has undertaken an extensive habitat restoration initiative near Gateway North Park. This project, recognized as the largest of its kind on the Lower Duwamish River, aims to address the ecological damage caused by past industrial activities. The restoration efforts were carried out as part of a Natural Resource Damage Assessment (NOAA Fisheries, 2014).

Boeing Restoration Project adjacent to Gateway Park North

Before

After

Figure 3-27: Boeing Restoration Project Change (Before and After)
(Source: A River Reborn: Restoring Salmon Habitat along the Duwamish River - YouTube)

The Duwamish River nowadays: I made a video to document the Duwamish river nowadays. A boat tour hosted by Duwamish River Cleanup Coalition (DRCC).

By activating the water routes from Gateway Park North to the Boeing Restoration site, children will have the opportunity to immerse themselves in the context of the contaminated Duwamish River and engage in site visits that promote playful learning. Through guided tours or educational programs, children can learn about the history and ongoing restoration efforts of the Duwamish River, including the impacts of pollution and the importance of remediation. They can witness firsthand the effects of contamination on the river ecosystem and gain an appreciation for the complexities of environmental issues.

Playful learning activities can be designed to make the educational experience engaging and interactive. Children can participate in water sampling exercises, where they learn about water quality testing and the factors that contribute to pollution levels. They can also observe and identify different species of plants and animals along the river, learning about their adaptations and the role they play in the ecosystem.

Site visits can include opportunities for children to actively contribute to restoration efforts. They can participate in shoreline clean-up activities, helping to remove litter and debris from the riverbanks. By engaging in these hands-on tasks, children develop a sense of responsibility and become empowered to take action to protect and restore their local environment.

Currently Sawhorse Revolution has a summer camp program to educate youth to build the boat over several intensive weeks (Figure 3-28). Volunteers with Heron's Nest are using the boat to remove trash from the Duwamish River (Boat Camp – Sawhorse Revolution). Furthermore, more water routes can be connected to the Gateway North Park and Heron's Nest Outdoor Education Camp. (Figure 3-29)

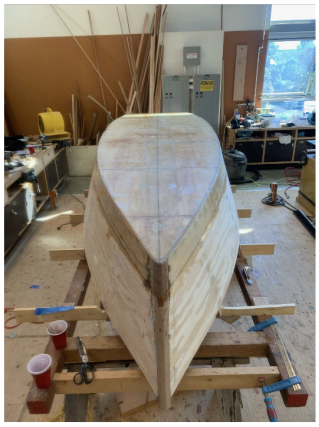


Figure 3-28 (above): Sawhorse Revolution's first wooden boat hits the water for Duwamish River cleanup; Photos by Melanie Masson;

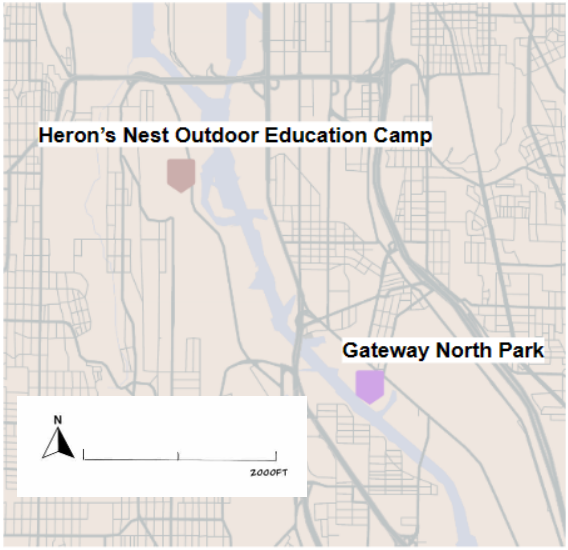


Figure 3-29 (right): Locations (Heron's Nest Outdoor Education Camp and Gateway North ark) shown in a map. (Base map adapted from GIS).

3.2.7 Ruby Chow Park

Figure 3-30: The observation deck at Ruby Chow Park (Side View)

Ruby Chow Park, located near Boeing Field, presents an exciting opportunity to reconcile the interests of aircraft enthusiasts while providing educational experiences for children. By collaborating with the Boeing company, the park can incorporate an observation deck that offers a unique vantage point for viewing aircraft activities. Beneath the observation deck, the park can host buzzing mushroom-related activities that engage and inspire young visitors.

Figure 3-31: The observation deck at Ruby Chow Park (Top-down View)

The observation deck provides a space for kids and visitors to observe the aircraft in action, learn about aviation, and appreciate the marvels of flight. They can witness takeoffs, landings, and aircraft movements, fostering a sense of wonder and curiosity about the world of aviation. Informational displays or interactive exhibits can provide educational insights into aircraft design, engineering principles, and the history of aviation.

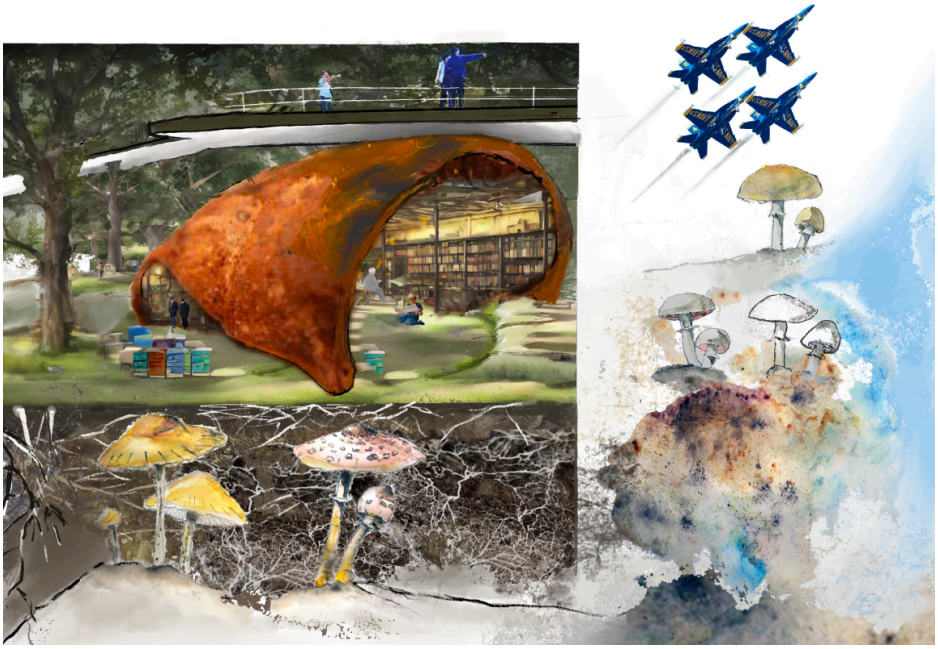


Figure 3-32: The observation deck rendering

The area beneath the observation deck can be dedicated to mushroom-related activities, creating a vibrant and interactive learning environment. Kids can participate in workshops or hands-on demonstrations where they learn about mushroom cultivation, the ecological role of mushrooms, and their potential uses in various industries.
Activities can include mushroom growing kits, educational displays, and interactive games that highlight the importance of fungi in our ecosystem.

This outpost educational place can also inspire children's interests in related activities such as building birdhouses or remote-controlled airplanes. Workshops and classes can be organized to teach kids basic carpentry skills and provide them with opportunities to design and construct their own birdhouses. Similarly, they can learn about aerodynamics and aviation principles while building and flying remote-controlled airplanes in designated areas of the park.

By combining the thrill of observing aircraft with educational mushroom-related activities and opportunities for hands-on creation, Ruby Chow Park becomes a dynamic and inspiring outpost educational place. It ignites children's imaginations, exposes them to human aspirations in fields like aviation and construction, and encourages their interest in STEM-related subjects. This multi-faceted approach to education fosters a sense of exploration, creativity, and a deeper connection to the world around them.

3.2.8 Georgetown Steam Plant

Georgetown Steam Plant is an excellent location to provide kids with valuable knowledge and experiences that can shape them into environmentally-conscious citizens. The historical significance and unique features of the steam plant offer a captivating setting for educational opportunities focused on sustainability, energy, and environmental awareness.

Through guided tours and interactive exhibits, kids can learn about the history and operations of the steam plant, gaining insights into its role in the community and its impact on the environment. They can explore the principles of steam power, energy generation, and the transition to cleaner and more sustainable sources of energy.

The Georgetown Steam Plant can also serve as a platform for teaching children about environmental conservation and the importance of renewable energy. Workshops and educational programs can be designed to introduce concepts like energy efficiency, renewable energy sources, and sustainable practices. Kids can learn about the benefits of solar power, wind energy, and other green technologies, fostering an understanding of the potential solutions to environmental challenges.

3.2.9 South Seattle College

South Seattle College's apprenticeship programs provide an excellent opportunity for kids to develop practical competence and hands-on skills in various disciplines, such as ceramics. These programs offer valuable educational experiences that go beyond traditional classroom learning, emphasizing the importance of applied knowledge and experiential learning.

The YouthCare's YouthBuild Pre-Apprenticeship Program (Youthcare,) at South Seattle College in Georgetown not only provides apprenticeship opportunities but also plays a crucial role in educating and empowering young individuals to become environmentally-conscious citizens. By participating in this program, young people facing barriers to education and employment can gain practical competence in construction-based skills while also learning about the importance of environmental sustainability.

Through their involvement in the program, participants have the opportunity to develop a deep understanding of the environmental impact of their work and how it intersects with broader social and community issues. They can learn about sustainable construction practices, waste reduction strategies, energy efficiency, and other environmentally-friendly approaches. This knowledge and hands-on experience can inspire them to incorporate environmentally-conscious principles into their future careers and personal lives.

Incorporating Boeing as a main stakeholder and designing educational programs at South Seattle College to acknowledge the craftsmanship involved in making a remote-controlled aircraft can indeed be a positive step.

By partnering with Boeing, a dominant player in the Georgetown region, educational programs can benefit from the expertise and resources of the company. This collaboration can offer students and community members valuable insights into the aviation industry and expose them to real-world applications of craftsmanship in aircraft manufacturing.

South Seattle College can develop a curriculum that combines theoretical knowledge with hands-on training, allowing participants to learn about the various components and processes involved in building a remote-controlled aircraft. This approach not only fosters practical skills but

also nurtures a deep appreciation for the craftsmanship required in the aerospace industry.

Engaging with Boeing can provide access to industry professionals, who can serve as mentors, guest speakers, or even provide internship opportunities. Such interactions can inspire students, offering them a glimpse into potential career paths and helping them establish connections within the industry.

Additionally, incorporating sustainability principles into the educational programs can enhance environmental awareness. This can include discussions on reducing the environmental impact of aviation, exploring alternative fuel sources, or promoting eco-friendly design and manufacturing practices. By integrating sustainability into the curriculum, South Seattle College can contribute to cultivating a more environmentally conscious workforce in the aerospace sector.

3.4 Educational Programmings & incorporating each of the 7 tangram elements

Connecting various educational programming outposts through a food-book truck and converging them at the main campus in Gateway North Park can be a creative and engaging approach to fostering community engagement and knowledge sharing.

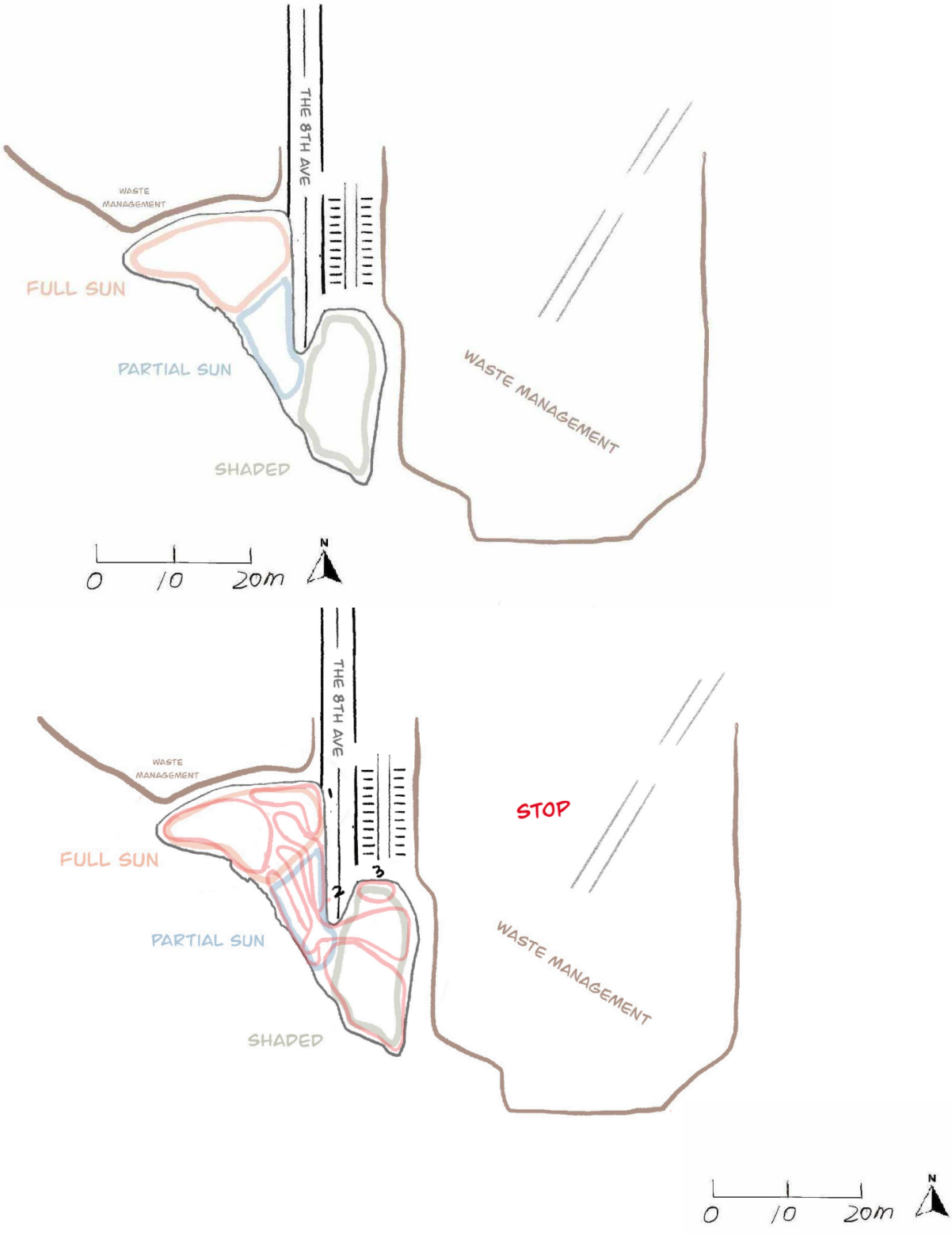


Figure 3-33: Full Sun & Partial Sun & Shaded Area and dissected 7 areas with 3 drop-offs areas

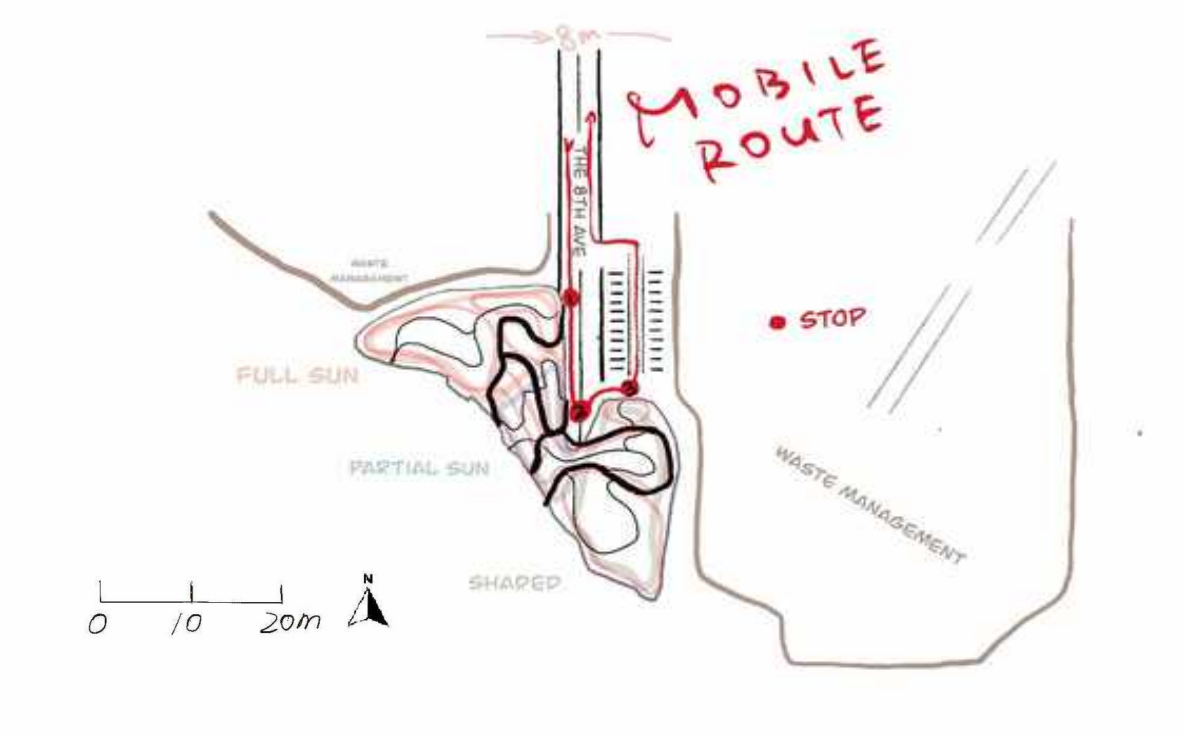


Figure 3-34: Mobile Route and paths designed in Gateway North Park

At the main campus, there are 3 drop-off locations for compost, sawdust and logs respectively, which will support edible landscape (food forest format), woody mushroom land and mycofiltration and biodegradation.

Figure 3-35: Site Plan at Gateway North Park (Aerial photo is adapted from Google Earth)

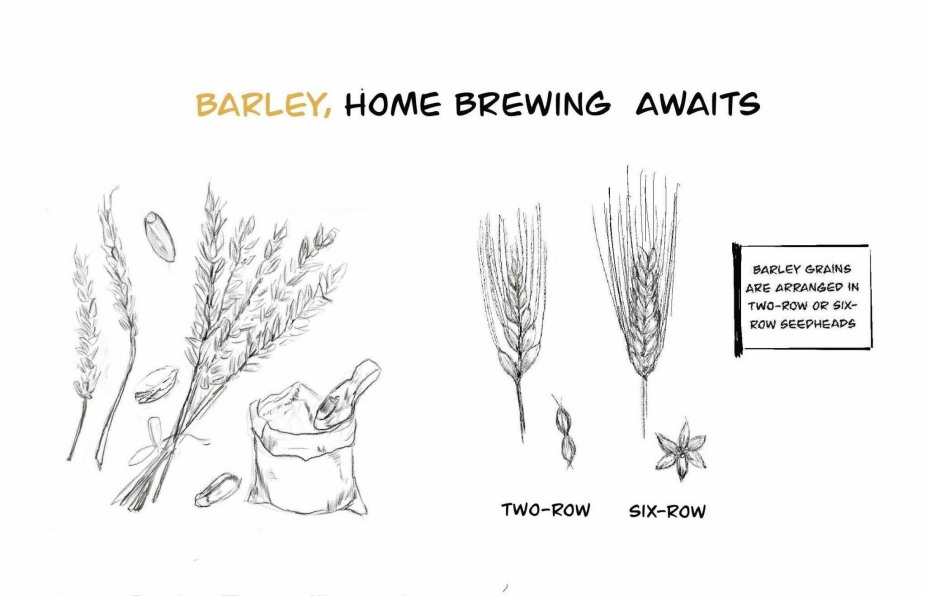


Figure 3-36: Barley Types Illustration

Edible landscape particularily emphasized on indigenous food (camas), grains such as barley (Figure 3-36), ryes to for mushrooms's spawns to inoculate on.

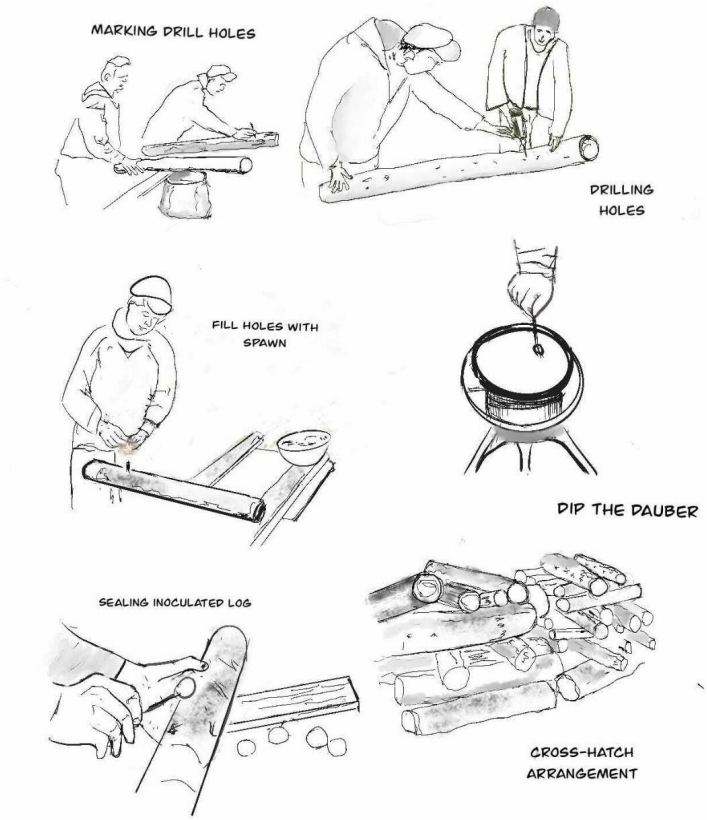


Figure 3-37: Woody Mushroom Inoculation Illustration

Incorporating experiences such as growing mushrooms, using wood stumps as play elements, creating awe-inspiring moments through roaming and wonder, and engaging in on-site wood making and carpentry can greatly enhance the educational and experiential value of the program. Furthermore, exploring the use of mycelium as a building material for on-site installations adds an exciting and innovative dimension to the learning process.

Chapter 4 Storyline of Georgetown in Graphic Novel Format

I created characters to graphically envision the **past, current and future** of Georgetown.

4.1 Character Design Rationale: Zoom Out

Zooming out on a large-scale perspective, I created two characters Duwa and Landis to represent the Duwamish River and the land of Georgetown respectively to tell the narrative of historic chapters of Georgetown.

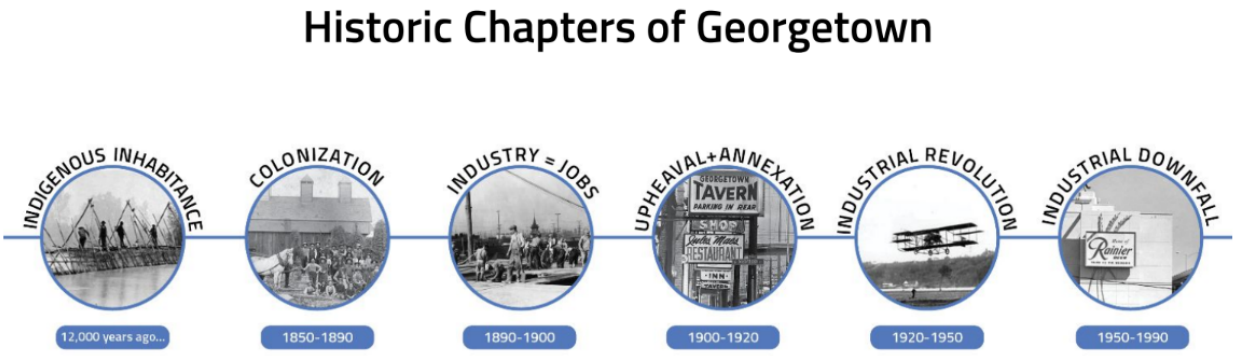


Figure 4-1: Historic Chapters of Georgetown. Image readapted from historylink.com

Georgetown, straddling the tension between natural resource exploitation along the Duwamish River and thrusting industrial development after annexation with Seattle, invites new opportunities to treat superfund sites and draw upon the strengths of resilient communities.

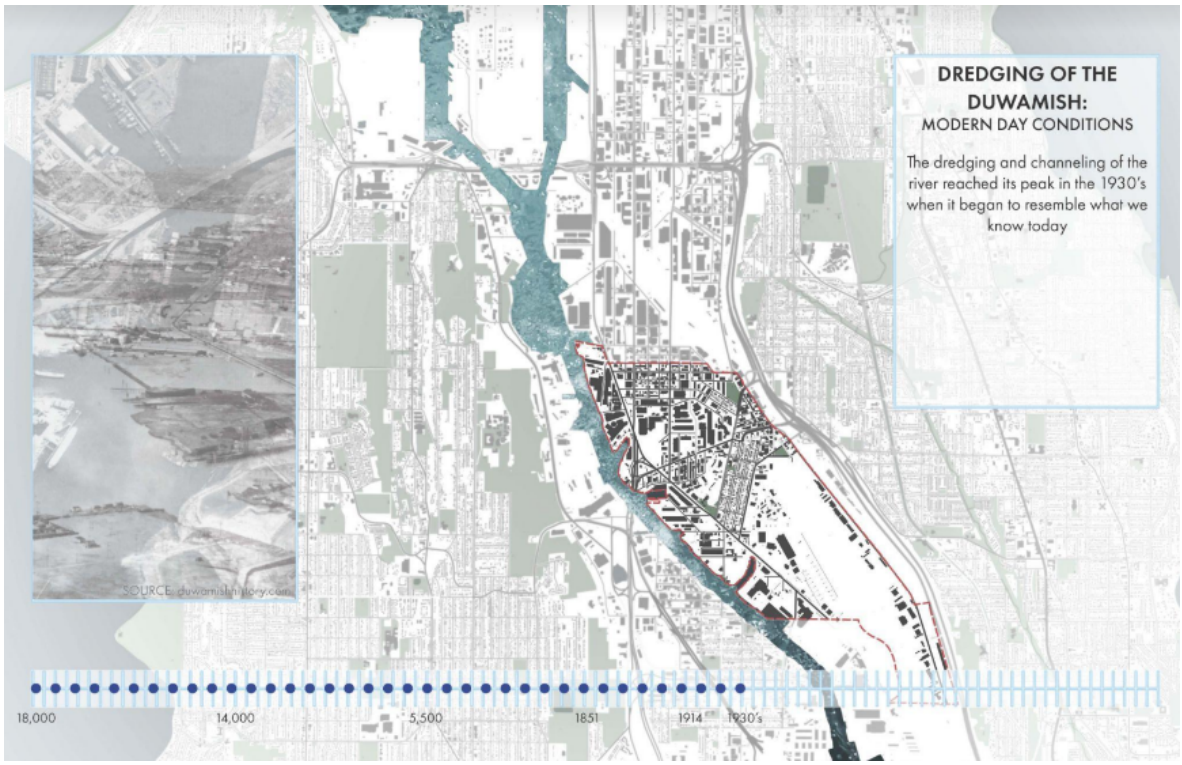


Figure 4-2: Dredging of the Duwamish River (Base map was adapted from GIS; The dredging Information and the overlaid image was sourced from Duwamish River Community Coalition (DRCC).

The original road network of Georgetown followed the natural meader of the Duwamish, as Georgetown and Seattle as a whole grew more industrious, the Duwamish was dredged and channeled to allow for deep sea vessels to navigate it (Figure 4-2).

The concept of the ecotone, as mentioned in Chapter 2, plays a significant role in understanding the dynamic relationship between land and water in Georgetown. By separating the characters of Landis and Duwa (Figure 4-3), the narrative explores the tension and interaction between these two elements. This tension reflects the historical changes that occurred in Georgetown, from its original road network following the natural meander of the Duwamish to the dredging and channeling of the river to accommodate industrial growth. (Figure 4-4, 4-5, 4-6, 4-7,4-8)

Figure 4-3: Duwa and Landis Character Image

Historical Chapters:

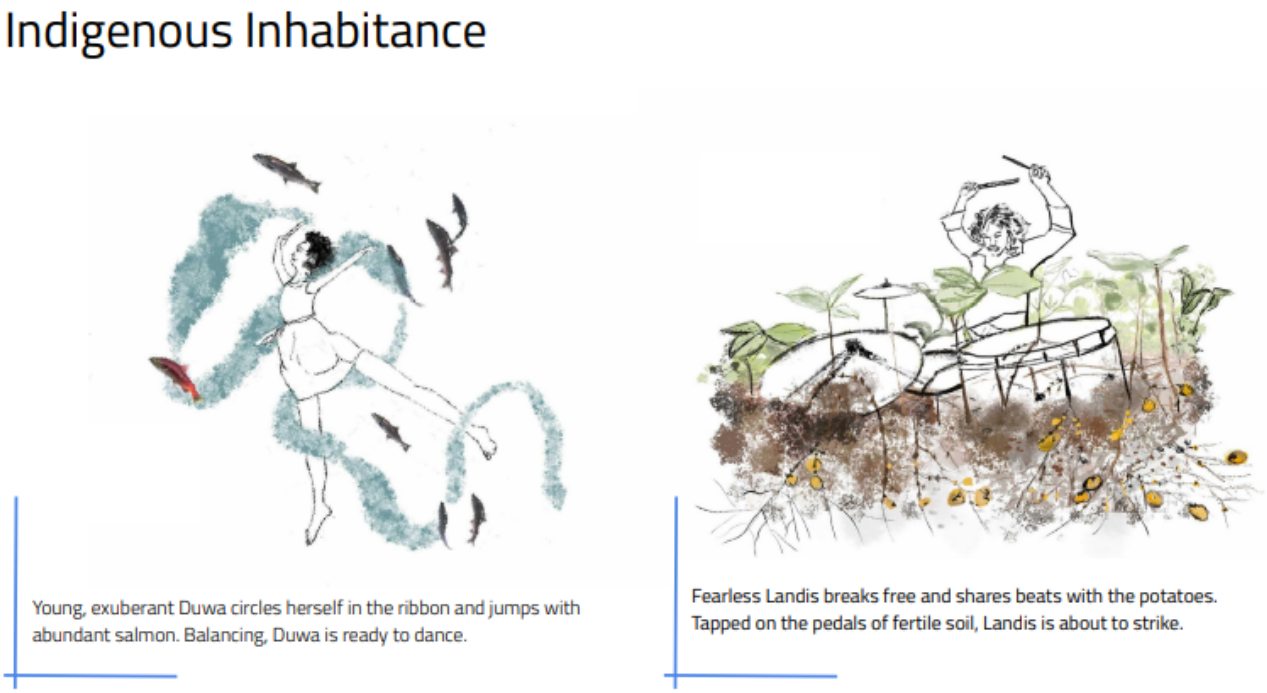


Figure 4-4: Indigenous Inhabitants Chapter

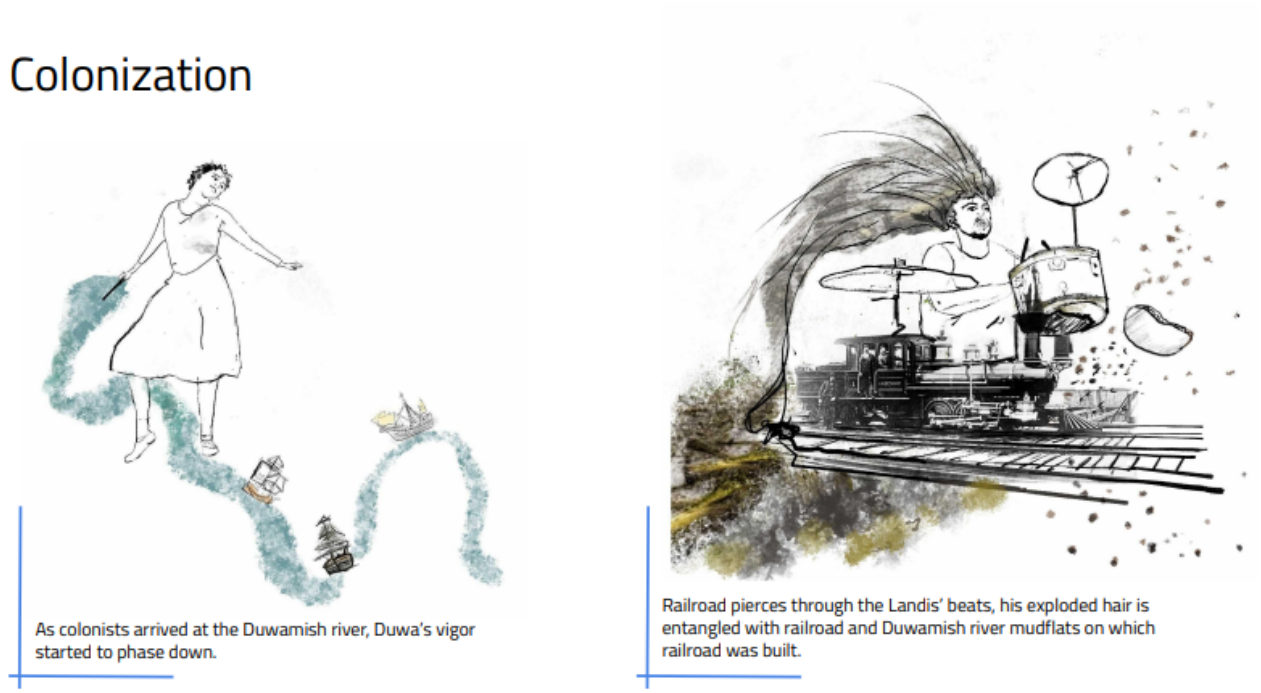
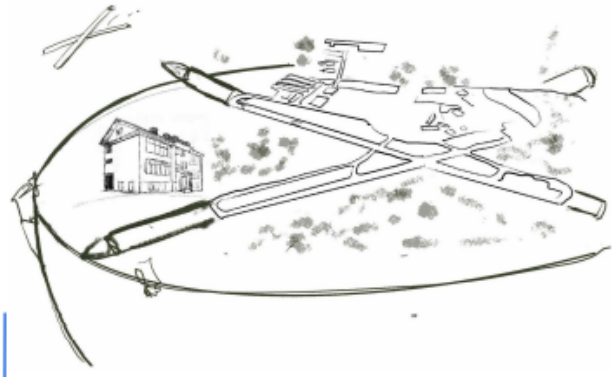


Figure 4-5: Colonization Chapter

Figure 4-6: Industry =Jobs Chapter

Industrial Revolution

Along with the engineered straightening of the Duwamish, Duwa's ribbon is straightened. Farmers transport produce to the new Pike Place Market by boat.



Landis muffles his ears as the soil from Seattle's flattened hills fill the mudflats. Here the half-broken drumsticks symbolize the new municipal airport runway, Landis has paused his beats.

Figure 4-8: Industrial Revolution Chapter

Industrial Downfall

Deflated by the frequent cars and airplanes, Duwa falls down and barely has the energy to wave her ribbon.

With the development of I-5, Landis no longer feels the rhythm of the land; he can't produce any sound that will be in concert with the humming of industrialized scenery.

Figure 4-9: Industrial Downfall Chapter

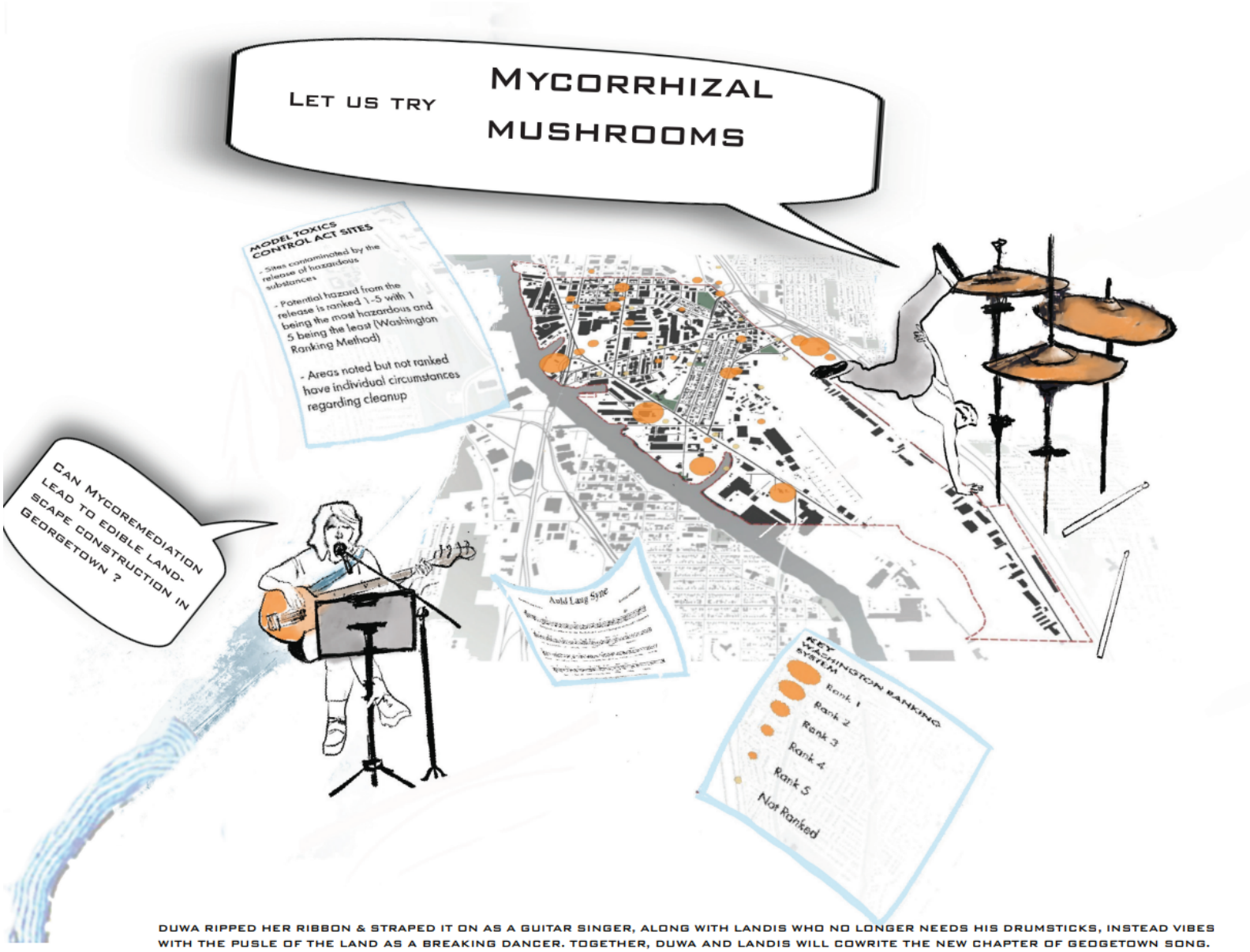


Figure 4-9: Present Chapter (Source for ranking circle: Environmental Coalition South Seattle)

At the present Chapter, Duwa and Landis evolved to orchestrate an “ Auld Lang Syne” song to envision the future of Georgetown. This signifies a symbolic union between the land and the Duwamish River, highlighting the interconnectedness of Georgetown's geography and history.

4.2 Character Design Rationale Zoom in

On a smaller scale, I would personalize mushrooms, maple trees, and moss into different characters.

Mico, mushroom character:

Enter **Mico** (pronounced as "My-koh")here after the two characters Duwa (hydrology, Duwamish river) and Landis (soil, contaminated superfund sites) to discuss the tension in an ectone region. Mico as a gender-neutral character speaks for Myco, aka fungi, mushrooms, with " punk and spunky" attitude:), was born out of carbon-based spawns : wood chips, sawdust and grains.

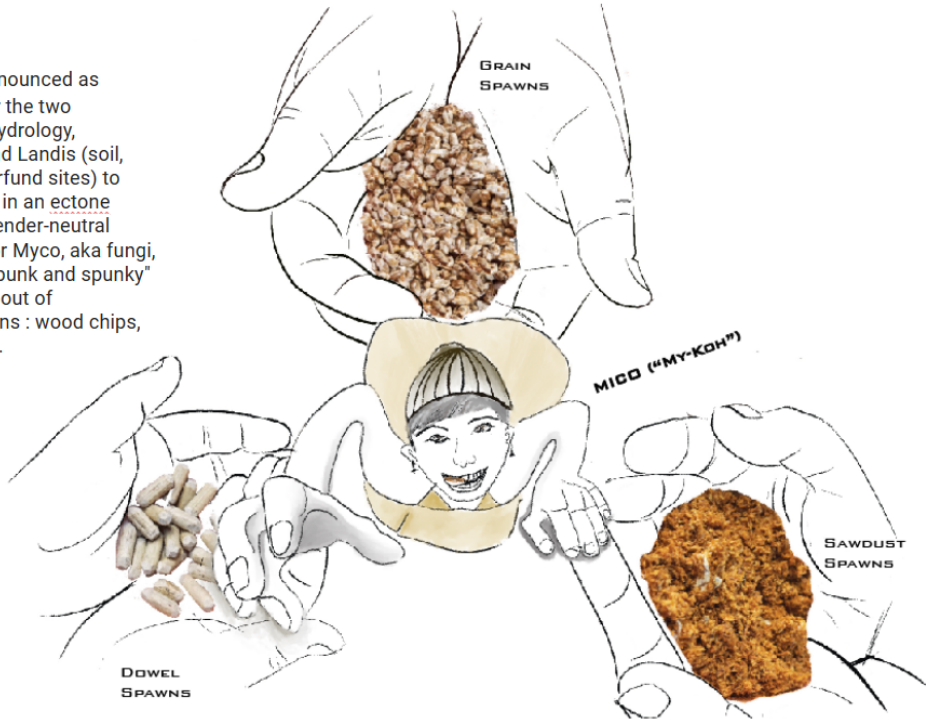


Figure 4-10: Mico, Mushroom Character

Mapal, maple tree character : with a broad smile, open arms, and a relaxed posture. He has a warm and friendly expression, with eyes that twinkle and convey a sense of kindness and compassion. The body language suggests that he is approachable and non-threatening, with a gentle and easygoing demeanor that puts others at ease.

Bigleaf maple is native to the Pacific Northwest region of North America, which includes the Seattle area. In fact, bigleaf maple is a common sight in many parks and neighborhoods throughout the city, and is a beloved symbol of the natural beauty and ecological richness of the region.

Bigleaf maple trees are known for their large, broad leaves, which can grow up to a foot wide. Thus, I imagine Mapal having a wide and welcoming appearance, with a friendly and nurturing personality that reflects the shelter and shade provided by the tree's canopy.

The seeds of the bigleaf maple tree, two winged “helicopters”, known as samaras, as shown as a necklace in my graphic novel style, are edible and have been used in various culinary traditions. The seeds are small and somewhat bitter, but can be roasted and eaten like nuts or ground into a flour and used in baking.

** (It's worth noting that the use of bigleaf maple as a food source is not as widespread as the use of other trees, such as sugar maple or birch, for this purpose. However, it is an interesting and unique aspect of the tree's cultural and ecological significance in the Pacific Northwest region.)*

Figure 4-11: Mapal, maple tree character

Moss–Mosy

Backstory: The Duwamish River is a Superfund site in the Seattle area, and there have been studies conducted on the effects of pollution on the local environment and the Duwamish Tribe's traditional foods and medicines, including the use of mosses. In one such study, conducted by the Duwamish River Cleanup Coalition in collaboration with the University of Washington, moss was used as a bioindicator to monitor the presence of heavy metals in the river and surrounding areas.

Mosses are known to absorb and accumulate heavy metals from their environment, making them useful indicators of pollution levels. In the study, researchers collected moss samples from various locations along the Duwamish River and tested them for heavy metal contamination. The results of the study showed that mosses collected from areas near sources of pollution, such as industrial sites and major roadways, had significantly higher levels of heavy metal contamination than mosses collected from less-polluted areas.

Figure 4-12: Mosy and Mossy (Mosy's little brother) are sprinting to the Duwamish River.

Mosy has a whimsical quality that fits well with the character's playful personality, with a carefree attitude and a love of adventure. Mosy have a special affinity for water, using their ability to absorb moisture to heal wounds or create a protective barrier.

Mosy have a deep reverence for nature and the environment, and might be fiercely protective of their forest home. They value creativity and playfulness, and might be drawn to others who share their love of adventure and exploration.

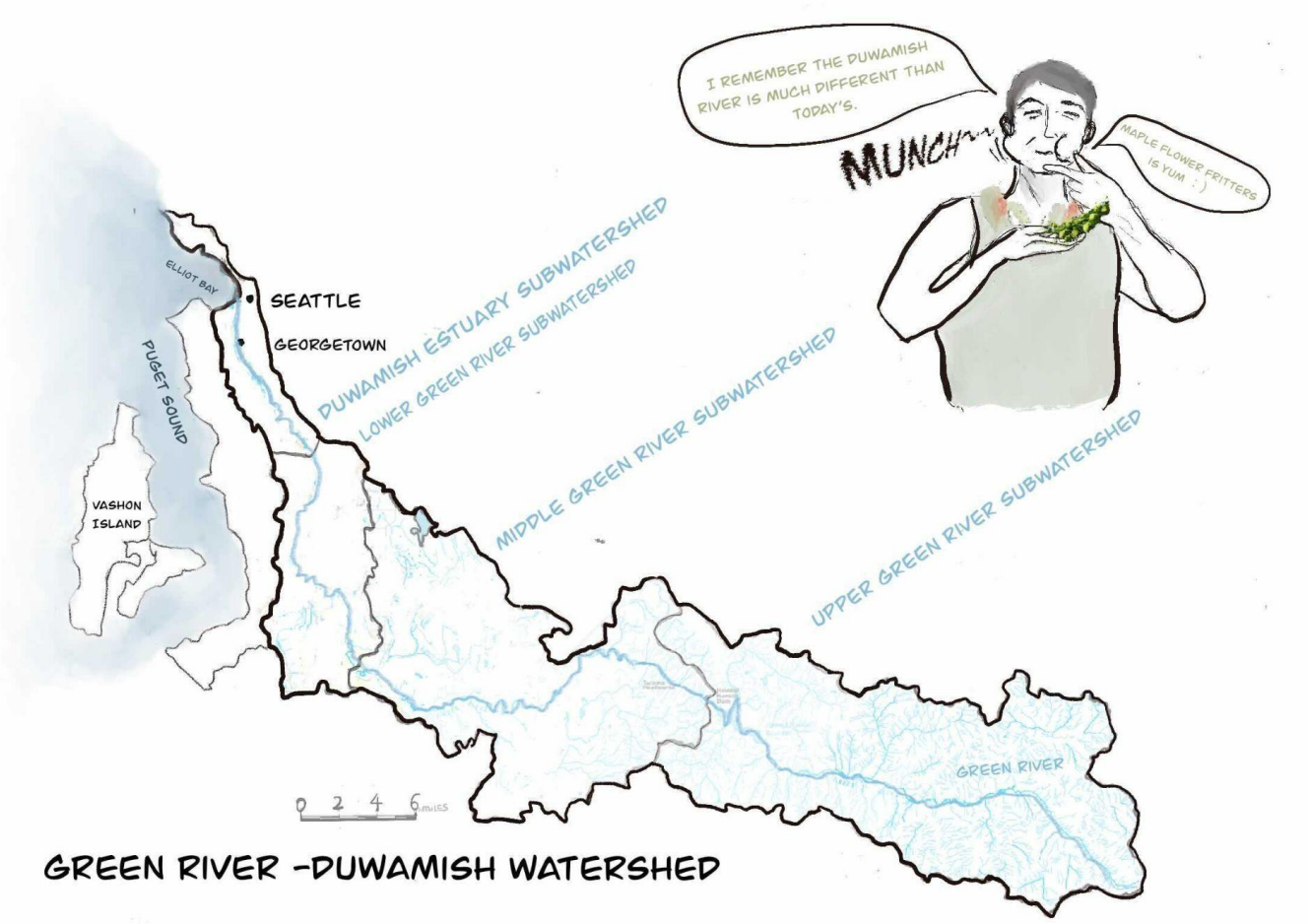


Figure 4-13: Green River— Duwamish Watershed Illustration
Figure 4-14: Duwamish River in the Past (Next Page)
Figure 4-15: Mico is about to inoculating woody mushroom spawns (Next Page)


MID 1800S
TODAY
DUWAMISH VALLEY
HMMM, AROUND MID 1800S, WHEN MY COMFORT DRINK IS MAPLE SYRUP

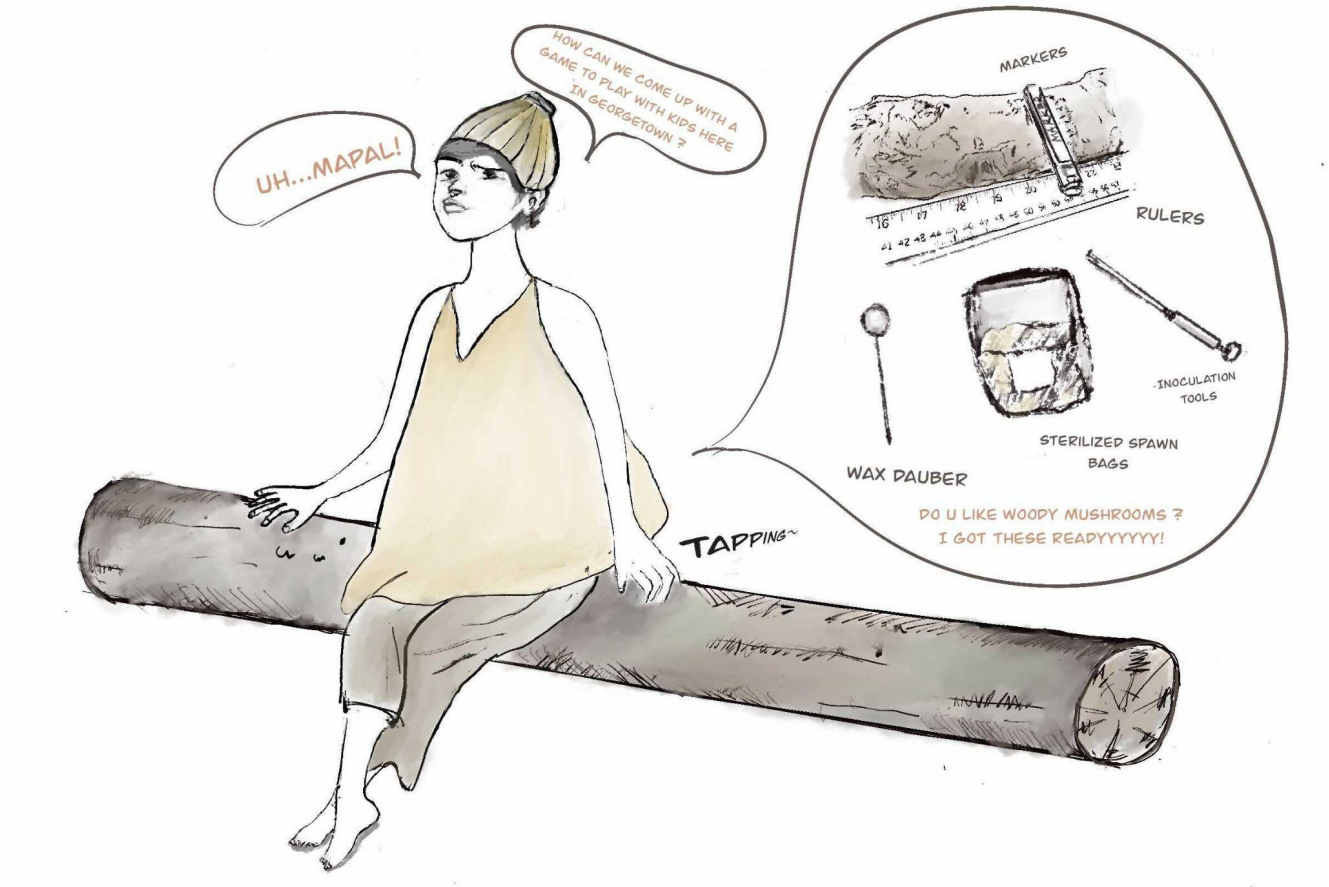

UH...MAPAL!
HOW CAN WE COME UP WITH A GAME TO PLAY WITH KIDS HERE IN GEORGETOWN ?
TAPPING~
MARKERS
RULERS
INOCULATION TOOLS
STERILIZED SPAWN BAGS
WAX DAUBER
DO U LIKE WOODY MUSHROOMS ?
I GOT THESE READYYYYYY!

Figure 4-16: Mico and Mapal having a discussion about Duwamish River and indigenous food

In the old Duwamish River region, indigenous communities relied on a variety of food sources that were integral to their diets and cultural practices. Some of these include wapato and salmon. Wapato, also known as Indian potato or duck potato, is a root vegetable that grows in marshy areas, including the wetlands near the Duwamish River. Indigenous peoples harvested wapato as an important staple food. The tubers were collected, cooked, and eaten, providing a valuable source of nutrition. Salmon was another vital food source for indigenous communities along the Duwamish River. The river supported robust salmon runs, including species like Chinook, Coho, Sockeye, and Steelhead. Native American tribes practiced sustainable fishing techniques, such as using fish weirs and traps, to harvest salmon. These fish played a central role in their diet, cultural ceremonies, and trade. Apart from wapato and salmon, indigenous communities in the old Duwamish River region also relied on other food sources available in the area. This could include shellfish like clams and oysters, game such as deer and elk, berries, and plant resources that provide nourishment and sustenance. (Culture Today)

Figure 4-17: Mico at wood stump/vermicompost playground near a camas field

Picture this: a vibrant camas field basking in the sun, with the colorful blooms of camas plants swaying gently in the breeze. And right nearby, we have a group of industrious and hungry worms, happily munching away on organic waste. These incredible worms are transforming that waste into nutrient-rich #vermicompost, a superfood for the soil! Worms=pets :)

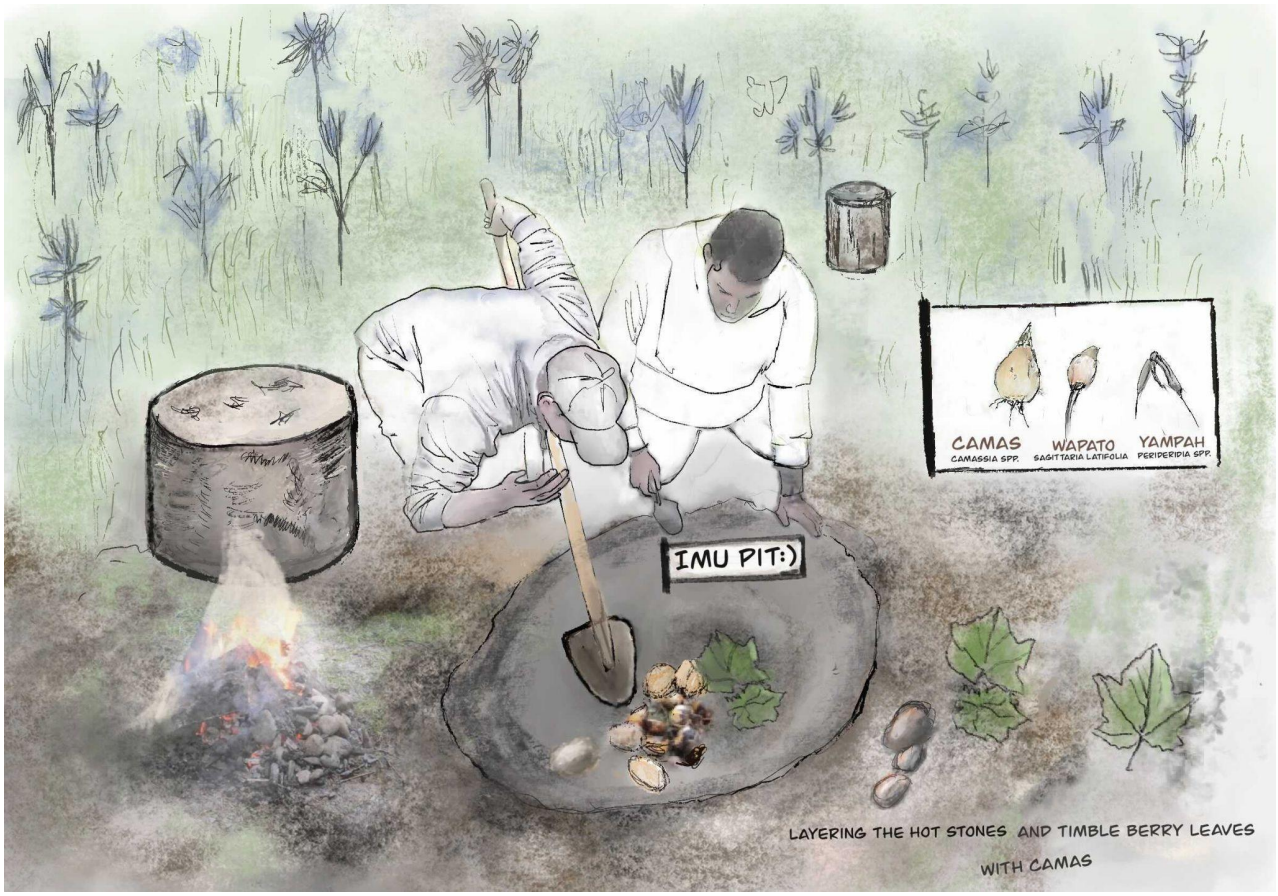


Figure 4-18 Indigenous way of cooking camas

To prepare camas, indigenous communities would traditionally dig a pit known as an imu pit or earth oven. The pit is lined with rocks and then heated with a fire, allowing the rocks to become extremely hot. Once the rocks are heated, the fire is removed, and the pit is layered with camas bulbs, often wrapped in leaves or placed in baskets. When camas is cooked, particularly through slow cooking methods, the inulin present in the bulbs breaks down into more digestible carbohydrates. This process, known as hydrolysis, transforms the inulin into simpler sugars, such as fructose. (WSDAgov. 2022)

Chapter 5 Conclusion & Reflections

The reflections on the scalability and transferability of my design approach here seeks to shine light on the potential for application in other contexts. My tangram framework adapts into the uniqueness of Georgetown's cultural context by respecting the historical narrative and leveraging on the community assets and liability, incorporating mobile educational format to tie site design into a bigger context.

The conflict between the natural world and human achievements is a complex issue that arises from the competing interests and priorities of different stakeholders. Alison Mathie and Gord Cunningham's work on Asset-Based Community Development (ABCD) highlights the potential for communities to drive their own development by leveraging local assets and resources (Mathie & Cunningham, 2003)

Understanding the perspectives and interests of different stakeholders is a crucial first step in addressing the conflict between the natural world and human achievements. This includes not only environmental groups but also industrial leaders and other relevant players in the region.

Through dialogue and collaboration, it becomes possible to identify shared interests and opportunities for cooperation. For example, industrial leaders may be open to exploring sustainable practices that minimize their environmental impact, improve efficiency, and reduce costs in the long run. Finding win-win scenarios where both environmental and economic goals can be achieved is key to fostering positive change.

Boeing has a longstanding presence in Seattle and the surrounding areas, contributing significantly to the local economy and shaping the region's identity.Talking with Manager Rob at Western Trailer Repair Inc in Georgetown provided valuable insights into the local sentiments towards the Boeing Company. Contrary to common assumptions, it was discovered that not all individuals in Georgetown harbor negative feelings towards Boeing. In fact, many residents rely on the company's presence in the local economy for their livelihoods and business operations.

Watching the Blue Angels air show in Georgetown alongside friends who share a passion for making Remote Control planes has been a thrilling and memorable event. The connection I have established with aviation inspired me to think more creatively and strategically about how design can enhance and align with the unique characteristics and needs of the aviation industry in this area.

It is important to approach these interviews with an open mind and respect for the perspectives shared. Each person's experience provided unique insights into the complex dynamics between Boeing and the Seattle community.

Through such interviews, **a more nuanced understanding** of the community's dynamics and the multifaceted impact of major corporations like Boeing can be gained.

When applying my tangram-based framework in Georgetown, considering Boeing as a main stakeholder and their dominance in the Georgetown region, designing educational programs in South Seattle College to acknowledge the craftsmanship into making a remote-controlled aircraft serves the purpose.

“Mapping community assets” mentioned in Asset-Based Community Development strategy (Mathie & Cunningham, 2003) involves identifying and visualizing the resources, strengths, and potential of a community. Incorporating Mini Mart City Park as an outpost educational place to rethink the contaminated properties into community assets through an arts and cultural lens. Contaminated sites can be also regarded as assets instead of liabilities.

Contaminated sites, such as brownfields or abandoned industrial areas, often pose environmental risks and are perceived as liabilities due to their negative impacts on ecosystems and human health. However, with appropriate remediation and redevelopment efforts, these sites can be transformed into assets that benefit the community .

In the case of Georgetown, I focused on mycoremediation to address the water and land contamination respectively. Applying phytoremediation techniques using plants like *Nasturtium officinale* (watercress), *Lemna gibba* (duckweed), and *Ipomoea aquatica* (water spinach) and hyperaccumulators *Brassica juncea* (Indian mustard), *Salix viminalis* (Basket willow) and *Populus spp.* (Poplar trees) in Georgetown can further enhance the remediation efforts for water and land contamination.

By emphasizing the connection between art creation, on-site building, culture, and environmental consciousness, the tangram framework can become a catalyst for change and have a ripple effect to inspire individuals to take action in their own communities.

One caution is if the contaminants that are absorbed by the fungi during mycoremediation get decomposed, then their constituents may return to the soil. However, the decomposition process is complex and can involve many different biological and chemical interactions.

During the decomposition process, the contaminants may be broken down into simpler, less toxic compounds by the fungi or other soil microorganisms. These simpler compounds can then be taken up by plants or used as nutrients by other microorganisms, which can help to restore the soil to a healthier state.

However, it is also possible that some of the contaminants or their breakdown products may persist in the soil or be released into the surrounding environment. The extent to which this occurs will depend on many factors, including the specific contaminants that were present, the type of fungi used, and the soil conditions at the site.

If I can explore further, I would like to test out some feasibility of the application of mushroom in mycoremediation on-site and carve out a clear phase plan for development.

In Chapter 4, I have applied graphic novels to create collective memories: The filling of the former bend of the Duwamish with sediment from dredging illustrates the physical transformation of the area and its impact on the local geography. By acknowledging this history and the ecological significance of Georgetown's location as an ecotone, the narrative aims to deepen the understanding of the neighborhood's past and envision its future.

Through the metaphorical collaboration of Duwa and Landis in the "Auld Lang Syne" song, the narrative suggests a harmonious coexistence and shared vision for the future of Georgetown. This vision could encompass sustainable development, environmental stewardship, and cultural

preservation, acknowledging the unique identity and historical charm of the neighborhood while embracing progress and growth.

Through creating various site visit videos and dance videos, I hope to add more dimension to the landscape architecture profession. We take roles such as resident documentarian extraordinaire, multimedia artist advocating for ecological literacy, landscape visualization specialist, installation artist, creative director/curator, public engagement specialist who develops innovative strategies and initiatives to engage the public in landscape architecture projects, and even environmental animator to communicate ecological concepts, design ideas, and environmental narratives.

Just like books in a library, landscapes can serve as living records of human experiences, traditions, and the evolution of societies. They provide a tangible link to our past, allowing us to connect with our roots and preserve our collective memory. Multiple educational outposts in Georgetown offer spaces for learning and exploration, the land can provide opportunities for experiential education and discovery. Through hands-on experiences in natural environments, individuals can engage their senses, cultivate a sense of wonder, and deepen their ecological literacy. Landscapes can become interactive classrooms, inviting people to explore, ask questions, and learn from direct experiences.

Landscapes can be a wellspring of inspiration for artists, designers, and innovators. Exploring and interacting (such as dance, mud-drawing) with the land can tap into its artistic potential and draw inspiration for various creative endeavors. By treating the land as a library, we can emphasize the importance of stewardship, sustainable practices, and the preservation of biodiversity, ensuring that future generations can access and benefit from its treasures.

The UN’s Sustainable Development Goals (SDGs) has recognized the importance of mental health as a critical aspect of sustainable development. I strongly believe that part of landscape architecture is about constructing emotional infrastructure and hope my multimedia presentations (video, graphic drawings etc.) will further explore the value of leveraging collective memory to foster

community action and help the community to envision the future outlook in a more compelling storytelling strategy.

Epilogue

The Tangram framework is designed to be flexible and adaptable, built upon three pillars: active citizenship, place knowledge, and mobility and rootedness. This flexibility allows the framework to be applied to a variety of contexts and challenges.

6.1 Active Citizenship & The Role of Engagement

Sherry Arnstein introduces a conceptual framework called the "Ladder of Citizen Participation." (Arnstein,1969). This ladder categorizes various forms of citizen participation. She argued that meaningful citizen participation is essential for effective democratic governance and planning processes. However, not all forms of citizen participation are equally impactful or empowering.

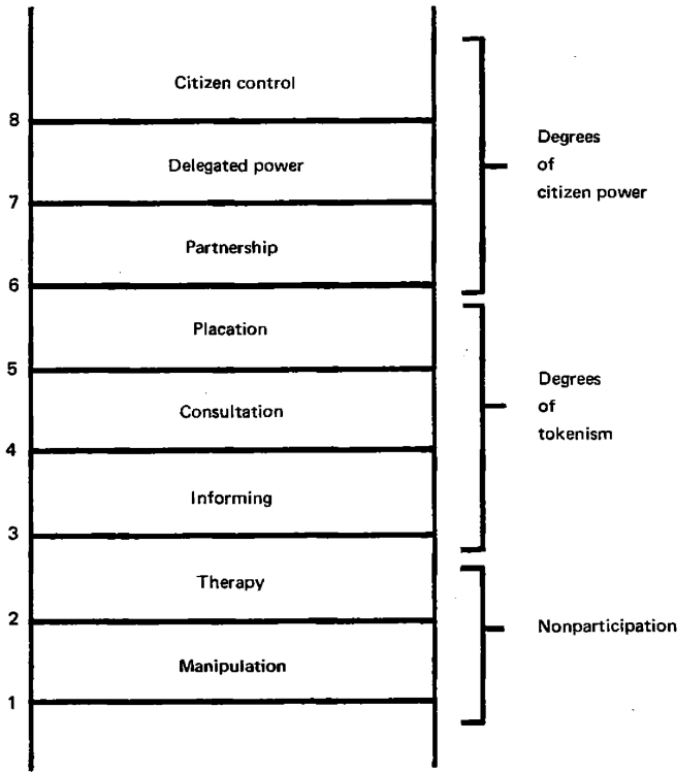


Figure 6-1 Arnstein, Sherry. (July 1969). “ A Ladder of Citizen Participation”. Journal of the American Institute of Planners, 35(4), 216-224.

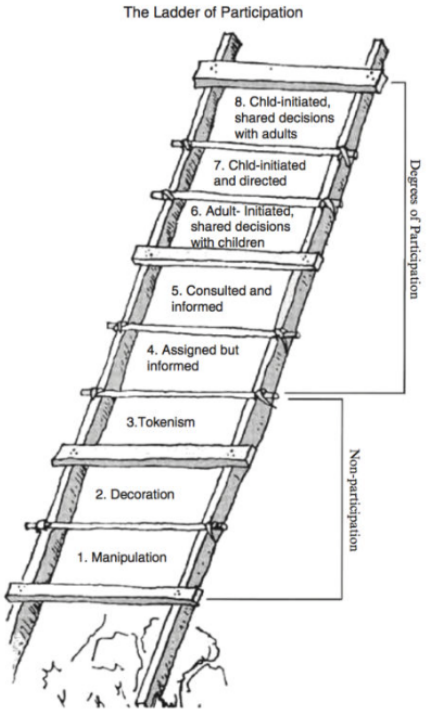


Figure 6-2 Roger Hart's "Ladder of Children's Participation" (Source: Hart, Roger A. (1992). Children's Participation: From tokenism to citizenship, Innocenti Essay, no. 4, International Child Development Centre, Florence)

The higher rungs on the ladder represent more active forms of citizen participation. They include informing, consultation, and placation, where citizens receive information and have the opportunity to express their views, but decision-making power remains with authorities. The subsequent rungs, partnership, delegated power, and citizen control, represent increased levels of citizen influence and decision-making authority, ultimately leading to active citizenship.

However, it's important to recognize that citizen participation and active citizenship are inherently political in nature. In my thesis, I particularly emphasized on playfulness, targeting the next generation, the kids. My approach towards public education focuses on the playful aspects of engaging children in citizen participation without delving deeply into the political dimensions.

By centering my thesis on the idea of building a sense of community and cooperation among children highlights how playfulness can foster empathy, inclusivity, and teamwork, all of which are essential for active citizenship.

Roger Hart's "Ladder of Children's Participation" (1992) specifically focuses on the participation of children and youth. It is an adaptation of Arnstein's ladder, tailored to the unique needs and capacities of children in decision-making processes. Hart's ladder describes the characteristics associated with different levels of decision-making agency, control, or power that can be given to children and youth by adults.

The ladder provides a framework for understanding and evaluating the levels of decision-making agency and power given to children in various contexts.

The "Ladder of Children's Participation" (1992) by Roger Hart acknowledges the importance of children's participation and their capacity to contribute meaningfully to decision-making processes. It recognizes that children have a right to be heard and to actively participate in matters that concern them. The ladder categorizes different levels of children's participation, from lower rungs where children have limited involvement and tokenistic participation to higher rungs where children have more substantive roles in decision-making.

By using Hart's ladder, one can assess and analyze the extent to which children are actively engaged as citizens within their communities. It provides a framework for evaluating the quality and depth of their participation, and can guide efforts to enhance their involvement and agency. It also highlights the importance of moving beyond tokenistic forms of participation towards meaningful engagement, where children's voices are valued, their perspectives are considered, and their contributions are taken seriously.

6.2 Place Knowledge—Evaluate the assets and liabilities of this region

“Knowledge of a place–where you are and where you come from—is intertwined with knowledge of who you are.” (Orr, 1992, P130)

Identifying the main players in a region is indeed an important step in getting to know a place. Understanding the key individuals, organizations, and institutions that shape a region can provide valuable insights into its culture, politics, economy, and social dynamics.

Once we have identified the main players in a region, the next logical step is to delve deeper into the rich tapestry of experiences and insights that reside within the people who have a deep connection to the place. While knowing the key figures and institutions provides a framework, it is through interviews with those who have lived, worked, and grown up in the region for extended periods that we can truly uncover the profound stories and firsthand accounts that bear witness to the transformations that have shaped the place over time.

Conducting interviews with people who have deep roots in the region or extensive experience working and living there can provide invaluable insights and firsthand accounts of the changes and transformations that have occurred over time. These individuals can offer unique perspectives, personal anecdotes, and a wealth of knowledge about the place and its evolution.

6.3 Mobility and Rootedness

We are on the cusp of a climate crisis. Within my thesis pursuit, I used the tangram metaphor to address how to cultivate the next generation of environmentally conscious citizens. A resilient future demands more environmentally conscious citizens.

In today's global context, the notions of mobility and rootedness present interesting dynamics and considerations. On one hand, increased mobility through globalization, migration, and technological advancements has facilitated movement and connections across borders, enabling individuals to explore new opportunities, cultures, and experiences. On the other hand, rootedness, which encompasses a sense of belonging, cultural identity, and confidence, holds significant power in providing individuals with a sense of stability, community, and personal grounding.

For environmentally conscious citizens, the concepts of mobility and rootedness hold particular significance in their pursuit of sustainable practices and a resilient future. Here's what I have concluded it means for environmentally conscious citizens:

Mobility for Environmental Engagement
Mobility allows environmentally conscious citizens to expand their knowledge and engage with environmental issues on a broader scale. They can participate in international conferences, collaborate with like-minded individuals and organizations globally, and learn about innovative environmental practices from different regions. Mobility enables them to share ideas, strategies, and

solutions, contributing to the collective efforts in addressing environmental challenges.

Rootedness in Local Environmental Contexts

Rootedness encourages environmentally conscious citizens to develop a deep connection to their local environment and engage in community-based environmental initiatives. By understanding the specific environmental issues, challenges, and resources in their own region, they can actively contribute to local sustainability efforts. Rootedness fosters a sense of responsibility and stewardship towards the local ecosystem, leading to initiatives such as community gardens, renewable energy projects, waste reduction programs, and conservation efforts.

Cultural Identity and Sustainable Practices

Rootedness also plays a role in promoting sustainable practices within specific cultural contexts. Cultures and traditions often have inherent connections with the environment, and environmentally conscious citizens can draw upon their cultural identity to inspire sustainable behaviors. By preserving and revitalizing cultural practices that promote environmental stewardship, individuals can integrate sustainability into their way of life and inspire others within their communities to do the same.

Balancing Global Awareness and Local Action

For environmentally conscious citizens, the interplay between mobility and rootedness is crucial. They can leverage their global awareness, gained through mobility and exposure to diverse environmental perspectives, to inform and influence local actions. By applying international best practices and innovative approaches to their local context, they can contribute to sustainable development in their communities. At the same time, rootedness ensures that local knowledge and values are respected, creating a more inclusive and effective approach to environmental conservation.

“Landscape… shapes mindscape.” (Orr, 1992, P130) For environmentally conscious citizens, the landscape becomes a canvas upon which their environmental values and practices are formed. A well-designed and sustainable

landscape can evoke a sense of connection to nature, inspire stewardship, and promote sustainable behaviors.

As individuals develop an environmentally conscious mindscape, they are more likely to shape and transform the landscape to align with their values. This can include initiatives such as rewilding projects, urban greening, and regenerative design, which aim to restore and enhance the ecological integrity of the landscape.

The reciprocal nature of influence paves the way for a world of generosity and giving, ultimately fostering a resilient future. This concept extends beyond mere transactions, emphasizing the interconnectedness of individuals, communities, and ecosystems. By recognizing the interdependence between various entities, we can establish a culture of mutual support and collaboration, leading to collective growth and sustainability.

In considering the ideas of rootedness and mobility in the world, the concept of vernacular architecture comes into play. Vernacular architecture embodies the indigenous wisdom of building structures that harmonize with the local environment and culture. It reflects a deep-rooted connection to the land, materials, and traditions of a specific place. At the same time, vernacular architecture evolves and adapts to changing needs and circumstances, showcasing the element of mobility inherent within it.

By embracing the principles of vernacular architecture, we can integrate the values of rootedness and mobility into our built environment. This approach encourages sustainable practices that honor local resources, climate, and cultural heritage while also allowing for innovation and resilience in the face of changing conditions. It emphasizes a balance between continuity and transformation, fostering a sense of place and belonging while remaining adaptable to the dynamic nature of our world.

LIST OF FIGURES:

All figures are by the author unless otherwise noted.

Acknowledgements

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