Towards a Holistic Landscape: Understanding, Repairing and Sustaining Systems

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Abstract

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Landscape interventions are often designed through a human-centric lens that does not always consider the essential role that more-than-human elements, alongside other underrepresented elements, have in the holistic landscape. This research examines how **systems-based thinking** can shift peoples' perceptions of how we view and understand the landscape. Systems-based thinking is organized at its most basic level into elements, interactions, intentions, and resulting function, which in this case are the processes and forms shaping the landscape. I hypothesize that through systems-based thinking and design, people can understand the landscape system holistically and consider how humans interact with and understand the landscape system around them.

For this investigation, I develop a **landscape biography methodology** to examine how a landscape system has been altered due to design interventions, critical narratives, and human and more-than-human relationships within that system. Storytelling through design along with ecorevelatory design and community engagement serve as a framework to measure the landscape literacy, ecological literacy, and place attachment people have with these systems. **Storytelling through design** concentrates on

how past land narratives are seen through the latest design interventions and help inform site users of system narratives. **Landscape literacy** measures the effectiveness of people understanding those narratives, including people–place connections, social injustices, and elemental relationships in the system. **Ecorevelatory design** offers an approach to make visible to visitors the once-invisible and incorporates more-than-human elements at the forefront of the intervention. This design strategy leads to **ecological literacy** and human understanding of the critical role that more-than-human elements play in the landscape. **Community engagement** inclusively builds system relationships and extends learning between human and more-than-human elements in the landscape throughout the design process. **Place attachment** demonstrates human-element connections by caring for the land, sharing the memories people have with the land, and exhibiting pro-environmental behaviors.

Three case studies – Sweetgrass in Seattle, Hunter's Point South in New York City, and Menomonee Valley in Milwaukee – illustrate the critical roles of this framework in understanding landscape narratives, repairing conditions for more-than-human elements of a system, and sustaining healthy system relationships for the future. Systems-based design demonstrates the need for a holistic function as the primary objective of design interventions; relationships and interactions between elements are crucial in achieving a holistic system.

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Glossary

Community Engagement: Project design, implementation, or stewardship teams including neighbors, people from the local community, regulators, stakeholders, and/or interesting individuals in the design, construction, or stewardship process. This is typically led by a firm, lab, organization, or non-profit.

Design Intervention: An intentional change in the landscape system done by humans to change how people use a space. The intervention can also include changes based on more-than-human elements but that is not guaranteed.

Ecological Literacy: The way humans understand more-than-human elements of the landscape and how systems flow and function within a site.

Ecorevelatory Design: An intentional change that promotes or reveals more-than-human elements within a site. It creates a landscape where human and more-than-human elements interact and cohabitate. (Helphand & Melnick, 1998b)

Elements: Human and more-than-human pieces or components in a system or landscape.

Holistic: Recognizing human and more-than-human viewpoints and various and often conflicting narratives when examining a story or landscape. Also considers underrepresented voices and elements of a landscape.

Holistic Age: An idealistic point in time when the landscape narrative is not human-centric and considers a holistic approach.

Human: People or human beings. Typically referenced as site users of the landscape. Human-like elements can also refer to inanimate objects that are intended solely for people's use.

Land/Landscape: Components of the earth's surface in which humans and more-than-humans serve as the elements. The landscape has a variety of elements and systems that make up the larger, theoretical understanding of the land and includes terrestrial, riverine, and shoreline systems.

Landscape Literacy: The way humans read and perceive landscape narratives, particularly the human components and history of the land. (Heatherington, 2011)

More-than-human: Living beings in a landscape that are not human; examples include vegetation, water, fish, or other wildlife.

Narrative: A retelling of events from one perspective or viewpoint.

Place Attachment: The connection people have to the land and system they live within. (Manzo & Devine-Wright, 2019)

Site: A specific location within the landscape that is defined by human-contrived political boundaries.

Story: A broader understanding of past events with multiple narratives that bring different perspectives.

Storytelling through Design: A strategy that encourages a variety of land narratives, both historic and present, to be visible through the design intervention.

Systems-thinking: A human way of understanding the complexity of the world in which we live. This theory considers elements, interactions, and intentions to develop a resulting function (Rottle & Yocom, 2010). It also understands human and more-than-human elements as one system and not as separate entities or hierarchies.

Preface

Background

Within the dogma of contemporary Western science, humans continue to impact and change the flow of ecosystems with a dominant or controlling perspective that continues to see humans as separate or distinct from them. Other forms of knowledge identify humans as only one among many elements in the system. Within a systems-based thinking paradigm, one understands the land as a system through the lens of elements, interactions, and a resulting function (Scheffer, 2009b). Ecofeminist theory, Indigenous knowledge, and landscape ecology all consider systems-based thinking from their own perspectives and can anchor how we perceive the land (Haraway, 2016; Hobbs & Wu, 2007; Kimmerer, 2013c). These frames also consider the nondominant role of humans on the land, as compared to more-than-human elements – fish, plants, water, and wildlife – instead of a sense of human hierarchical superiority over more-than-human elements. Through storytelling and ecorevelatory design in the landscape, humans can become more aware of the other elements in the ecosystem, interactions between elements, and the function/process of the ecosystem – a foundational approach to cultivate environmental literacy. Art elements on a site, such as sculpture, murals, and banners, along with intentional design interventions that promote more-than-human elements, can create an interaction between humans and more-than-human elements that can expose new narratives of the landscape. Holistic stories examine the same ecosystem from different perspectives. The landscape can draw us closer to a more holistic understanding of the processes, relationships, and elements defining a system.[1] The more we consider different perspectives, the greater the potential to holistically understand systems.

While using systems theory as a basis for this research, understanding the relationships between elements within the landscape becomes critical to determine and sustain healthy connections and holistic processes within the system. These interactions are not clean, simple environments. There are "messy" (Nassauer, 1995), "unpredictable" (Ward Thompson, 2011), and "unconventional" (Higgs, 2003) relationships, as viewed from a human perspective, but these interactions combine to create mutual relationships resulting in a system that is independent of human interference. Landscape systems brim with complexity, becoming difficult to distinguish because of their interconnecting elements across spatial and temporal scales. Related to stories, structured narratives can represent many varying views of the land to better understand the system from multiple perspectives.

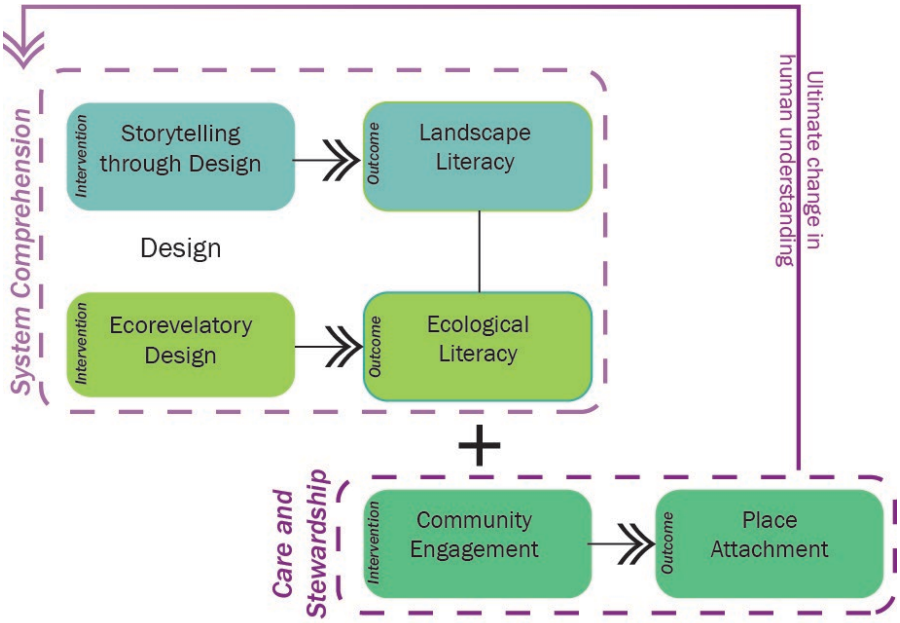
This research examines narratives that can be revealed through design and identifies how people can and do connect with the landscape through design interventions. It assesses human understanding of these connections, the land, and systems through the development of landscape literacy from storytelling through design; ecological literacy impact from ecorevelatory design; and place attachment connection through community engagement. See Figure 0.1. **Storytelling through design** concentrates on how past land narratives are seen in the land and how they helped shape the design that is there

[1] This proposal will refer to a "holistic goal," but a true holistic perspective is unattainable because humans are an element within the ecosystem, and we will always bring some amount of bias with us. That said, we should strive to include more voices and perspectives in the story and design to create better interactions and ecosystem relationships.
Holistic approaches focus on overall system health, not on a single element. For example, holistic medicine works to treat the disease, not the symptom. In the environment, a holistic approach considers the larger system in decision making (Marchand et al., 2020).

today and project the potentials of tomorrow. In this way, the land can be understood metaphorically as layers built upon over time that reveal elements, interactions, and functions of the land's history (Heatherington, 2011). These narratives often expose cultural practices and injustices that have occurred within and upon the land system (Spirn, 2014b). This history is measured through foundational practices in developing site literacy and by discovering whether people understand the land narratives and history displayed in present-day storytelling through design interventions. Landscape literacy is one measure to assess the understanding of people–place connections, social injustices, and element relationships in systems (Spirn, 2014b, 2019). **Ecorevelatory design** focuses on how designs can "make the invisible visible" and bring more-than-human elements to the forefront of the design (Helphand & Melnick, 1998b). Ecorevelatory design is a form of design practice emphasizing the restoration and repair of more-than-human elements of a system. This design strategy can lead to ecological literacy and human understanding of more-than-human elements in the system and their crucial roles in the landscape. Through this approach, it is imperative to examine how people live with the land where human ideals are not the center of the design (Higgs, 2003). Ecological literacy results from people wondering, connecting, engaging, contextualizing, and recognizing the existence of more-than-human elements in the system and more-than-human interactions or subsystems within the larger ecosystem in which we participate (Boehnert, 2012). **Community engagement** creates an inclusive approach to design that helps build relationships between humans and more-than-human elements in the landscape. Relationality and community respect have been critical practices in Indigenous and ecofeminist theories through strategies of care (Haraway, 2016; Whyte, Caldwell, & Schaefer, 2018). Ultimately, community engagement can lead to place attachment, which focuses on relationships between elements in the system. Place attachment is shown through care for the land, memories people hold of the land, and proenvironmental behaviors (Manzo & Devine-Wright, 2012). I hypothesize that through each of these elements, humans can understand the system holistically and, eventually, shift the human-dominant perspectives of land to understandings that are more diverse and fluid.

Figure 0.1

Understanding the research interventions and outcomes being studied in the landscape



Research Questions

This project seeks to engage the question of *how landscape design can reveal narratives to tell holistic stories about the land, enhance ecological literacy, and form a greater attachment to all elements within the ecosystem.* Utilizing methods of post occupancy evaluation, this research aims to demonstrate *an investigative approach that considers the impacts of design priorities and goals* and examines three sites using *holistic strategies that prioritize the human understanding of more-than-human and underrepresented voices of the land.*

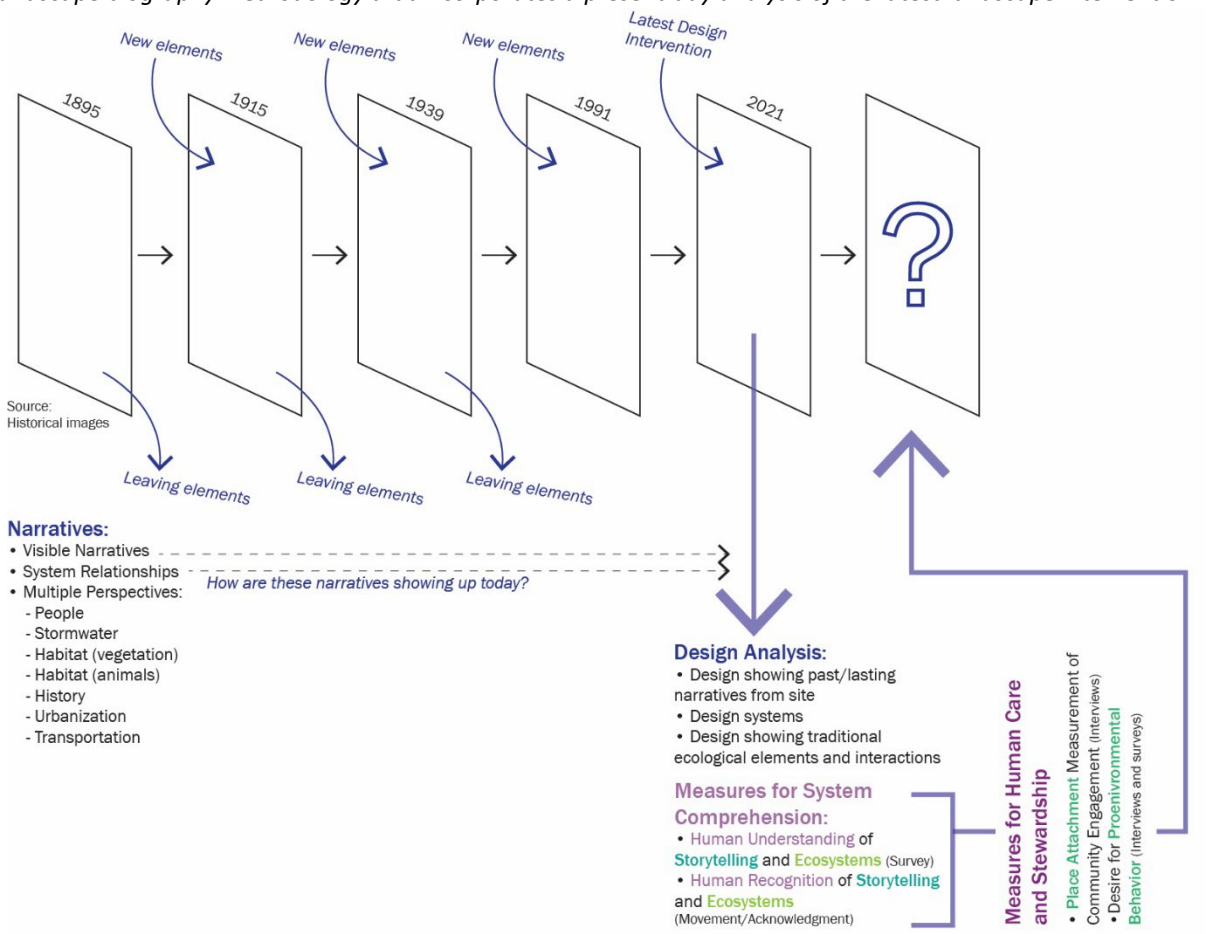
Methods

This research explores each study location through a landscape biography recognizing historical narratives and interactions within the system (Kolen, Renes, & Bosma, 2017). It uses a place-based case study methodology to examine current system design, intervention implementation, and landscape stewardship through the lens of landscape literacy, ecological literacy, and place attachment. It facilitates the research to further comprehend how the system currently functions in terms of how human elements understand and interact with more-than-human elements and narratives. The landscape biography methodology is based on James Reason's understanding of systems in healthcare and how one state migrated to another (Reason, 1990, 2000). Each case study site is a postindustrial urban shoreline re-envisioned through design and contained all three intervention strategies – storytelling through design, ecorevelatory design, and community engagement. This approach measures the impact of the site's human user and encourages holistic thinking about the land. Seattle, New York City, and Milwaukee are each studied with the same foundational case-based methodology to understand how the site and its greater context as a landscape has functioned in the past through landscape biography and how it functions today through interviews, surveys, and observations. The methodology is shown in Figure 0.2.

Semi-structured interviews with key stakeholders for each site are used to provide a holistic understanding of the system function, relationships, and design intention. This research used interviews with stewards, landscape architects, and community leaders to understand different perspectives and intentions with the intervention. Intercept surveys and site observations were used to query site users and to assess the understanding of the present-day relationships between human and more-than-human elements. The components of each piece were employed to measure the landscape literacy, ecological literacy, and place attachment people feel and demonstrate towards the site.

Figure 0.2

Landscape biography methodology that incorporates a present-day analysis of the latest landscape intervention



Findings

Each case study examined is a rehabilitated urban shoreline. These sites were considered natural or undisturbed shorelines prior to European colonialization, modified through industrialization and urbanization, and then designed to assist in re-establishing the ecological systems that were degraded or lost through earlier industrial uses. Rehabilitated urban shorelines are ecological systems often defined by the components of vegetation, wildlife, and stormwater management. Each study site was heavily modified, altering the ecological processes and their relationships over time from human–dominant systems to those considering more-than-human elements within the system. Understanding the systems and relationships between elements is crucial to revealing narratives and to creating mutualistic interactions and relationships.

Through the Sweetgrass Case Study in Seattle, the constructed floating wetlands created opportunities to repair more-than-human element interactions within the system. With a temporary landscape installation, few public users felt connected to the floating wetlands and the eco art added to the site. Those who did were often regular site users or engaged in the installation. The results of this study suggest the importance of public engagement in a site to increase the public recognition of more-than-

human elements by 31% and the desire to participate in stewardship by 44% (*n* = 51). While temporary installations do not directly benefit humans, they create opportunities for community engagement and interactions between humans and the more-than-humans.

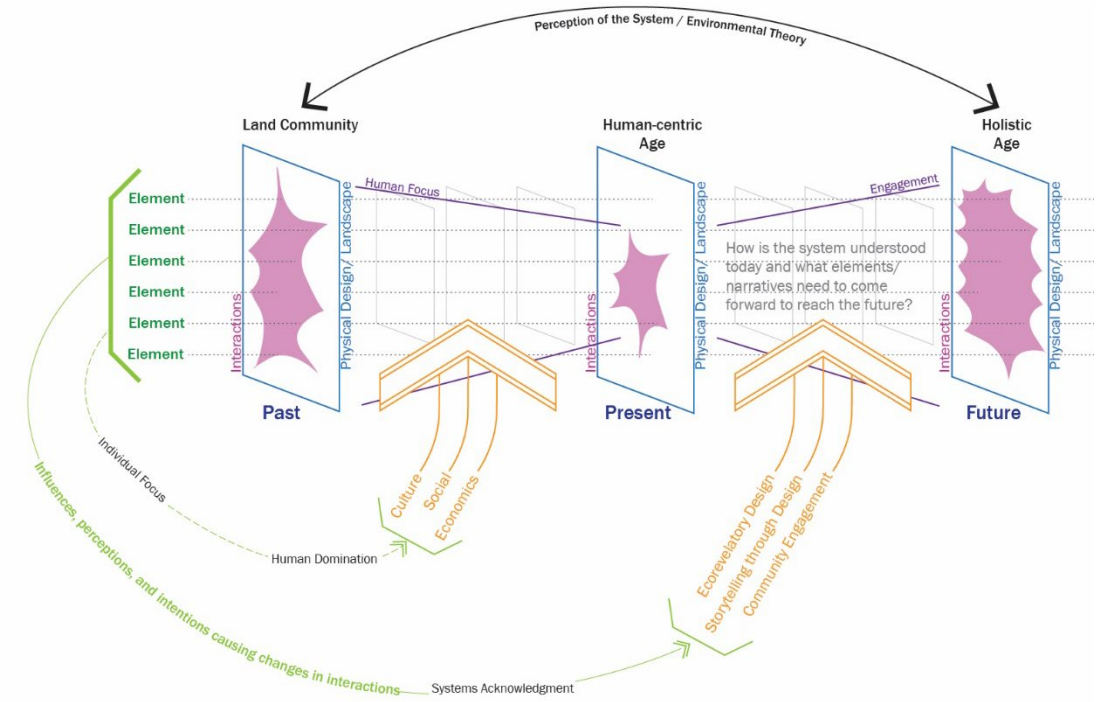
Hunter's Point South Waterfront in New York City was designed to acknowledge the historical site narratives of marshland, industrialization, and transportation. Urban growth at this site engaged with current and future community narratives. The design aimed to benefit both the human community and the location's more-than-human elements. For this study, landscape literacy prevails in this design intervention, and over 50% (*n* = 60) of the site users could explain something about the site history. Most site users demonstrated ecological literacy when conveying something sustainable about the site; just over half could describe the system and its sustainable features. People chose to seek out the more-than-human places and stopped to enjoy time in those spaces, which is the first step in getting people to comprehend the site's sustainable features of a site.

Three Bridges Park and Menomonee Valley Stormwater Park are located along the southern reach of the Menomonee River in Milwaukee, Wisconsin. Both sites have a long history of manipulation and alteration for human gain. When the latest strategy was implemented, designers considered both human and more-than-human elements in the ecorevelatory design. In this study, ecological literacy was apparent when 93% of the site users considered more-than-human elements while defining a healthy ecosystem, with 68% detailing vegetation or biodiversity, 41% considering wildlife, and 27% describing stewardship or sustainability in their description of the parks (*n* = 41). Some of this result can be explained by the Urban Ecology Center (UEC) adjacent to the site and runs ecological literacy programs for children and adults. The connection this center forms between the park and the community is a leading explanation for how people engage with the landscape and demonstrate connections with the land.

The findings from each of the three case studies demonstrate the roles storytelling through design, ecorevelatory design, and community engagement in creating more holistic connections and relationships between system elements. The study implies that designers should be intentional and blatant with their design interventions to foster landscape and ecological literacy. Community engagement efforts at each site were key components that instilled greater holistic thinking and place attachment. By involving individuals and communities and by providing education along the way, landscape and ecological literacy may be increased to bring us closer to a holistic age. See Figure 0.3. This research articulates a need for designers to transition towards creating holistic landscapes that encourage healthy systems and inclusive processes.

Figure 0.3

Understanding a system in the future holistic age



Limitations and Next Steps

This work was limited to three sites in varying areas of the United States. Future work should include a larger comprehensive study of ecological literacy and community engagement programs to understand the key components needed to establish ecological literacy and community engagement in the design and restoration of postindustrial shorelines. Additionally, while each case study was selected for the common feature of urban shoreline rehabilitation, their contexts were distinct and located in diverse neighborhoods. For example, Hunter's Point is in Queens, New York, where the adjacent communities speak more than 135 languages. In contrast, the Milwaukee neighborhood predominantly spoke Spanish. The survey was given only in English, and the researcher did not speak Spanish or another language. Some children translated the survey for parents to obtain responses, but better inclusion and diversity from the survey could have resulted in different responses.

The next steps in this research are to reorient this research methodology into a design methodology and better understand how it could shape the course of our landscape in the future. If we understand the landscape as a series of elements, interactions, and resulting functions, how can interventions in the system change the system dynamics and the future outcomes? What role can storytelling through design, ecorevelatory design, and community engagement have in future designs to encourage a holistic view of the landscape and elevate more-than-human and underrepresented elements in the land? Lastly, how does a holistic relationship with the land emerge and evolve, and how does it change how we create new relationships with the land?

Chapter Overview

Chapter 1: ***Systems-based Theory: Recognizing Storytelling Through Design, Ecorevelatory Design, and Community Engagement Approaches in a System-based Framework***

Systems-based thinking is an ontological approach that frames land by its spatial and processual capacities through categories of elements, interactions, and the resulting functions. This chapter explores the underpinnings of systems-based thinking with Indigenous knowledge, ecofeminist theory, and landscape ecology. The understandings of elements as human and more-than-human fosters a nonhierarchical interpretation of the landscape and recognizes underrepresented elements in the system. When applying this thinking to design practices, storytelling through design, ecorevelatory design, and community engagement are analyzed to see how these concepts and practices change the relationships between human and more-than-human elements in the landscape. This analysis leads to an investigation of how systems-based thinking can ultimately help lead to a holistic landscape.

Chapter 2: ***Landscape Biography Methods: Understanding the Holistic Landscape Through Landscape Literacy, Ecological Literacy, and Place Attachment***

Each case study location – Sweetgrass in Seattle, Washington; Hunter's Point South Waterfront in Queens, New York; and Menomonee Valley in Milwaukee, Wisconsin – was examined through a methodology of landscape biography that recognizes historical narratives and interactions within the system. Each site has a postindustrial history with rich narratives and a relatively recent intervention that promotes more-than-human elements as a part of the landscape. The landscape biography methodology explores the system over time, what elements cause changes in the system, and how the current design creates opportunities for landscape literacy, ecological literacy, and place attachment. Intercept surveys, semi-structured interviews, and formal site observations allowed for further insights into how humans view the system's function. These methods also created opportunities to measure landscape literacy, ecological literacy, and place attachment to determine whether the holistic stories that emerge from the designed interventions are recognized and resonate with visitors.

Chapter 3: ***Sweetgrass Case Study: Exploring Interventions with Community Engagement at the Forefront of the Landscape***

The Sweetgrass Case Study analyzed person–environment relationships related to floating wetland prototypes installed to benefit juvenile salmon along the Lake Washington Ship Canal in Seattle, Washington. First, through examining the Lake Washington Ship Canal using the proposed landscape biography methodology, changes in historical land and system relationships were identified. Subsequently, floating wetlands were designed, built, and installed to restore juvenile salmon habitat and repair salmon–environment relationships in the watershed. Sweetgrass Arts, through a grant from the City of Seattle Neighborhood Matching Fund, created an opportunity to hire local artists to share their land stories, experiences, and perspectives through art along the trail. Posters, banners, painted stencils, and poetry were installed near the floating wetlands to reveal the ecosystems and make more-than-human elements – salmon, plants, water, and wildlife – more visible to people using the adjacent trail. My surveys and observations of site users assessed the landscape and ecological literacy people gained from the storytelling and ecorevelatory aspects of the multiple project elements. Subsequent interviews with the artists, community scientists, and project team members were used to assess place attachment to the study location. This study suggests that community engagement is essential to

forming meaningful connections with the land and is necessary to restore system relationships between humans and more-than-humans. It also suggests that storytelling and ecorevelatory practices should be more widely implemented for people to understand and steward the systems around them. A holistic lens to design is vital to improve person–environment relationships and to promoting landscape stewardship practices.

Chapter 4: ***Hunter's Point South Waterfront Park Case Study: Discovering Stories and Narratives in the Landscape and Examining the Landscape Literacy of Site Users***

The Hunter's Point South Waterfront Park was an abandoned site that once served as a rail depot, coal yard, and ferry terminus, across the water from midtown Manhattan in Queens, New York. As the city grew and storm surges became greater, designers accommodated these emerging stresses by "bending" the interactions between system elements but not changing the site-level interactions (SWA/Balsley, Weiss/Manfredi, & ARUP, 2019). The site includes several of the original rail lines and other postindustrial remnants that help tell the historical narratives. At the same time, it changed the contaminated brownfield site into a shoreline filled with tidal marshes to increase the site resilience. This site design focused on making sustainable design strategies visible on the site. It showed that most site users understood at least one narrative of the landscape system. Most site users connected to human elements and did not understand the historic more-than-human elements. The site designers were determined to showcase different types of ecosystems that support more-than-human habitat and combine the human and more-than-human habitat cohesively in the ecosystem. Most site users identified more-than-human elements when pressed about ecological aspects of the land. Finally, those who volunteered as caretakers and stewards demonstrated connections with the land, revealed memories of community gatherings, and exhibited proenvironmental behavior. These findings further emphasize that if people are stewards and care for the land, their understanding of the holistic land around them and their place attachment to it are strengthened.

Chapter 5: ***Menomonee Valley Case Study: Ecorevelatory Design Within Systems Theory***

The Menomonee Valley Community Park in Wisconsin was once a wild rice marsh along the Menomonee River. In the late 1800s and early 1900s, the area was filled and turned into the Milwaukee Road Shops and Airline Yards rail site. It is now one of the "largest brownfield redevelopment successes in Wisconsin history," according to Wenk Associates. The site was transformed from a rail yard to a community park through design strategies incorporating ecological restoration, stormwater treatment of nearby neighborhood and highway runoff, and a reconnection to the Menomonee River. The site also includes narratives from the local Miller Brewing Company, Milwaukee Stockyards, and sewer pipes. The narratives in the designed site create an interesting juxtaposition in the system of native plant restoration and the postindustrial elements still evident on the site. This study showed that a user's personal experiences of the place and signage explained their knowledge of the history and landscape interventions more than the design elements did. Ecological literacy was evident from the narratives of general site users, UEC participants, and a larger neighborhood community. The UEC creates ways for people to learn about and acknowledge the more-than-human elements in the landscape. People are recognizing, appreciating, and seeking out the more-than-human elements. The place attachment formed by users in this landscape contributes to building strong, caring relationships between human and more-than-human elements. Menomonee Valley is emerging as a holistic system in which people look to care for one another and the more-than-human elements in the landscape.

Chapter 6: ***Sustaining the Holistic Landscape***

Using systems-based thinking, each case study site is framed to include elements, interactions, and functions in an interconnected system and to determine a site user's understanding of the landscape. Viewing the landscape through these lenses, more-than-human elements and underrepresented elements become critical pieces of landscape story. Storytelling through design, ecorevelatory design, and community engagement are ways to engage humans in the landscape function and drive interactions that could change their understanding of the holistic system. The positive intentions behind these interactions are measured through landscape literacy, ecological literacy, and place attachment. Future work should make each of these practices more intentional for site users. Finding creative ways to use art and design to show land narratives creates opportunities for people to engage with the landscape system. This study demonstrates the importance of the intersection of ecology, art, and human perspective and intention. Design's role at that intersection is pivotal in the land relationships and needs to consider an ultimate system function as the design. This identifies what elements, interactions, and intentions are needed to support that function. Systems-based design can lead us towards a more holistic future that recognizes and supports underrepresented elements including more-than-humans.

Chapter 1

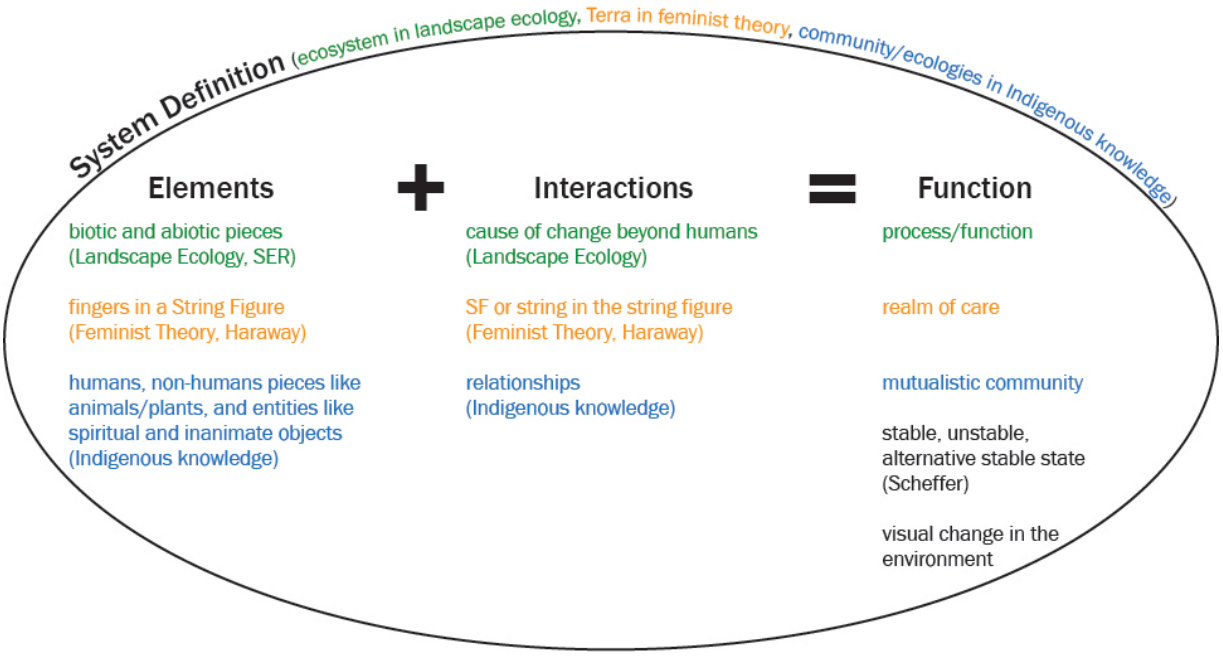
Systems-based Theory: Recognizing Storytelling Through Design, Ecorevelatory, and Community Engagement Approaches in a System-based Framework

In Western design and culture today, the landscape is viewed through a human-centric lens, and design interventions are often executed with the primary intention to benefit humans and society. In a holistic design intervention, more-than-human and underrepresented elements are additionally engaged as primary benefactors. This research explores landscape through systems-based thinking. It considers how to understand the landscape as a system in which both humans and more-than-humans are mutually supportive and critically important. Although it remains a human-contrived way of viewing complex landscapes, systems-based thinking encourages humans to understand a holistic view of the system that we are a part of, not in control of.

Systems-based design is an emerging approach within the allied design and planning disciplines to meet project needs while addressing contextual issues across temporal and spatial scales. Systems-based thinking comes from the understanding that all elements in an organization relate to each other and work together to allow the system structure to function and process (Scheffer, 2009b). A system is defined as having three components: elements, their interactions, and the resulting function. Figure 1.1 shows how elements and interactions create the system's function and form an approach to consider a holistic understanding of the landscape. Systems-based thinking will be used in this research and sets the foundational theory for understanding and characterizing the landscape system in which we work and live.

Figure 1.1

System-based thinking definition



Roots of Systems-based Thinking and Design

Systems-based thinking has roots in landscape ecology, feminist theory, and Indigenous knowledge. Each knowledge base makes similar contributions to systems-based thinking with its own process to form knowledge of a system. In landscape ecology, the overall system is referred to as an ecosystem, whose is on the environment and what elements constitute a landscape. In feminist theory, Donna Haraway considers our large system as "Terra" (Haraway, 2016). It lives within a larger system referred to as the "Chthulucene" – a holistic, inclusive, and not human-centric realm (Haraway, 2016). In Indigenous knowledge, the system is referred to as "communities" or "ecologies" (Kimmerer, 2013b; Whyte et al., 2018). Whyte et al. define ecologies as "systematic arrangements of humans, nonhuman beings (i.e. animals, plants, etc.) and entities (i.e. spiritual, inanimate, etc.)" working together to thrive in the landscape (Whyte et al., 2018). Each knowledge base has distinct approaches to describe the elements, interactions, and functions that make up the larger system.[2]

Elements. Elements are the components that comprise a system, the physical and tangible parts that have a role or character in the environment. In landscape ecology, an ecosystem is comprised of all biotic and abiotic elements (Society for Ecological Restoration International Science & Policy Working Group, 2004). The human and more-than-human elements within the landscape range from a small scale with insects and vegetation to larger climate elements of temperature, sea level rise, and stormwater. Notably, this definition includes humans indirectly and mainly as the causal agents contributing to alterations and loss of resilience in natural environments. At all scales, numerous elements help one another and work together to form the ecosystem's environment. A Muir web, left in Figure 1.2, is used in landscape ecology to visualize an ecosystem's complexity. Each dot or point in the system is a new element. In feminist theory, the system is depicted intricately. One that I visualize is the string figure, middle of Figure 1.2. The elements are represented by the fingers or anything that supports the formation of the string to take shape (Haraway, 2016). In Indigenous knowledge (IK), the elements within the ecologies are "humans, nonhuman beings (i.e. animals, plants, etc.) and entities (i.e. spiritual, inanimate, etc.)" conspiring to prosper in the landscape (Whyte et al., 2018). All three theories of knowledge identify a wide breadth of element types and understand that the elements themselves are standalone elements that do not work without interactions.

Interactions. While acknowledging elements in the system are important, the interactions within each system are critical to bringing elements together and creating movement or flow within the system. Landscape ecology uses the term "interactions" with the primary understanding that the connection between two elements, often without human interference, allows that interaction to occur (Society for Ecological Restoration International Science & Policy Working Group, 2004). According to the Muir map

[2] Throughout this writing and this dissertation, it is imperative to acknowledge that the author writes this work from a Western perspective. The understanding of knowledge below is based on readings and reflects a Western background and historical framework. I also recognize that traditional ecological knowledge (TEK) is a term that Western science developed to describe Indigenous ways of knowing. I will use Indigenous knowledge (IK) in this writing, but acknowledge that it does not cover the vast realm and ever-changing knowledge produced by Indigenous peoples (Kimmerer, 2013c).

in Figure 1.2, the interactions are the lines that connect each of the dots or elements (Harrison & Sanderson, n.d.). Interactions between elements help to explain how ecosystems begin to function and become a community. The European approach to landscape ecology considers how nature–society interactions on one plane intersect with spatial patterns and ecological process on another plane (Wu & Hobbs, 2007). The American approach focuses on interactions between and within ecosystems to look across scales and at adjacent systems (Forman, 1995). In this theory, ecosystems focus more on relationships between systems and across such scales. For this dissertation, the European landscape ecology approach will be used because it includes societal and human influences within the ecosystem.

As humans, we are inherently a part of the landscape and not separate or above other elements. This is strongly apparent in feminist theory and IK. In feminist theory, Haraway refers to the connections as "SF: science fiction, speculative fabulation, string figures, speculative feminism, science fact, so far" (Haraway, 2016). As mentioned above, the string figures visually display the site connections through the string. Haraway used string figures to illustrate relationships and contextual connections between elements (see Figure 1.2). This illustration is a reminder that these connections are not just interactions connecting two elements. Knots created in interactions, the connections established by journeying together, and the intertwining of the strings reminds us that these interactions are more than simple moments in time. These interactions are points where change, design, and cohabitation occur. The interactions also depict the final design in the string figure, just as interactions in elements create the process of the system.

Lastly, IK is not about elements found or the system's production. Instead, IK is most concerned with the lasting relationships between elements; the acknowledgement that all elements, especially more-than-human elements, can contribute to the knowledge body; and the mutualism that comes from being a member of this system (Kimmerer, 2013c). If a relationship between elements is fostered, nurtured, and respected, the overall system will mutually function for all elements. In Indigenous knowledge, interactions are based on cultural values and relationships. Interactions, relationships, and connections in the system give it life and movement.

Function. When the elements and interactions combine, we begin to see movement, circulation, and feedback loops in the system. Landscape ecologists describe a process in which elements cycle through a system, allowing it to function. While there are cycles and loops, landscape ecology has a clear process and pattern. In feminist theory, the interactions show us the result of the system or image of the string figure. The string figure makes these interactions visible, but the interactions themselves are complex and dependent on other interactions or elements. Feminist function becomes an unknown realm, rooted in care for all elements of the system (Allison, 2017). In IK, the function represents the connection and relationship between elements and the creation of a mutualist community from the interactions. The function manifests both in the system as seen at work and in the community working together to acknowledge the roles everyone plays in the system. A medicine wheel represents the Indigenous business model that has "more variables and no fixed variable end points or expected outcomes" (Marchand et al., 2020). The medicine wheel is compared to the appearance and function of a spiderweb (see Figure 1.2). The spiderweb applies to the environmental system with no expected

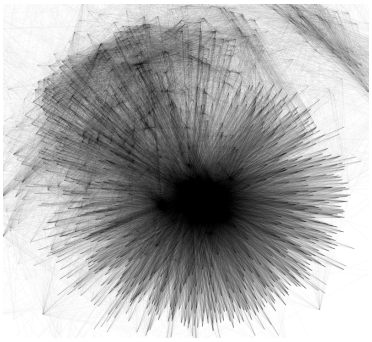
outcomes from elements and a holistic framework that puts more-than-human elements above human elements (Marchand et al., 2020).

In the construct of these functions, purpose or intent is embedded in the elements and interactions. Landscape ecology focuses on more-than-human elements; specifically in the North American approach, the health of the more-than-human elements is the only target when considering ecosystems (Wu & Hobbs, 2007). Feminist theory inherently includes the intention of care (Allison, 2017); more specifically, people demonstrate care towards more-than-human elements. Lastly, IK aims for a mutualistic community that includes a motive to support more-than-human elements (Marchand et al., 2020). As with feminist theory, IK also exhibits an intention of care when considering holistic systems.

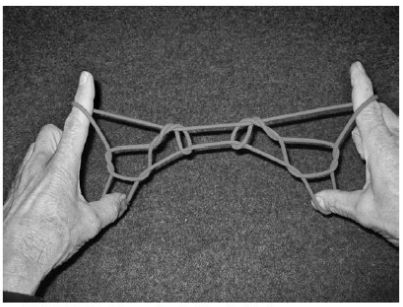
These systems can function as stable, unstable, or critical transitions or as alternative stable states (Scheffer, 2009a). Systems begin in a healthy state, but when interactions within the system change, the system transitions. The shift can be external and quite visible in changing the system function, or it can be internally focused and adapt its capacity to handle some changes within a system. This is where resilient systems allow a change to be reconciled and adapted within the existing function. It is critical to understand system boundaries and relationships to have a system that can adapt internally creating resilience and sustainability. When a modification is too much for one system to hold, the transition can create a paradigm or regime shift (Scheffer, 2009a). These critical transitions create critical points that will lead us to new understandings, states, and perspectives on the system.

Figure 1.2

Depicting a system: landscape ecology (l), feminist theory (m), Indigenous knowledge (r)

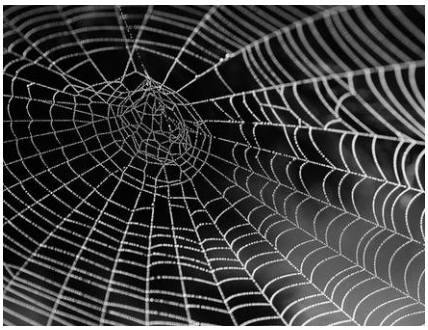


Muir web from the Mannahatta project (Harrison & Sanderson, n.d.)



1.2. *Ma'ii Ats'áá' Yilwoí* (Coyotes Running Opposite Ways). Photograph by Donna Haraway.

Coyote String Figure (Haraway, 2016)



Spider web depicting an Indigenous Business Model (Marchand et al, 2020)

System-based thinking is also rooted in complexity that grows in scales and time. As more layers are discovered, the function of a system becomes increasingly more complex. Complexity theory focuses on the base of these systems being nonlinear with multiple feedback loops and causalities making each site unique. An increasing amount of information also leads to extraordinarily complex systems. These nonlinear systems are "coherently organized around some purpose" (Lewontin & Levins, 2007). Multiple systems overlap and interrelate as the purpose for each system changes. When a system functions

holistically and benefits all, they are considered healthy and on a long-term stable trajectory. However, such a view does not consider disturbances that change ecosystem function and trajectories since a stable system is possible only without disturbance, which is anomalous for ecosystems (Vogt et al., 1997).[3]

Complexity theory operates on the premise that each situation or study site is unique and contextually dependent, noting that multiple, distinct factors influence each study site. Each element within a system interacts uniquely with others. Within each system, "diverse components, nonlinear interactions, scale multiplicity, and spatial heterogeneity" differentiate systems that appear similar (Wu & David, 2002). Indigenous knowledge reminds us that by separating culture from the problem, science, or research, the knowledge is decontextualized and not viewed holistically (Marchand et al., 2020). With nonlinearity, limitless interactions and context of the system, the comparison between systems and perspective of each system are distinct. Each system can provide possibilities for a system function but does not supply a direct application from one system to another because the context differs. Therefore, in research, measuring the changes within the variables of a system provides an understanding of how a system has grown, evolved, and transitioned to new states.

System-based Design

As the knowledge of systems-based thinking grows and becomes increasingly familiar in Western design, it becomes more imperative to include it in design practice. To design with systems-based thinking is to consider that the designer is setting up a framework with elements that anticipate or encourage interactions to help a full system function. As the designer, one is not designing elements within a space. Instead, design occurs as interactions and system functions change because of new elements within a system. The system operates and thrives based on the interactions between humans and humans, humans and more-than-humans, and more-than-humans and more-than-humans. Therefore, fostering and nurturing those relationships is critical in design; the design elements alone will not help a system function.

The diverse theoretical foundations of systems-based thinking frames applied planning and design approaches distinctly, partly based on the scalar emphasis of the originating discipline. Ecological design or planning is generally understood as the application of the principles of landscape ecology at the site scale, focusing on site-based and contextual processes and functions to improve existing conditions (Rottle & Yocom, 2010). On the other hand, ecological planning concentrates on how these processes impact site conditions across spatial scales, from the region or watershed to the site (Krosby et al., 2015). Feminist design is generally less site based and systems focused, drawing on periods of significant change to the site or region (Jacobs, 2020). Indigenous planning centers on mutual relationship building

[3] It is important to note that systems-based thinking is still a construct of human comprehension. Humans are innately defining and organizing systems where humans are a component. That said, humans do not have to be the center of the organizing elements, although they often still are. More-than-human elements have the potential to play a critical role in the system.

and fundamentally works with Indigenous principles to find a way for the larger community to flourish (Whyte et al., 2018).

Systems-based design can create an environment with mutual respect and promote understanding between elements with goals to benefit beyond human gain. Additionally, it has an inclusive and relational focus. Multiple narratives, human and more-than-human, can be understood and conveyed through systems-based design. This approach creates the ability to cross scales and timeframes linking systems and defining larger, more complex environments.

This research considers how systems-based design is depicted and facilitated in landscapes with storytelling through design, ecorevelatory design, and community engagement. Western design and understanding of the environment often has been rooted in making places better for humans (Nash, 1990). Systems-based design encourages the recognition of more-than-human elements in the system and articulates the need to engage in design practices with each element in mind, not solely the human perspective. Storytelling through design and ecorevelatory design can emphasize the land's narrative elements and more-than-human elements and interactions, while community engagement enhances interactions within a system, which if the designer responds, may alter system functions.

Storytelling Through Design. The shifting relationships within the ecosystem heavily influence the landscape's change over time. The landscape "(becomes) the story to be read" from the narratives told by humans about the land, human experiences, and more-than-human elements (Heatherington, 2011). Storytelling through the design process can maintain prior narratives of the landscape while relating past and new narratives (Heatherington, 2011; Potteiger & Purinton, 1998). Through art (Anholt & Mavor, 2013; Hood & TED Talks, 2018) or relics and materials (Heatherington, 2011), these sites can remind site users of past, present, and potential future stories.

An approach of storytelling through design examines how site elements can be understood in a landscape to interact with human elements and can help to alter our perspectives of the landscape. This approach attends to these emerging narratives and seeks to establish new interactions between the elements of the system. Storytelling through design allows past, present, and future narratives to be articulated and comprehended. It showcases an element of time and history of land that is critical to gaining a holistic perspective on the landscape. Narratives from holistic storytelling and Native culture reveal relationships between elements and past land communities (Jojola, 2013; Marchand et al., 2020). The systems and processes are not singular circumstances, but rather carry a fourth dimension, time, through which narratives are structured and conveyed. Indigenous culture has demonstrated that passing knowledge from generation to generation allows knowledge and understanding to build on itself and better influence future decisions (Jojola, 2013). With this tradition, "the knowledge of the past informs the present and, together, it builds a vision towards the future" (Jojola, 2013).

Furthermore, it is vital to consider the storytelling from more-than-human or underserved human element places. Feminist approaches tend to emphasize marginalized and underserved communities to the forefront of the design goals (Hesse-Biber, 2017). These often differ goals from those of traditional designers. A feminist approach encourages people to begin to recognize other systems in the

environment. Even if it visualizes mistreatment or negative relationships in the landscape (Jacobs, 2020), it brings the full system to the foreground of the design intention.

Storytelling through design allows multiple narratives to emerge from the design. With a focus on multiple elements and relationships, the ability to see many perspectives and relationships within the design is encouraging. One way narratives and perspectives are communicated in Native culture is through storytelling. Such telling allows for the unveiling of "invisible culture" to be shared with others (Marchand et al., 2020). Holistic storytelling creates a nonlinear approach that contributes new and varying perspectives to the story and highlights relationships with the system (Marchand et al., 2020). Systems-based design and storytelling through design acknowledges and accounts for this multiplicity of narratives and stories in the design process. In Native cultures, stories are often told in oral traditions and passed from generation to generation. Holistic stories share multiple perspectives, including more-than-human actors for people to hear and understand (Kimmerer, 2013a). In many Indigenous cultures, holistic stories are the foundation for understanding how the ecosystem functions and for future decision-making about the landscape (Kimmerer, 2013a; Marchand et al., 2020).

Ecorevelatory Design. British landscape designer Catherine Heatherington asks, "who is writing the text and who is establishing meaning (2011)?" In Western culture, stories are not as commonly told from holistic perspectives as in Indigenous culture (Kimmerer, 2013c). Site users, those who are reading the landscape, could primarily be humans, but more-than-humans could likewise be reading the landscape, perhaps in a very different way when seeking habitat or nourishment. Ecorevelatory design strategies offer the opportunity to utilize design practices to articulate and amplify the site for multiple user types.

Ecorevelatory design was first articulated in the 1990s as a way to reveal more-than-human systems and make them more visible in the landscape design (Wenk & Gregg, 1998). Early ecorevelatory work focused on stormwater and promoted green stormwater infrastructure. It was a design approach framed with "the capacity to make the invisible visible" and bring greater awareness to site users about the complexity of interactions and meaning on a given site (Helphand & Melnick, 1998a). It amplifies the more-than-human elements and interactions within a system and reveals the interactions between humans and more-than-humans. Ecorevelatory design emerged from the larger conversations of the time related to ecological design practices rooted in landscape ecology and more-than-human elements while integrating cultural elements that altered system functions and revealed new interactions (Arisoy, 2013). Ecorevelatory design is a further refinement of the approach developed by Ian McHarg, whose work considered regional ecological systems in individual and communal forms as a basis for design (McHarg, 1967, 1969). Ecorevelatory design and McHarg's Design with Nature are both rooted in ecology, systems, layers, interactions, and more-than-human elements; they strive to put more-than-humans at the forefront of the design process and consider the impact humans have on more-than-human systems (McHarg, 1969).

Since its early emergence in ecological design practices, ecorevelatory design has been criticized for expecting too much understanding by the site users and that there are insufficient cues to identify sustainable landscapes and ways to connect with ecological education (Arisoy, 2013; Eisenstein, 2001). These criticisms were furthered with the perceived understanding that design alone does not have the capacity to alter people's perspectives and understandings, and more specifically articulation and

education is necessary to fully understand design intentions on a site (Eisenstein, 2001). If we consider design as a change of the elements and interactions within a place, human relationships and education are critical to design and the changing of landscapes. The European approach to landscape ecology reminds us that humans are a part of the design. So when we consider ecorevelatory design or ecological design, we must consider humans and more-than-human elements, interactions, and relationships to comprehend a holistic understanding of the landscape (Hobbs & Wu, 2007).

Through a storytelling lens, ecorevelatory design can be viewed in another way. Early ecorevelatory strategies with a human literacy component included Joan Nassauer's "cues to care" (Nassauer, 1995). Nassauer later reflected that cues to care are not enough; we need to extend the theory and education to move beyond the aesthetics to foreground ecological knowledge and literacy in landscape design, creating change in the system (Li & Nassauer, 2020). As ecorevelatory design expresses ecological integrity and importance, it also looks to historical reliability. Ecorevelatory design is a form of restoration and repair to more-than-human elements of a system. In ecological restoration, examining how people live respectfully with the land is critical, and human ideals are not the center of the design (Higgs, 2003). In this case, the designer tells a story about how ecosystems can function respectfully, encouraging new holistic insights, and creating new ways for humans to interact with more-than-human species. Storytelling often focuses on a human-centric lens through which to explain the landscape to people (Donly, 2017). In doing so, it is crucial for landscape architects, designers, and allied professionals to consider how storytelling can increase human connections and their understanding of the system. Furthermore, ecorevelatory design can promote community engagement in ways that further change the ecosystem.

Community Engagement. The Centers for Disease Control and Prevention (CDC) has defined community engagement as "the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people" (Centers for Disease Control and Prevention, 2011). The CDC defines community in terms of systems and social, virtual, and individual perspectives. When considering a community in terms of systems, the goal is for people to come together to consider the problem "in relation to the whole organism" and to understand the sector collaboration necessary for a healthy system (Centers for Disease Control and Prevention, 2011). Social perspectives seek to find behaviors and patterns that link people together and form a greater depth of community (Centers for Disease Control and Prevention, 2011). In design, community engagement facilitates a project to bring together people with different backgrounds, knowledge, and ideas to determine strategies for a future design intervention. When people are collaborating during design, construction, research, and outreach, the process allows for equity and environmental justice to lead the design intervention (Andrews, Mocorro Powell, Rottle, & Engelke, 2022).

When considering community engagement and its impact on a larger community, systems-based thinking will expand the relationships from human-to-human and include human-to-more-than-human. While landscape systems often include human and more-than-human interactions, they do not include considering a holistic relationship. The interactions in much of the design center on how they can benefit the human elements of the system. This research investigates how community engagement can

advance care and repair damaged relationships between human and more-than-human species in a system. Within an inclusive approach to design, relationships between elements become essential. Indigenous planning has long focused on relationships that benefit the entire system (Whyte et al., 2018). In many Indigenous planning practices, design principles focus on developing relationships, trust, and respect. These approaches are based on experiences with the land and understanding the relationships fostered with people in those settings. The intent is not to define specific design techniques or elements for a given site but to engage in approaches that actively listen to the land, to live in community, and then to respond. The approach is grounded relationship building and collective interpretation, not system element modifications. Systems-based design aims to be inclusive and can pair with Indigenous planning, particularly in terms of how to have relationships be the focal point in the community and not a specific function or performance.[4]

Prior knowledge informs current and future practices of community engagement and relationship building. Community engagement is often incorporated with storytelling through design and ecorevelatory design as ways to identify interactions and relationships and how they have changed within the system. Responding to Eisenstein's (2001) criticism of ecorevelatory design, the system and function cannot change without a modification in interactions and human relationships to other elements in the system. If we consider design as the change in interactions and function of a landscape, human engagement within the process is crucial in changing the system's relationships. Restoration ecologist Eric Higgs explains this crucial process in terms of *focal restoration*, where "community engagement and local culture" may change the system elements (Higgs, 2003). He further elaborates that humans connect with more-than-human elements and the system more effectively "when they get their hands dirty, literally, and the lessons learned hold fast" (Higgs, 2003).

Within these complex relationships and system dynamics, humans inherently try to "control" how interactions occur, thus the outcome. Even when we want to create "wildness" in design, we desire a specific aesthetic. Higgs reminds us that wildness cannot be predicted and that "one must engage in reciprocal relationships, giving as much as one takes, listening as much as talking" (Higgs, 2003). Indigenous culture reminds us of this reciprocal relationship between plants in the three sisters' plantings[5] (Kimmerer, 2013c, 2013b). In systems-based thinking, we can try to provide a framework for interactions and encourage relationships, but we cannot control that process. One must pause and listen to be part of this relationship. The time required to understand system relationships is not built into a typical Western design approach, since it does not frequently include advocacy for the land community and its relationship culture.

The relationships also remind us that system flow and interactions are deeply based in culture and societal relations. Until a holistic societal understanding of systems is fully comprehended in Western

[4] In order to have Indigenous planning, Indigenous people must be leading the conversation (Matunga, 2013). I am suggesting that we learn from Indigenous culture by creating a better community relationship with Indigenous peoples and not repeating colonialism.

[5] The three sisters of corn, beans, and squash are planted together in Indigenous cultures to mutually support the growth of all the species. Corn grows quickly and supplies support for the bean to grow up. The squash stays low to the ground and creates protection against "nibbling caterpillars" (Kimmerer, 2013b).

design approaches, system elements and interactions will be influenced through a humancentric lens. Human interventions will still be made for human benefit without regard for the larger land community. Native culture has long known how a holistic vision is needed with mutualistic relationships to strive for a healthier land community. IK asserts that one takes only what is necessary and returns to the land as much as possible (Kimmerer, 2013b). In general, Western cultures have become decontextualized from the whole system, thus separating cultural norms from land elements and concealing human impacts. Therefore, learning to design with culture and community engagement is critical to understanding how to repair systems' processes and functions.

Shifting From a Human-centric to a Holistic Land Community

When we consider system-based design with the elements of storytelling through design, ecorevelatory design, and community engagement, it is critical to remember the complexity of this system(s) and the roles that system states and scales play in this landscape.

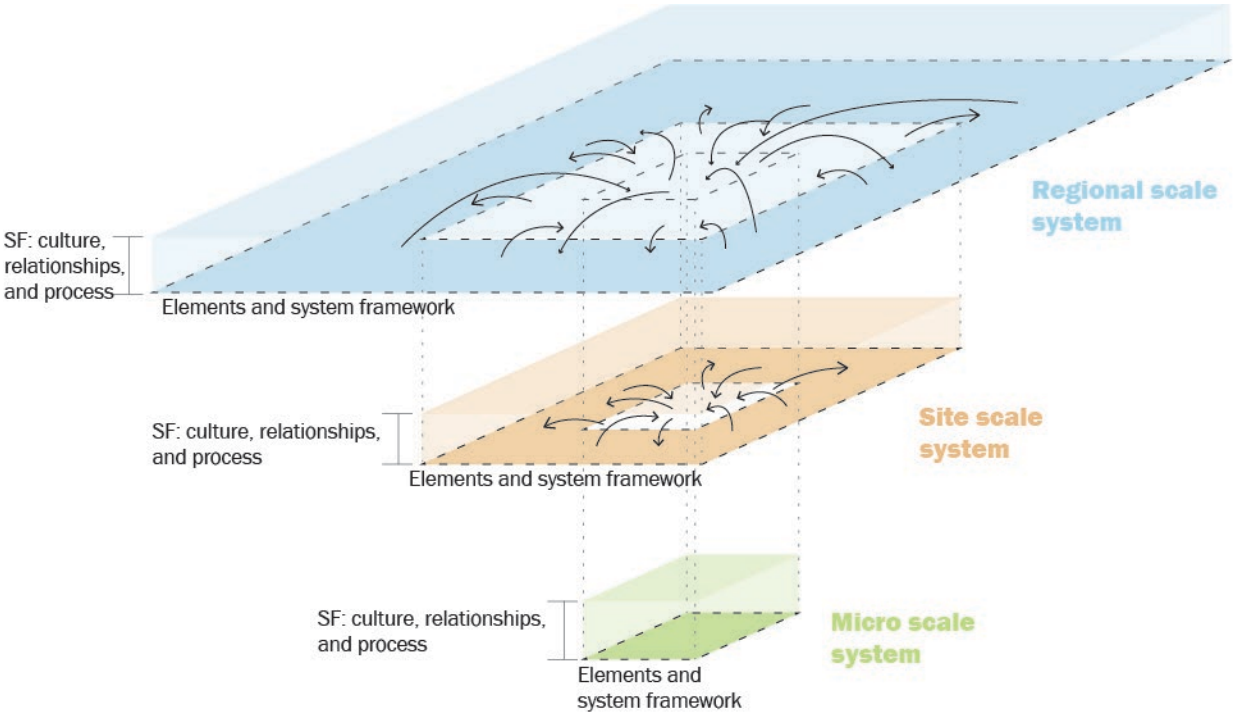
System-based thinking is often used to promote resilience theory. Resilience occurs as systems transition between states, where the current system reaches a safe operating space in which it can respond to and recover from disturbances (Scheffer, 2009a). While resilience within a system is important, resilience planning sometimes disregards or removes elements. The feedback loops for resiliency are focused on keeping systems as close to the current safe operating space as possible to continue obtaining benefits of infrastructure, not enabling the cultural influence on the system to change. Most Indigenous cultures tell stories that include relationships between system elements at the local and landscape scales that give a community the knowledge to maintain a system at its most functional state, even despite disturbances (Marchand et al., 2020). Storytelling and ecorevelatory design expose the cracks in the system, but also help systems to be resilient due to generations of land narratives and accumulated knowledge of more-than-human elements. The Indigenous approach forming knowledge of a system does not produce a specific solution for a problem but a process to form knowledge of the system elements (Marchand et al., 2020). Design strategies and community engagement are intended to benefit the human analysis of the system and to provide feedback to site users, as with many Indigenous practices, allowing them to understand how to repair a system's function. The feedback loops in systems-based thinking have culture so closely embedded that it is hard to infiltrate a new cultural norm. A critical transition in the cultural norm is needed to create a paradigm shift from a human-centric view to a more holistic land community.

The mutualistic relationships described between various elements are critical in the systems-based theory. The interactions extend beyond the arbitrary boundaries of the site and scale. Systems-based thinking considers a microscale of elements in the soil or micro detail, a site-scale application to change site elements, a regional influence of the site's impact on the surrounding environment, and a global effect of climate change and human impact of more-than-human elements (see Figure 1.3). Every scale has an SF (e.g., string figure) realm (Haraway, 2016) that considers culture, relationships, and process. Each scale and system have fuzzy boundaries that overlap and intermix. Therefore, the cultural and social influences found at each system are critical in having a functioning system at each scale and are intertwined when the diagram is combined. This interconnection creates system complexity that is unique to each land.

The land incorporates layers from all these scales that blend and intermix to create complex systems. Landscape design has influences from larger (regional) or smaller (micro) scales that impact how elements and relationships function at the site scale (Kahn & Burns, 2021). A site has human-defined boundaries, while the landscape or landscape design stretches beyond those boundaries and considers the complexity of the system layers. Kahn and Burns (2021) define a site as "the ground chosen for something" and as "the location of some set of activities or practices." In Figure 1.3, the landscape is considered the full model, with arrows flowing between scales; the site is defined from the black-dashed line that gives a boundary to the mass.

Figure 1.3

Intersections of scale systems



Cultural and social relationships are vital in understanding these interactions. Therefore, in the design process, to understand elemental interactions on the site, a design team must learn to recognize the cultural influences and priorities that cause those interactions. Interactions on a site will neither change nor have a significant impact without altering the cultural connection between elements.

Another factor critical to using systems-based design between scales is recognizing marginalized or underrepresented voices in each system and determining how the other systems can assist these groups of humans or other species to advance a more holistic approach to the design process. The design process can be used to elevate these voices. At times, when looking at one scale, a design team does not realize that people or species are marginalized, but when comparing that site to a larger regional scale, it becomes crucial to amplify that voice as a stronger element of the system. For example, a site could

be designed to include native habitat for birds. The larger migration and fly-through zone is not seen unless a design team looks at the regional scale and considers the lack of habitat in the surrounding area. Therefore, a systems-based design approach would emphasize the need for bird habitat to assist the more-than-human element in the system.

By recognizing the cultural impacts and scalar influences, a design team can begin to consider larger holistic system changes. A holistic perspective is better understood by designing with a larger system including marginalized, underrepresented, and more-than-human voices in the conversation. If designing with a holistic design community is possible, we can begin to have stronger relationships and interactions between elements in the system and strive towards a system with mutual benefit for human and more-than-human elements.

Conclusion

Systems-based thinking and the proposed framework for design have strong intellectual roots in landscape ecology, feminist theory, and Indigenous knowledge. Human and more-than-human elements are structured in the system as a framework to promote interaction. The interactions and relationships between these elements create and maintain system functions and process that cycles that operate collectively and are recognized as heavily influenced by cultural perspectives and societal relationships. The twists, turns, knots, and entanglements within the systems create complexity. Within this complexity is the potential to unravel and highlight multiple narratives and voices that emerge as critical to supporting the health and resiliency of the overall system. Storytelling through design, ecorevelatory design, and community engagement are intentional strategies that offer the opportunity to alter system dynamics to articulate a more holistic understanding of the landscape. Ultimately, systems-based thinking and design focuses on identifying a holistic design approach that attempts to navigate system processes to support the visibility of all elements in the system. Systems-based design is less about creating a site of elements and more about defining a framework that can foster mutual relationships between elements, systems, scales, and timeframes.

Chapter 2

Landscape Biography Methods: Understanding the Holistic Landscape Through Landscape Literacy, Ecological Literacy, and Place Attachment

Holistic approaches to design and systems-based thinking represent a paradigm shift that considers more-than-human and marginalized or underserved elements in the landscape. To understand how we reach a holistic system approach to the design of sites and landscape, we must first examine current practices in design and contemporary human perceptions and understandings of landscape narratives. This research considers three case study locations that have implemented the components of storytelling through design, ecorevelatory design, and community engagement to build strong and holistic communities in each location. The research seeks to address the question, ***How can landscape design reveal narratives to tell stories about the land, enhance ecological literacy, and form greater place attachment to all elements with the ecosystem?*** Through post occupancy evaluations, this work demonstrates ***a research approach that considers the impact of these design goals*** and examines these sites utilizing ***holistic strategies that prioritize more-than-human and underserved voices of the land.***

The landscape includes narratives that reflect the site's past and present systems (Heatherington, 2011). Each narrative reveals a point of view within a series of events. In a landscape, each element has a distinct narrative – sometimes complementary, sometimes competing, sometimes formal, sometimes informal. The narratives build and coalesce to create a story of a site. The story consists of varying points of view and includes descriptions with less order or structure. Indigenous culture often considers holistic storytelling that intentionally engages opposing narratives or underrepresented and more-than-human experiences (Marchand et al., 2020). In each site examined during this project, the historic and contemporary narratives articulated through the design tell a larger story about the site for a site user to interpret and understand.

The research explores the case study locations through a landscape biography methodology that recognizes historic narratives and interactions within the system. It examines the current design through the lens of landscape literacy, ecological literacy, and place attachment to further comprehend how the system currently functions. More specifically, they explore how human elements understand and interact with more-than-human elements and narratives. The methodology of landscape biography is used to investigate a larger story with diverse narratives to understand the complexity of the site. The multiple narratives come from historical images that illustrate what elements exist at any given site, historical documentation in book and video format from people who have been there (both Western and Indigenous peoples), and semi-structured interviews with people recently involved in decision making regarding the latest design intervention. By combining these varied backgrounds, a holistic understanding of the site emerges in the landscape biography, producing a view considering both human and more-than-human elements in the system. In addition, site visits, semi-structured interviews with stewards, intercept surveys, and site observations delve further into the current design strategy.

Landscape Biography

A biography is often defined as the telling of story about a person. Research about that person is compiled and then relayed through another person's perspectives. Typically, it starts at one point in time and reflects on the change that has occurred in their life up to another point in time. However, Jan Kolen (1995) describes how if one expands the subject beyond a specific person, one can start to create

a “cultural biography.” Kolen defines a “cultural biography” as the history of goods within society that change meaning and form to fit people’s attitudes (Kolen, 1995). Marwyn Samuels first transferred the biography language to a landscape to explain that humans cannot separate themselves from the land in understanding histories today (Samuels, 1979). Kolen, Hans Renes, and Koos Bosma (2017) have furthered the conversation, defining how landscape biography has become a method of landscape research.

A landscape biography explores the change in a landscape from past to present to future (Kolen et al., 2017). This entails focusing on two points in time or a specific period and how the system’s functions change from one point to another, articulating how human action or inaction has altered interactions and modified the functions of the system. Kolen and colleagues incorporate the complexity of culture, social, and economic factors that have caused changes in the interactions and resulted in new landscape functions (Kolen et al., 2017). This approach foregrounds human perception of the landscape and explains why there were changes to the physical landscape and system interactions. The culture, social, and economic components are discerned from a human perspective, making humans the primary “author” of the landscape biography. The author is ultimately the storyteller of the landscape. Applying this approach to research and design, the designer or design team becomes the storyteller.

For storytellers of a landscape biography, it is imperative to create a holistic story and convey multiple narratives within the biography to the best of their knowledge and ability. The telling of holistic stories is common practice in Indigenous cultures through oral narratives (Marchand et al., 2020), but it has often been lost in Western culture, which focuses on linear stories. Since the landscape is not strictly composed of human elements and has layered more-than-human elements within the system, hearing multiple sides of the story helps us to make informed decisions for a larger, more diverse system in the future. It begins to frame and prioritize design goals and objectives to support system function more holistically.

A holistic story allows many elements within the system to have a voice and narrative in the story. Urban residents offer firsthand knowledge and local community culture to the system, while ecological science brings the background from a natural systems perspective. The local community culture often is a keystone indicator in understanding why certain system interactions occur. Those interactions can be understood only by people who know the site intimately and spend time in the space. In the holistic Native cultures, local community members listen to and observe how elements interact in the system and learn from those elements (Kimmerer, 2013c). Ecological science has a strong history of research examining the patterns and processes of specific elements found in the landscape (Kimmerer, 2013c). When utilizing a landscape biography research methodology, a systems-based design approach can be beneficial to connect the local community perspective and the ecological science knowledge into the research and design. Robin Wall Kimmerer (2013) refers to the analogy of two vessels on a river floating side by side to describe the Indigenous versus the Western science lens. In this research, the landscape biography method melds ecological science and local knowledge, recognizing that both provide valuable knowledge to the site and are needed to convey a holistic story.

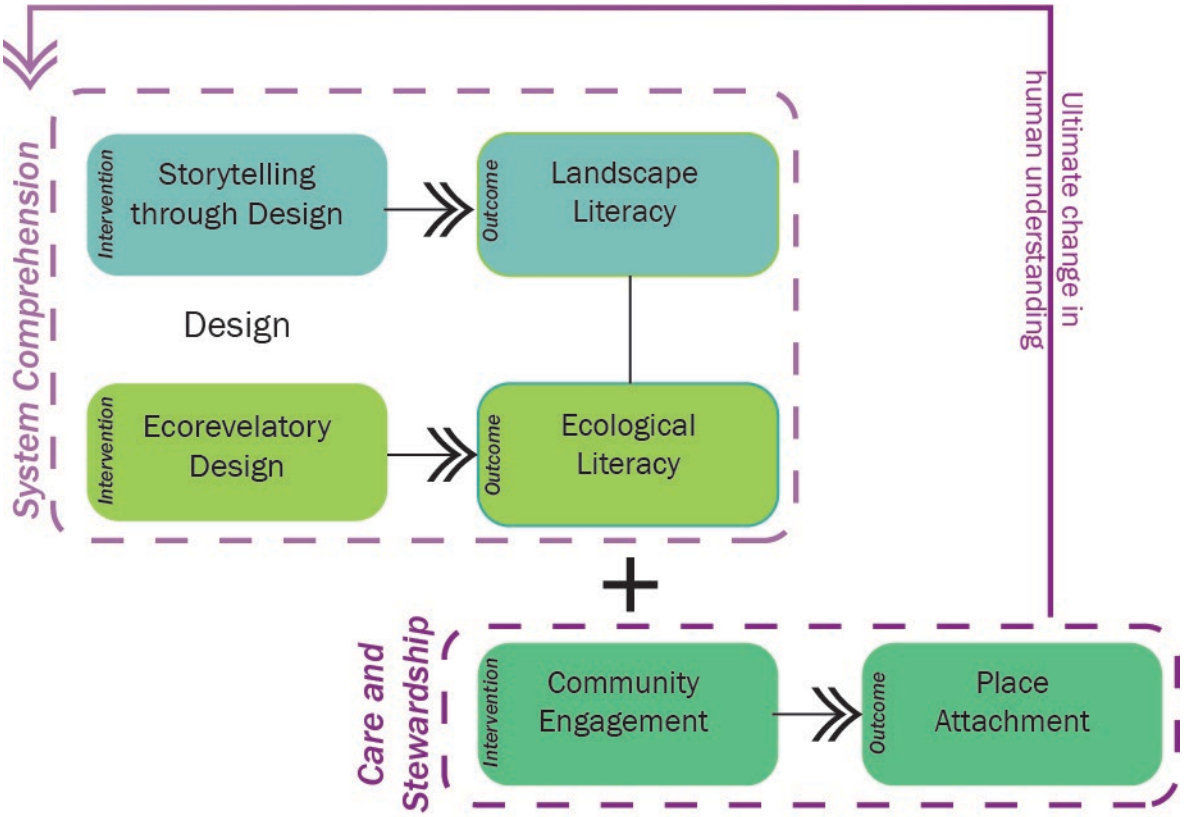
Landscape biography creates a research approach directly related to evidence-based themes and narratives found today in the design. In mapping systems through landscape biography, we can identify elements, or “materials” as Samuels (1979) refers to them, as well as see gaps in the narrative. Those missing pieces or connections prompt the formation of “idealistic” goals to improve a holistic system,

specifically aiming to benefit more-than-human elements in the system. The biography fosters an understanding of the system through its interactions, system flows, and cultural components.

Landscape biography also considers the historical narratives of the system while recognizing the current design. It identifies how the design themes – storytelling through design, ecorevelatory design, and community engagement – demonstrate the interactions and relationships between human and more-than-human elements of the landscape. The success of these design themes is measured through landscape literacy, ecological literacy, and place attachment, which support the examination of the human and more-than-human interactions, understandings, and relationships in the land (see Figure 2.1).

Figure 2.1

Understanding the research interventions and outcomes being studied in the landscape



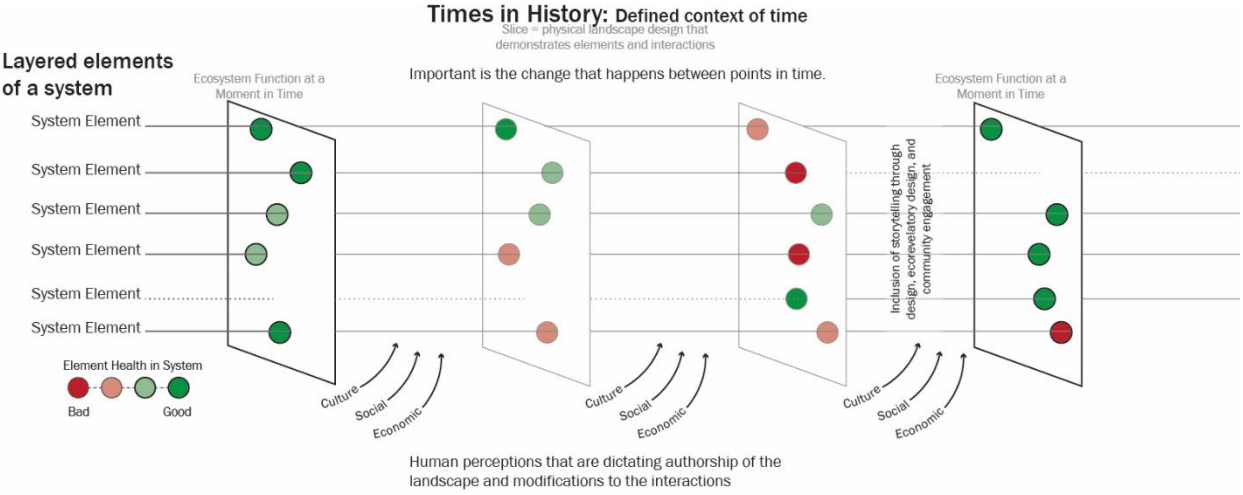
Historical Systems. Within landscape biography, changes in the system occur over time. When trying to understand what causes these changes and their effects on the system, we can learn from medical disciplines that have long looked for system errors to prevent mistakes from being made. James Reason uses the analogy of Swiss cheese to describe human error in a system (Reason, 1990, 2000): A system has holes that allow elements to continue through it until they reach a point where the cheese hole

closes. The “mouse” comes into the block of cheese and begins to eat away to create more holes in the block that make the error potential in the system larger; in this instance, the mouse is human culture.

When applying this strategy to the land, a cheese slice represents a landscape at a moment in time. Systems-based thinking and design have shown systems to be composed of elements and interactions that create function and system flows. The elements in the ecosystem are the components trying to continue through the system. Their journeys in the system can lengthen or shorten while promoting some elements and suppressing other elements (see Figure 2.2). These interactions are incredibly complex and not accurately understood in consideration of just one hole.

Figure 2.2

Diagram of landscape biographies within systems-based thinking



Tying Reason’s description of human error (Reason, 1990) to the methodology of landscape biography, the addition of cultural, social, and economic factors represent the “mouse” in the system and explains why changes in the system are considered to be caused by “errors.” The “errors” define what interactions are occurring in the system and why changes in the landscape elements, interactions, and relationships occur. Despite the connotation of the word “error,” perceptions of culture, society relationships, and economic impacts are not necessarily negative. They can include the reintroduction of elements into the ecosystem, representing positive interventions. Ultimately, the impact of these perceptions will differ based on the authorship of the narrative.

In this research, to begin to understand system changes over time, a storyteller needs to highlight the past and recent narratives of the site. The system elements include the components seen in ecological science systems and traditional landscape analysis, such as soils, geomorphology, vegetation surveys, land use, infrastructure mapping, solar analysis, and hydrology. In addition, elements include the people, communities, and local knowledge intertwined in each site. Therefore, discovering place-based narratives, oral histories, local memories, maps/prints/images, and perceptions of sound/smell/light help to create these perspectives and cultures (Kolen et al., 2017). They give insight into the interactions, connections, and relationships between elements that are lost in traditional analyses.

The last component in understanding landscape biography is the engagement of the current landscape. These interventions have had different outcomes of landscape literacy, ecological literacy, and place

attachment, yielding a new understanding of how elements relate to one another, interact, and view the holistic system.

Landscape Literacy. The landscape is a "story to be read" that exposes human and more-than-human narratives through design (Heatherington, 2011). Whereas a book uses words to form literacy, landscape literacy is a cultural practice through which to better understand and address injustices (Spirn, 2014b). Storytelling through design is a strategy to discover those narratives and create more visual opportunities for literacy (Heatherington, 2011; Potteiger & Purinton, 1998).

Landscape literacy is one strategy to measure people–place connections, social injustices, and element relationships in systems. Ann Whiston Spirn demonstrated this strategy in her work at Mill Creek in West Philadelphia (Spirn, 2014b) with a project to assist low-income residents and public officials in understanding floodplain boundaries and the health and safety metrics of development. The biggest concern was that people did not comprehend where stormwater came from, where it went to, and why flooding occurred. Low-income households in this neighborhood often just knew that stormwater caused major damage (Spirn, 2014b, 2019).

Landscape literacy is measured to determine what people understand about the landscape where they live, both from a past and from a present perspective. Spirn describes the language of landscape as a "native language," a "habitat of mind," and a "dynamic connection between place and those who dwell there" (Spirn, 1998a). We are a part of that landscape and "not the sole authors of landscape" (Spirn, 1998a).

Indicators of landscape literacy will help to signify the elements human recognize in the landscape. By asking people "What is the site's history and what helped you know this?" we can determine whether people link the landscape narratives of the past to those that remain recognizable today. Furthermore, it underscores the extent to which the landscape is being read or people are obtaining this history and these narratives from other sources. Site users were also asked, "Is there a certain art or landscape elements that helped you better understand the landscape or ecosystem (past or present)?" The answers again disclosed whether there were specific elements of the landscape and design critical in connecting people to the landscape. The responses also demonstrated whether people focused on human or more-than-human elements, indicating the role humans play in the landscape to each site user. A final indicator determined how people use the space and whether they stop to read the landscape and to better understand the space around them.

Ecological Literacy. Ecological literacy promotes an understanding of systems and land for humans. It places humans within the system and allows users to begin to understand their role or influence on the more-than-human function of the system. David Orr (1992) coined the term "ecological literacy" to define the results of environmental education, the feeling of exploration in the environment, and the desire to learn more. He uses a "sense of wonder" as a feeling people get while exploring and learning about the environment (Orr, 1992). The experiential learning elements of ecological literacy shift human knowledge and understanding from a human-dominant to a more-than-human-dominant perspective (Boehnert, 2012). Today, the human-dominant system controls the story of how to repair the links between a natural landscape and a built environment. This approach is not conducive to holistically assessing a system. Jody Boehnert has described how a narrative formed predominantly from the human-dominant system results in behavioral responses not conducive to adopting a holistic view of the landscape. Boehnert (2012) describes these as the "six Modernist D's (disembodied, disembedded,

disengaged, disconnected, decontextualized and in denial)." Ecological literacy is possible when people wonder, connect, engage, contextualize, and recognize more-than-human elements in the system and more-than-human interactions or subsystems within the larger ecosystem.

In Western culture, there has been a disconnect between humans and more-than-human system elements. There is no acknowledgement of mutual interactions and relationships between diverse elements that result in a functional system resilient to disturbances (Higgs, 2003; Vogt et al., 1997). In contrast, mutual relationships are prominent in Indigenous culture and shared through environmental storytelling (Marchand et al., 2020). Ecological literacy and a holistic understanding of systems are evidence in environmental storytelling. Therefore, Western culture must integrate ecological literacy to recognize a holistic system and its more-than-human elements.

The measures and indicators of ecological literacy focus on how people define the system and whether they recognize more-than-human elements and the role of those elements in the system. In this study, site users were asked, "In this park, what defines a healthy ecosystem?" This question helps reveal whether people recognize more-than-human elements in the system, whether they focused mainly on human elements and did not see a holistic system, and how they relate to the land. Additionally, site users were queried, "How would you explain the sustainable features of the park to your friends?" to examine whether people could articulate how the system functioned and what positive interactions and relationships occurred between system elements. A final indicator of ecological literacy was observing how humans interacted with and sought out more-than-human elements of the site.

Place Attachment. Placemaking is rooted in people's connection with the holistic systems, leading to place attachment and healthier interactions between human and more-than-human elements. The interaction between elements can create a connection to place for humans. The sense of place comes from the knowledge people gain from human relationships with other elements; that knowledge forms a place identity people relate to the landscape. Place identity is among the components that lead to place attachment (Manzo & Devine-Wright, 2012). Place also refers to the "safe and familiar" feeling and personal relationship people have in an environment (Tuan, 2013). In typical place attachment theories, the feelings acknowledged by humans reflect safety, security, fear, peace, and health for people. Through the base of landscape and ecological literacy, place attachment could come from environmental education, sense of wonder, and exploration of the place. The sense of place also comes from being local and a part of the system flow (Carpenter, 2013) as well as the memories associated with a place (Cooper Marcus, 1992a). The better people can identify how they relate to a place, the greater their connection and the stronger the place attachment and relationships between elements.

In understanding place, people can find peace, restoration, responsibility, and relationship to something larger than humans (Orr, 1989). The relationship with place should be mutually beneficial between human and more-than-human elements while pushing humans to care for the more-than-human elements. The understanding of place also grounds proenvironmental behavior. Proenvironmental thinking seeks to consider more-than-human elements and relationships in the system while minimizing human impact that harms more-than-human elements (Kollmuss & Agyeman, 2002). There is a connection between a sense of place and an environmental ethic (Senda-Cook & Endres, 2013). Environmental ethics, like ecofeminist ethics, derive from care and maintain more-than-human

elements within the system.[6] One form of place attachment through a feminist lens is the application of a care ethic to the place (Noddings, 2012). Proenvironmental behavior is one way to show care for the system relationships and more-than-human elements in the system. The relationship between human and more-than-human elements necessitates understanding care and finding mutualistic benefits in the relationships.

Community engagement and examples of care that humans have shown in the system demonstrate place attachment in the landscape. By asking site users, "What memories will you take from this place?" the responses will reveal whether people connect to human or more-than-human elements in the system. Furthermore, inquiring whether site users learned something about the system and now think differently about the landscape demonstrates whether people are discovering system elements and relationships from the land around them.[7] People need to understand the landscape around them to have an environmental ethic. When people were asked why they felt differently, the responses also demonstrated proenvironmental behavior, education, and reminders about a larger system of which humans are a part. Lastly, people were asked, "Would you be interested in being a steward and helping to care of the landscape? If so, why?" The results revealed proenvironmental behavior, a feeling of connectedness, and why they want to contribute. Some responses were human-related while others were more-than-human related, but most related to a demonstration of care for the land.

Community engagement can promote place attachment throughout the project. By engaging community in the landscape's design, implementation, and stewardship, those actively involved can build place attachment and pride from the completed work. Each site has unique ways to engage community members to increase the caring relationships between human and more-than-human elements. The results demonstrate the impact of community engagement on relationship building between human and more-than-human elements by querying engaged community members with the same questions as site users.

Interview, Survey, and Observation Procedures

Semi-structured interviews of key stakeholders in each site provided a holistic understanding of the system's function, relationship, and intention. On-the-ground stewardship leaders' interviews provided insights into each site's community engagement and landscape performance. Landscape architects and designers were interviewed to provide insights about their design intentions and the narratives and stories they aimed to tell. Each designer had applied intentional interventions to the system that demonstrated the importance of more-than-human elements in the site and their approach to improving interactions and relationships for more-than-human elements. Each interview was recorded while walking the site with the respondent, then reviewed word-for-word to determine the design

[6] Ecofeminist ethics was derived from environmental ethics that focuses on the land and feminist ethics that focuses on a care. The land ethic by Aldo Leopold never used the word "care," but his later actions in life and writings demonstrated a strong care for the environment. I believe there is a connection from environmental ethics to feminist ethics. Environmental ethics focuses their thoughts on ecosystems and the land, while feminist ethics takes a broader view. There is also a strong connection between Indigenous knowledge and relationship with the land and the feminist ethic of care (Allison, 2017; Leopold, 1966; Swanson, 2015).

[7] It is critical to note that while this shows us whether people are learning and recognizing what is around them, many site users were already very educated about the site and felt connections to it in other ways. Hence, it cannot be the only indicator of place attachment.

intentions and goals for the system and to better realize how the system functions.[8] The interviews were semi-structured with questions relating to the specific storytelling through design, ecorevelatory, and community engagement strategies at each site but tailored to each stakeholder and their role and relationship to the site. Each interview inquired about landscape literacy, ecological literacy, and place attachment that the stakeholders noticed on the site. Taking a grounded theory approach, the recordings were reviewed to identify common themes, key events, and intentions by each stakeholder that emerged and supply codes used in the surveys and observations (Creswell, 2009; Robson, 2002).

Intercept surveys and site observations were used to query the site users and understand the present-day relationships between human and more-than-human elements. The components of each piece were employed to measure the landscape literacy, ecological literacy, and place attachment people feel and demonstrate on the site.

Paper copies of the survey were distributed to users 18 years or older through time samples (Robson, 2002). All pedestrians who passed by were asked to participate, but only those interested did so. Intercept surveys (RMS Blog Staff, 2021) were distributed during hour-long segments at varying times and days of the week. Surveys were taken at varying locations at each site to compare how different areas of the site differed in their responses and related to the land elements around them. For the first site, QR codes with a Google survey were also distributed, but this strategy resulted in very few participants. The initial surveys were then supplemented with hard-copy surveys. For additional sites, all surveys were paper copies with clipboards and pencils provided so that participants could complete it and return it immediately. The surveys were free-response answers/open questions (Robson, 2002); therefore, they were manually coded into themes that emerged for each question (Creswell, 2009). Themes for coding the results also came from analyzing the design for the theory elements – storytelling through design, ecorevelatory design, and community engagement – and interviews with the landscape architect and other organizations regarding their intentions for the design. For relevant questions, the general categories of human and more-than-human elements were also used to distinguish an understanding of more-than-human elements in a holistic system. Most questions also had a certain number of responses that were inapplicable, unknown, or unanswered; these were grouped into another category. Percentages for each themed category were run for overall surveys and for those that responded to the question, removing those that answered in the n/a group. The results were compiled into two categories, namely site users and engaged community, to distinguish how those who have been involved in community engagement answered differently than general site users. Participation was asked of those general site users walking through the park. If people were biking, running, or doing other physical activity, they were not asked to stop their activity. General numbers of surveys are shown in Table 2.1. Some questions had different *n*-values due to some respondents not answering every question. The question *n*-values are found in Table 2.2.

Table 2.1

N-*values for overall surveys*

	Sweetgrass	Hunter's Point South	Menomonee Valley
Overall *N*	51	76	46
General Site User *N*	40	60	
Steward *N*	11	16	

[8] In one case, the designer was out of state, so a zoom interview was conducted.

Table 2.2

N-*values are based on those that answered the questions. Questions varied at each site slightly due to location and what was learned from previous applications at another location. Complete survey questions can be found in Appendix A*

	Sweetgrass			Hunter's Point South			Menomonee Valley
	Overall	General	Steward	Overall	General	Steward	Overall
Healthy ecosystem features?		41		66	50	16	44
History of site?				41	26	15	26
Art of site		41					
Landscape element to know systems?		51		51	37	14	33
Explain sustainability?				43	30	13	33
Memories?	51	40	11	63	49	14	46
Think differently about the landscape?	51	40	11	76	60	16	39
Why think differently?	30	19	11	38	25	13	17
Interest in being a steward?	51	40	11	76	60	16	42
Why be a steward?	26	19	7	35	19	16	24

Formal observations occurred at various times during the day and throughout the week (Creswell, 2009; Robson, 2002). Methods were based on Jan Gehl's Public Life Tools, specifically Stationary Mapping Activity and People Moving Count (Gehl, n.d.; Gehl & Svarre, 2013), but were modified for these sites and the research questions being asked. People and their activities were recorded on a map for different times they passed through a location.[9] Each site was evaluated based on researcher experience and stakeholder interviews for path hierarchy in relation to a connection with more-than-human elements. The paths people took that were human-dominant were compared with the more-than-human dominant paths. This comparison demonstrates the intentions site users took to traverse more-than-human areas. Additionally, observations of people were recorded when and where site users stopped to observe the landscape, view the surroundings, or interact with plants, wildlife, and other more-than-human elements. Again, these observations demonstrate that site users understand that a more-than-human world exists.

[9] Activities were generally walking, running, biking, or scooters. Additionally, some sites had dogs and children recorded. The activities of children were not recorded, but whether they were walking, biking, scooting, or in a stroller, they were counted.

Case Study Framework

Using a case study approach as a research framework, the landscape biography methodology was applied to each case study with the goals of replicating the research and establishing internal validity with patterns across the results of each site. Multiple case studies were examined to strengthen external validity, demonstrating that it has the potential to be relevant beyond one case study (Yin, 2003). Each case study went through the full research process and measured all three interventions of design – storytelling through design, ecorevelatory design, and community engagement – to understand whether these elements featured in experiences of holistic systems. The methodology was adjusted in response to the sites' systems and relationships. Additionally, as it was implemented, revisions were made each time to correct mistakes and to reduce the findings' complexity. While each site exhibited the full research spectrum, each also emphasized one of the interventions and a stronger focus on that component of research.

By having three case studies, a larger sampling ensured that the research methodology is compatible on multiple scales, locations, ecologies, and urban settings. Demonstrating that the methodology can be applied to different sites and locations is critical to establishing its external validity in exhibiting whether the narratives of the site are accurately understood. During case study selection, sites were identified in varying geographic locations: Seattle, New York City, and Milwaukee. Each location has an urban waterfront area that was historically industrial and was redesigned in the past 15 years. Seattle was a temporary exhibit to understand whether a smaller research installation would have the same results as the larger, permanent system interventions. Each project was designed by different organizations – the University of Washington (UW) Green Futures Lab, SWA/Balsley, and Wenk Associates – each of whom had unique approaches to the sites, community engagement, and intentions to create holistic systems. Each site incorporated storytelling through design, ecorevelatory design, and community engagement in ways that were specific to that location, neighborhood, and community. Furthermore, they all had organizations continuing stewardship, environmental education, and hands-on involvement in the community today. That said, each site had its own goals, intentions, and ideas of a change in elements and interactions. Each design team had very different criteria and abilities, especially with one being temporary and on a very small budget while the other two were well-established initiatives.

Strong historical narratives of the urban setting for each location are legible in the site. For example, the Seattle site had strong concerns about water quality and environmental health. New York City was a site that was once a marshland and filled in for a shipyard that helped in the formation of Long Island and Queens. Milwaukee was a brownfield remediation site still having industrial neighbors, although they are required to be sustainably built, light industrial buildings. Each site has public access and is free for anyone to visit. Therefore, all sites have a mix of residents and visitors who experience the site for the first time. As a consistent narrative in the landscape, the designer incorporated some form of wetlands and ecological restoration that benefits more-than-human elements and encourages stronger relationships between human and more-than-human elements. Table 2.3 further compares the three sites.

Construct validity, internal validity, external validity, and reliability are all tests to perform in a case study to determine whether it is methodically sound and whether the evidence corresponds to reality (Yin, 2003). These tests can be used to crosscheck the landscape biography methodology. This research addressed construct validity through multiple data sources, including local storytelling, interviews with

site users and designers, and observations of how people use the space. Further data collection came from the historic images, maps, and writings that explain cultural influences and system flows. Internal validity was assessed during data analysis through the inclusion of multiple viewpoints for a given site. This assessment was critical for a holistic analysis; the multiple narratives allowed a robust understanding of the site, conflicts, and relationships between elements. In a larger case study exploring urban wetlands, external validity was shown by repeating the same methodology for other sites. This result proves that the methodology accomplishes the desired effect, but each site has results unique to the complexity of its system. The methodological framework of the landscape biography for each data collection point allows the results to be comparable between case studies and allows reliability to be addressed.

Case Study Locations

Sweetgrass

Sweetgrass is a temporary landscape installation in Seattle, Washington, designed to repair broken relationships between system elements and raise awareness of more-than-human system elements to site users. Floating wetlands were installed at the Fremont Bridge fender walls in May of 2021 to re-establish salmon habitat along Fremont Cut. The floating wetland prototypes can provide food and shelter through wetland materials including native vegetation. The UW Green Futures Lab monitored the installation to understand plant health, fish use, and design stability. This site combines the intersection of salmon habit and migration, history of sweetgrass vegetation shorelines and the Coast Salish peoples, Seattle's urban growth, the surrounding house boats, and the adjacent Burke–Gilman trail. It illustrates a small introduction into a highly urbanized, human-centric setting with many narratives and histories to explore. A collaborator, Sweetgrass Arts, commissioned local and Indigenous artists to develop banners, stencils, poems, and other educational art elements that can be applied to the system to bring attention to more-than-human elements and human relationships to other elements in the system.

Hunter's Point South Waterfront Park

The Hunter's Point South Waterfront Park was an abandoned site that once served as a rail depot, coal yard, and ferry terminus directly across the water from midtown Manhattan in Queens, New York (Landscape Architecture Foundation, 2010). As the city grew and as storm surges intensified, this site designed around resilience by "bending" the interactions between system elements but not changing the interactions within the site (SWA/Balsley et al., 2019). The landscape has preserved some of the original rail lines and other postindustrial remnants that highlight the site's stories while also changing from a contaminated brownfield site into a shoreline filled with tidal marshes and resilience strategies. This site design mostly focused on making sustainable landscapes visible on the site. In addition, site designers were determined to showcase different types of ecosystems to support the more-than-human habitat and to combine human and more-than-human habitat cohesively in the ecosystem.

Menomonee Valley Community Park

The Menomonee Valley Community Park in Wisconsin was once a wild rice marsh along the Menomonee River. In the late 1800s and early 1900s, the area was filled and turned into the Milwaukee Road Shops and Airline Yards rail site. It is now one of the "largest brownfield redevelopment successes

in Wisconsin history" according to Wenk Associates (Wenk Associates, n.d.). The site was transformed from a rail yard to a community park with ecological restoration, a stormwater treatment area addressing water flow from the neighborhood and highway runoff, and a reconfiguration of the Menomonee River. The site also includes narratives of the local Miller Brewing Company, Milwaukee Stockyards, and excess sewer pipes (Landscape Architecture Foundation, 2010). The narratives in the landscape create an interesting juxtaposition in the system of native plant restoration and the steel pipes, raised road, adjacent factories, and rail tracks still evident on the site. Further understanding of the system relationships and designer goals will clarify how this system works and other narratives on the site. This landscape was designed by Wenk Associates whose founder, William Wenk, was a leader in ecorevelatory design. This site offers an opportunity to determine whether the design goals and ecorevelatory goals were met. The site intervention was completed in 2007, so the intervention has had time to mature and grow into the landscape. It will be interesting to discern whether the ecorevelatory goals can be met over time.

Table 2.3

Site comparison between each case study location

	Sweetgrass	Hunter's Point South Waterfront Park	Menomonee Valley
Location	Seattle	New York City (Queens)	Milwaukee
Scale	<1 acres	30 acres	45 acres
Time (when was it built)	2021	Phase I – 2013 Phase II – 2018	2007
Permanent vs. temporary	Temporary	Permanent	Permanent
Ecorevelatory design goals	Art, floating wetlands, community engagement, native plants	Stormwater and climate change management, constructed wetlands and shoreline, art	Pipes, wood, native plants, art
Ecological restoration	Floating wetlands	Marsh, wetlands, and shoreline reconstruction for storm surges	Marsh (restored by AES/Marek Landscape)
Deep history	Indigenous history, urbanization, salmon loss, innovative restoration	Marsh land, rail depot, coal yard, ferry terminus	Marsh land, rail yard, brownfield, restoration, Indigenous history/wild rice fields
Urban environment	Fremont Neighborhood in Seattle	Long Island City in Queens	West Allis area of Milwaukee
Public Site	Yes – Burke–Gilman Trail and Fremont neighborhood – owned by WA DOT (fender walls), City of Seattle, and WDFW	Yes – connected to Gantry State Park – site owned by NYC Parks and future affordable housing site	Yes – connected to Menomonee Valley, Silver City, and Brewers' stadium – owned by WI DNR, DOT, and City of Milwaukee
Designer	Green Futures Lab	SWA/Balsley	Wenk Associates
Research highlight	Place attachment	Landscape literacy	Ecological literacy

Conclusion

An initial landscape biography was critical to understand the system elements and relationships before examining the current land system through surveys and interviews. These elements inform the different perspectives of place, how systems worked in the past, and how they function in the present and may inform the future. By using methods such as archives, surveys, interviews, and observations to understand the system, we can better grasp human relationships in the system and the design intentions of storytelling through design, ecorevelatory design, and community engagement. This research questions whether holistic stories resonate with people passing through the site and reduce system complexity to a level at which all site users could respond to and understand the relationships between the built and natural environments.

Chapter 3

Sweetgrass Case Study: Exploring Interventions with Community Engagement at the Forefront of the Landscape.

Introduction

Postindustrial, urban shorelines reveal significant histories of intense degradation and modification as part of their human-dominant narratives. The Sweetgrass Living Shorelines project introduced floating wetlands to provide juvenile salmon habitat to the Lake Washington Ship Canal in Seattle. The project team included researchers, designers, community scientists, and students who examined plant health, fish use, and water quality parameters to determine whether the floating wetlands provided sufficient and suitable habitat for salmon. This intervention connected community by improving education on system dynamics, primarily focusing on the conditions needed by more-than-human elements. Simultaneously through the Sweetgrass Arts Project, the team invited local artists to create banners, stencils, signs, and poems that shared educational information about the floating wetlands. It also allowed the artists to share the land story from their perspective. Community engagement expanded system interactions and influenced perceptions and care for more-than-human elements.

The study investigates the system dynamics and role of human elements in the present-day Lake Washington Ship Canal near Fremont Bridge and the Burke–Gilman Trail in Seattle, Washington. The Sweetgrass Living Shorelines project used systems-thinking to determine where new interventions were needed to promote and repair the system performance for more-than-human elements. Sweetgrass Arts promoted the more-than-human elements by educating people and encouraging a knowledgeable relationship between human and more-than-human elements. The design intervention was implemented, and the system was analyzed to understand the following:

- *How do people comprehend the landscape narratives – their connection to the historical system functions and their continuation to improve future system relationships? (landscape literacy)*
- *When the design intervention makes more-than-human elements more visible, do people understand the system function and more-than-human interactions in the system? (ecological literacy)*
- *How does community engagement in the design, implementation, stewardship, and research monitoring impact people's connections with the site and their interactions with more-than-human elements? (place attachment)*

Systems theory supports this research in conceptualizing and understanding the landscape. A system is defined by its elements, interactions, and overall system function. System complexity can be simplified into these categories and creates a mindset that focuses on the dynamics of all elements (Haraway, 2016; Marchand et al., 2020; Scheffer, 2009b; Society for Ecological Restoration International Science & Policy Working Group, 2004). Human and more-than-human elements – such as vegetation, water, air, and wildlife – each have individual roles within a landscape. Feminist theory and Indigenous knowledge characterize people as a part of the system and point to humans not dominating more-than-human elements of the system (Haraway, 2016; Kimmerer, 2013c; Whyte et al., 2018). For Sweetgrass Living Shorelines, the design team sought ways to help repair the system from the previously developed human dominance.

One strategy to enhance system relationships is to create awareness of system dynamics through community engagement. Educating and engaging individuals and elements in the system's processes makes people more aware of their surroundings and roles. The European approach to landscape ecology further considers how people are a part of the landscape and engages the community as a whole with human and more-than-human elements (Higgs, 2003). Community science is one strategy that deepens people's place attachment (Toomey, Strehlau-Howay, Manzolillo, & Thomas, 2020). Place attachment derives from people's connection to the full ecosystem that leads to an "emotional bond" between humans and place along with healthier interactions between ecosystem elements (Manzo & Devine-Wright, 2012). Place also refers to the "safe and familiar" feeling and personal relationship people have in an environment (Tuan, 2013).

Recognizing interactions between elements can create a connection to place for humans. One form of place attachment through a feminist lens is the application of a care ethic to a place (Noddings, 2012). Indigenous scholars have written about place attachment as a mutualistic community and have shown care for more-than-human elements through their storytelling and their relationships with the land (Whyte et al., 2018). The understanding of place also facilitates proenvironmental behavior. Proenvironmental thinking seeks to consider more than human elements and relationships in the system while minimizing the human impact that hurts other elements (Kollmuss & Agyeman, 2002). This study examines general site users' and community scientists' connections with the Fremont site and how they demonstrate a sense of care or proenvironmental behaviors toward this landscape.

This research explores how storytelling through design (Heatherington, 2011; Potteiger & Purinton, 1998), ecorevelatory design (Helphand & Melnick, 1998a; Wenk & Gregg, 1998), and community engagement can influence landscape literacy (Spirn, 2017), ecological literacy (Boehnert, 2012; Orr, 1992), and place attachment (Manzo & Devine-Wright, 2019). Specifically, the project considers the impact of a design intervention on human and more-than-human relationships when trying to foster holistic thinking in an area historically viewed using a human-centric lens.

Methodology

A landscape biography was completed using historic images, reference documents, site visits, intercept surveys, and user observation to understand the system dynamics and the design intervention needed in the landscape. Landscape biographies explore the change in a landscape from past to present and into the future (Kolen et al., 2017). The landscape biography included more-than-human elements and specifically focused on how the relationships between human and more-than-human elements have evolved. The latest design interventions, Sweetgrass Living Shorelines and Sweetgrass Arts, explain how the site can be transformed to benefit more-than-human elements and change human perception with storytelling through design, ecorevelatory design, and community engagement.

New system relationships between human and more-than-human elements, and how they related to the ecological and storytelling interventions, were examined through intercept surveys and site observations (Creswell, 2009; RMS Blog Staff, 2021; Robson, 2002). They measured landscape literacy of site narratives, ecological literacy of more-than-human elements, and people's place attachment to the site. An anonymous survey was distributed to the public at a community event, canvassed by the researcher, and accessed through a QR code or a hard copy that was returned to the researcher immediately. Forty (40) survey responses were collected from the public, and eleven (11) from "engaged community" members. All respondents were over 18 years of age and voluntarily chose to participate in

the study. Notably, 25 of the respondents participated in the survey when the main interpretive sign was vandalized or removed from the site. However, other design elements such as the floating wetlands and banners remained intact. Distributing physical copies of the survey generated the most results; very few responses came from handing out QR codes or leaving the QR code on the sign. The survey responses were then manually coded for common responses and key ideas that were intentional goals of the design team (Creswell, 2009). For site observations, the researcher spent an average of 54 minutes on the site at four different times throughout the week to understand how people move (e.g., walk, run, or bike) throughout the space (Gehl, n.d.; Gehl & Svarre, 2013). I tracked whether people noticed or stopped to view the floating wetlands, art, or signage. The focus of people looking at the human elements was compared to how often people noticed more-than-human elements in the landscape.

Landscape Biography

In the early 1800s, land in the present-day Fremont bridge area was stewarded by Native peoples. There was a community culture and an understanding of living *with* the land and *of* the land. When the land was home to the Coast Salish peoples, freshwater wetlands and bogs were filled with Wapato, Tule, Cattail, Skunk Cabbage, Devil's Club, Cranberry, Sphagnum moss, and Crabapple (Sheikh, Lape, & Fels, 2019). Indigenous people "fished, hunted, and gathered food" on the land and were known as "people of the water" (Muckleshoot Indian Tribe, 2012). Salmon was a food source, and the people knew the importance of caring for natural resources and tending to the habitat to benefit the salmon before they accepted the benefits from the land (Muckleshoot Indian Tribe, 2012). Indigenous people have a strong understanding of the environment and their place in nature, self-identifying as members of the land (Kimmerer, 2013b). They cared for and tended to the land and habitat as a member of this larger system; they understood the relationships between elements and what elements were essential for the system to persist holistically (Marchand et al., 2020).

Several thousand years before the arrival of European settlers, the water system in the case study area was a small creek which connected xaxču?, "Small Lake," to wiwalqʷ, "Large, having lots of water," which ultimately flowed into xʷəlč, "Saltwater" (Sheikh et al., 2019). There was an "Outlet," gʷaxʷap, near the location that was useful for observing water flows. Although the Outlet area was home to salmon, the present-day Lake Washington Ship Canal was not connected to the Cedar or Sammamish Rivers, where many present-day salmon begin their migration. Out-migrating juvenile salmon swam from the Cedar River into the Black-Duwamish River before reaching the Salish Sea. The land was home to the Coast Salish people who knew the river systems well.

One hundred and fifty years ago, the landscape system changed drastically when European settlers arrived in the area. Land history documents the transformation human and more-than-human elements, as shown in Figure 3.1. In 1855, the Treaty of Point Elliot was signed, forcing Native people to live in reservations that were less than 10% of their customary land area and with few survival resources (Marchand et al., 2020; Muckleshoot Indian Tribe, 2012). Settlers moved into these areas and seized the resources formerly managed by the Native people. They developed and graded the land to introduce new elements. Shorelines still had some freshwater wetlands and bogs that benefited the salmon habitats. Still, the area soon grew into a European-influenced port town with rivers and coastal areas becoming industrialized.

Industrial growth and colonization are seen in the early image of Fremont found in the Museum of History and Industry (MOHAI) archives, shown in Figure 3.1. An 1892 image entitled *Looking North on Fremont Avenue* (Buck, 1892) shows the original Fremont Avenue bridge that crosses the outlet. This image characterizes the Fremont community and reveals the European settlement named for John C. Fremont, a Western explorer who based the settlement on an area sawmill (Buck, 1892). The original boundaries of Lake Union and the outlet appear in pre-1900 archive photography (Unknown, 1894) along with the characteristics of the land (Unknown, 1895). These images indicate that increased development and hardening of the shorelines had occurred, but vegetation such as trees and a natural island in the middle of Lake Union remained. The vegetative shorelines still created opportunities for salmon habitat. The salmon migration stopped at Lake Union, as Lake Union did not connect to Lake Washington. The Lake Washington salmon swam out to the Salish Sea through the Black and Duwamish Rivers. Images of the outlet, presently known as the Lake Washington Ship Canal, were photographed by Webster & Stevens and revealed different characteristics of the water. The 1904 Webster & Stevens image displays a small amount of water, but a straightened stream with potential for eroded shorelines. The images taken in 1915 illuminate how the Lake Washington Ship Canal was a stream meandering with vegetated shorelines that benefit salmon habitat (Webster & Stevens, 1916-a; Webster & Stevens, 1915-b). Native vegetation and gradual water shorelines did provide salmon with increased opportunities for food and shelter (Cordell, Toft, Munsch, & Goff, 2017).

To create a more navigable waterway system for barges and large ships, dredging occurred between present-day Lake Union and Salmon Bay, such that the Lake Washington Ship Canal was opened in 1917 (Chrzastowski, 1983). The 1915 image, entitled *Digging the channel for the Lake Washington Ship Canal* by Webster & Stevens, exhibits the deep cut that was made during construction of the Ship Canal and displays the steam shovels and trains used to move earth and dig the canal (Webster & Stevens, 1915-c). This channel required a new Fremont bridge to be built in 1915 spanning the full channel and supporting greater vehicular, pedestrian, and streetcar use that increased access across the Canal and connected the Queen Anne and Fremont neighborhoods (Unknown, 1915). The bridge had massive supports that further hardened the water edges, as shown in City of Seattle's engineer James Patrick Lee's photographs during construction and on the opening day (Lee, 1916-a; Lee, 1917-b). The Montlake Cut was also dug, connecting Lake Union and Lake Washington, which lowered Lake Washington so that water no longer flowed out the Black and Duwamish Rivers. This change and redirection of the Cedar River system created a large shift in the waterway systems (Chrzastowski, 1983). Lake Washington's shoreline receded by 10 vertical feet, and new shorelines were revealed. The shift in water directions caused out-migrating juvenile salmon to come from their spawning regions upstream and swim through Montlake Cut and the Lake Washington Ship Canal to Elliot Bay.

Conflicts of interest and broken relationships were forming between system elements. As the hydrologic system of Lake Washington changed, this river became an migration route for salmon coming down the Cedar and Issaquah Rivers (Chrzastowski, 1983). These salmon no longer traversed the Duwamish; all migration occurred through the Lake Washington Ship Canal. Salmon needed this pathway as a major corridor; they needed habitat and healthy water conditions to grow and gain nourishment before they out-migrated to salt waters. At the same time, the perceived needs of the people and the dredging of the ship canal became critical to river transportation routes (Sargent, 1920). The ship canal, however, was not built to provide the natural, shallow shorelines beneficial to salmon. Consequently, the creation of this canal was at this site the beginning of changing relationships between humans and salmon that

were not conducive to the greater landscape. The dredging needed to complete the Lake Washington Ship Canal altered water quality properties. Hardened shorelines could not clean or filter the water like previous vegetation could. Beneficial vegetation that provided shade and cooling for the water vanished.

Indigenous presence in the area also shifted as colonization spread over the land and waterways (Muckleshoot Indian Tribe, 2022). As part of the original Treaty of Point Elliot, tribes ceded the land and moved to reservations. They were still allowed to fish, hunt, and gather from off-reservation locations, though the abandoned army bases that became tribal reservations had insufficient access to natural resources protected by the treaties (Muckleshoot Indian Tribe, 2022). Access to fish was challenged in the 1960s when Washington state created laws limiting off-reservation fishing and limited Indigenous Tribes to fishing on "usual and accustomed grounds," meaning the reservations (Brown, 2018). This severely limited the Native communities' access to food and cultural resources that had been strong for thousands of years. In 1974, after decades of challenging the US government in the *United States v. Washington* case, fishing rights were returned to the Indigenous peoples through the Boldt Decision, which allowed tribes to continue fishing in locations off-reservation, despite state regulations (Muckleshoot Indian Tribe, 2022). Unfortunately, the Boldt Decision impacted only federally recognized Tribes, so the local Duwamish, Chinook, and Snohomish tribes remained without rights and tensions persisted (Brown, 2018). The area's natural resources have long been critical to Indigenous communities. Their care of the land resources has been imperative to preserving species and elements, including themselves (Muckleshoot Indian Tribe, 2022).

As Seattle continued to grow and modernize, urban development near the water increased dramatically. The hardening of the shorelines seen on the *Fremont Bridge on Opening Day of Lake Washington* image from 1917 displays the remarkable change from the interconnections that used to exist on the shoreline (Webster & Stevens, 1917). Started in the 1880s and bringing 5,000 people to the neighborhood, the sawmill remained active in the 1930s, but it was not the only business in Fremont (Turner, 1930). Multiple rail lines served the mill, and other development activities began to dominate the area. Spanning Lake Washington Ship Canal and Lake Union, the Highway 99 Bridge became Seattle's first major highway bridge (Webster & Stevens, 1939). This area quickly became a major development zone for fast-growing Seattle. Barges traveling between Elliot Bay and Lake Washington increased the shoreline's economic development, and the shipping industry provided greater access and travel means for businesses to transport goods using the waterways. Caissons for the Tacoma Narrows bridge (Seattle Post-Intelligencer Collection, 1939) and the drydock going under Fremont bridge (Seattle Post-Intelligencer Collection, 1944) illustrate the importance of shipping and transportation that emerged with the addition of the Lake Washington Ship Canal.

As urban development expanded, the contaminants flowing into the water increased. In the early 1900s, stormwater and sewer pipes were combined into a single pipe system to route the stormwater and wastewater away from development (ECOSS, 2019). During heavy rain events, these pipes overflowed with untreated water and sewage into Lake Union and the Lake Washington Ship Canal (ECOSS, 2019). This overflow contaminated the water system with raw sewage, heavy metals from road runoff, and pollutants leaching from rooftops (ECOSS, 2019).

The human population of Fremont multiplied, as streetcars and trolley services brought people to the area until the late 1930s when the streetcars stopped running. The area then became less accessible by

public transit. Although it is still standing, the train station was abandoned in 1948 (Davis, 1948). With its close proximity to the University of Washington, the neighborhood became a home for the arts community and student life (Curbed Staff, 2014). Humans and development dominated the ecosystem and were more concerned about their travel and how the landscape could benefit human life than about their relationships to more-than-human elements. Former railroad tracks were redeveloped into the Burke–Gilman Trail, a 27-mile regional trail system built in 1978 (Davis, 1948). The combined sewer system stopped expanding in the 1950s, but old pipe infrastructure and combined sewer overflows continued to contaminate water and reduce water quality (ECOSS, 2019). The human relationship with salmon was becoming far more focused on how the humans helped themselves, not on how humans supported salmon or more-than-human elements.

Shorelines continued to be modified with cut and fill practices to add shoreline development and to create hardened edges for people and industry to access the water. Such development created more areas for salmon predators to hide in overwater coverage and removed native plants, and food resources needed by salmon. In addition, the fender walls under the Fremont bridge produced shadows, areas where predatory fish often reside (Ono & Simenstad, 2014). The image of the Aurora Bridge from 1939 reveals a very different shoreline condition than before the Fremont Cut was established (Webster & Stevens, 1939). These changes were further evident from the MOHAI pictures from 1939, 1960, and 1991. The shoreline shows soil edges with heavy grading and no vegetation (Seattle Post-Intelligencer Collection, 1939). The image from 1960 illustrates the considerable amount of concrete and construction along the shoreline, with some brush along the edge (Seattle Post-Intelligencer, 1960). By 1991, steep grading and the addition of fill created development opportunities and more parking spaces (Webber, 1991). Loss of native vegetation and an increase in concrete, riprap, and hardened edges persisted. Today, the shoreline continues to change, as the area is home to houseboats and Adobe's Seattle office, leading to further disconnect between salmon and the people.

As technologically based industries grew in Seattle, development and changes to the landscape increased. By 1994, Seattle started to implement more smart-growth measures to encourage redevelopment in Seattle neighborhoods (Fox, 2010). Urban development exploded, new housing and restaurants emerged, and the water was soon simply a backdrop to things happening in Seattle. By 2020, the water had become a playground for yachts, recreationalists, and construction barges. Human elements within the water system now dominate relationships in the system. As of 2018, 84% of the combined sewer overflows still presented prevalent problems in this area, generating water quality issues (King County and City of Seattle, 2022). Salmon, orcas, and other aquatic elements cannot survive in these toxic conditions. A water quality improvement project is working to lessen the overflows, but aquatic species and water quality properties have been modified significantly over the years. Salmon is an element that people still value but mainly recognize as a food source and something that humans use or dominate. The decline in salmon and more-than-human elements makes apparent the minimal concern for holistic system relationships.

As relationships shifted in the ecosystem, salmon populations significantly diminished (Kerwin, 2001). In addition to the loss of habitat, temperature levels in the Lake Washington Ship Canal rose significantly and dissolved oxygen levels dropped to lethal limits at certain times of the year (Urgenson, Kubo, & DeGasperi, 2021). Relationships between critical elements in the ecosystem have changed considerably over the last 200 years. There has been a loss of caring communities that originally defended retaining the more-than-human elements along the shoreline.

Figure 3.1

A timeline of the landscape socio-ecological history of the Fremont bridge area

Images:

1 - Lake Washington Canal, Seattle, ca. 1904; 2 - Lake Washington Ship Canal Under Construction, Seattle, ca. 1915; 3 - Lake Washington Ship Canal, ca. 1915; 4 - Fremont Bridge Under Construction, Seattle, November 16, 1916; 5 - Fremont Bridge on Opening Day of Lake Washington Ship Canal, Seattle, July 4, 1917; 6 - Aerial of Aurora Bridge Near Completion, Seattle, ca. 1932; 7 - Caisson for Narrows Bridge at Fremont Bridge, April 1939; 8 - Engineers Inspecting Aurora Bridge, Seattle October 8, 1991; 9 - Fremont Ship Canal, 2021

Floating Wetlands (Sweetgrass Living Shorelines)

The Sweetgrass research team recognized the need for salmon habitat to be recreated in this system to benefit out-migrating juvenile salmon. After two years of testing on floating wetland prototypes in the Duwamish River (Rottle, Bowles, Andrews, & Engelke, 2022), the research team took the lessons they had learned from that project's design and implemented constructed floating wetlands (CFW) on the shoreside of the fender walls for Fremont Bridge. The objective was to locate them in a place that did not have existing habitat. Salmon had been observed congregating in Lake Union for one to two days or up to two weeks before running through the Lake Washington Ship Canal in less than 24 hours (Urgenson et al., 2021). By situating the CFW at the edge of Lake Union and the Lake Washington Ship Canal entrance, the CFW would increase the habitat space for salmon to feed and rest when out-migrating. See Figure 3.2 to understand the project location. Since salmon migration routes have drastically changed over the past 125 years, the floating wetlands were intended to be a design intervention to change the system's dynamics and to extend the benefits to more-than-human elements.

Figure 3.2

An aerial view of the project site location

This project tested three design prototypes to ascertain whether the selected plants would grow and provide salmon habitat space. Each emergent prototype had material for flotation, substrate, plants, and cohesion. See Table 3.1 for an overview of materials used. These units, shown in Figure 3.3, were tested and constructed with support from a King County Waterworks grant and a Rose Foundation/Puget Soundkeepers grant. The units were installed at the protection piers of Fremont Bridge in June of 2021. See Figure 3.4. They were monitored during the 2021 and 2022 growing seasons for plant health, water quality, and fish use. The prototype installation was designed to benefit more-

than-human elements by growing native plants that provided food sources and shelter for out-migrating juvenile salmon.

Table 3.1

Floating wetland materials. If a material is used in more than one version, but not all versions, both colors are shown in that material

Flotation	Substrate	Plants	Cohesion
• Pumice Bricks • ABS 4" pipe • Mycoboard with infused polylactic acid (No flotation used in the 4.0 units)	• Woodstraw • Oyster Shells • Pea Gravel • Builders Sand • BioChar	• *Carex obnupta* (Slough Sedge) • *Carex stipata* (Sawbeak Sedge) • *Deschampsia cespitosa* (Tufted Hair Grass) • *Eleocharis palustris* (Common Spikerush) • *Schoenoplectus acutus* (Hardstem Bulrush) • *Schoenoplectus pungens* (Sweetgrass) • *Scirpus microcarpus* (Small-fruited Bulrush) • *Sidalcea hendersonii* (Henderson's Checkermallow) • *Sisyrinchium idahoensis* (Idaho Blue eyed Grass)	• PermeaTex Straw and Excelsior Blanket (later included in 4.1) • PermeaTex Woven Geotextile fabric (later included in 4.2) • Tensar TriAx® Geogrids

2.0 Version • 3.0 Version A • 3.0 Version B • 4.0 Version A • 4.0 Version B • 4.1 Version • All Versions

Figure 3.3

Floating wetland prototypes tested by the project

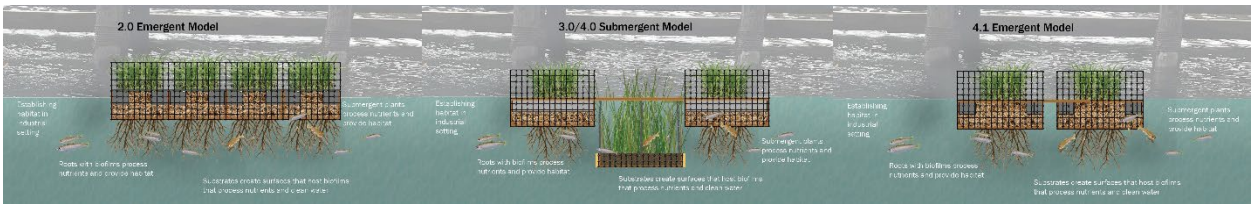


Figure 3.4

Installed floating wetlands. Henderson's checkermallow (l), sweetgrass and slough sedge (m), and tufted hair grass (r) growing in the 3.0, 4.1, and 2.0 units

Storytelling Through Design (Sweetgrass Arts)

As the site's design was modified for the project, the story of place continued to change. This project employed a process of storytelling through design to expose historical narratives on the site and to blend them with present-day narratives and human experiences (Heatherington, 2011). Storytelling can help humans to examine site elements, interactions, and relationships. Design elements including art, relics, and materials intentionally incorporated to remind site users of past and present stories (Anholt & Mavor, 2013; Heatherington, 2011; Hood & TED Talks, 2018). The landscape can be "read" from these elements to establish narratives about human, more-than-human, and land relationships (Heatherington, 2011).

The addition of the Sweetgrass Arts explored salmon and floating wetland narratives through art elements. There were four categories of eco art: banners at the CFWs, signage along the Burke–Gilman trail, stencil painting on the trail, and poetry about the land, including salmon (Figures 3.5 and 3.6). These eco art features were in places people could easily access from the Burke–Gilman trail (see Figure 3.5). Following a design competition, five Seattle-area artists were commissioned to create educational art elements, eco art, explaining the landscape system and salmon migration with their own stories and their understanding of the land. Two local artists were found through a nonprofit community art network. The research team solicited one local artist. Two Indigenous artists were identified through a local group of Indigenous artists in Seattle.

The goal for the selected art elements was for people to better understand the system relationships and function. Two artists created graphic design elements – fish in the water, salmon gills patterns, and marsh grass geometrics – that helped tell a salmon story. These design elements were added to banners displayed next to the floating wetlands with words intended to remind people of more-than-human elements in the system (see Figure 3.6A). Another artist designed a stencil that was used to paint salmon on a local trail to connect people to the river that ran parallel to the trail. The graphic design of salmon on the banners was also turned into a stencil for painting on the trail (see Figure 3.6D). One of the artists created a sign sharing her relationship with the land. As an Indigenous artist, she shared work that demonstrated "Water is Life," an Indigenous phrase that became popular to a larger population during the pipeline protests. This artist used it to share her story and relationship with the water and land. She explained that the inspiration for her work came from "living off the land with my family" (see Figure 3.6B). Lastly, an information sign was created that included poetry from an Indigenous artist. This poem shares a holistic perspective on the land and relationships between system elements. The poem was shared on a poster that explained the CFW, the history of the area, and the goals of the research project (see Figure 3.6C and 3.7). These art and education elements helped tell the story of the landscape system and supported people in sharing their perspectives of the land and project.

These art elements served as temporary strategies to engage the community in the design interventions and to offer opportunities for people to consider the landscape system. In the Sweetgrass Arts project, design through storytelling goals included conveying the story of salmon through the landscape and allowing people to share their stories about the land from their perspectives.

Figure 3.5

Site plan showing storytelling and ecorevelatory design elements

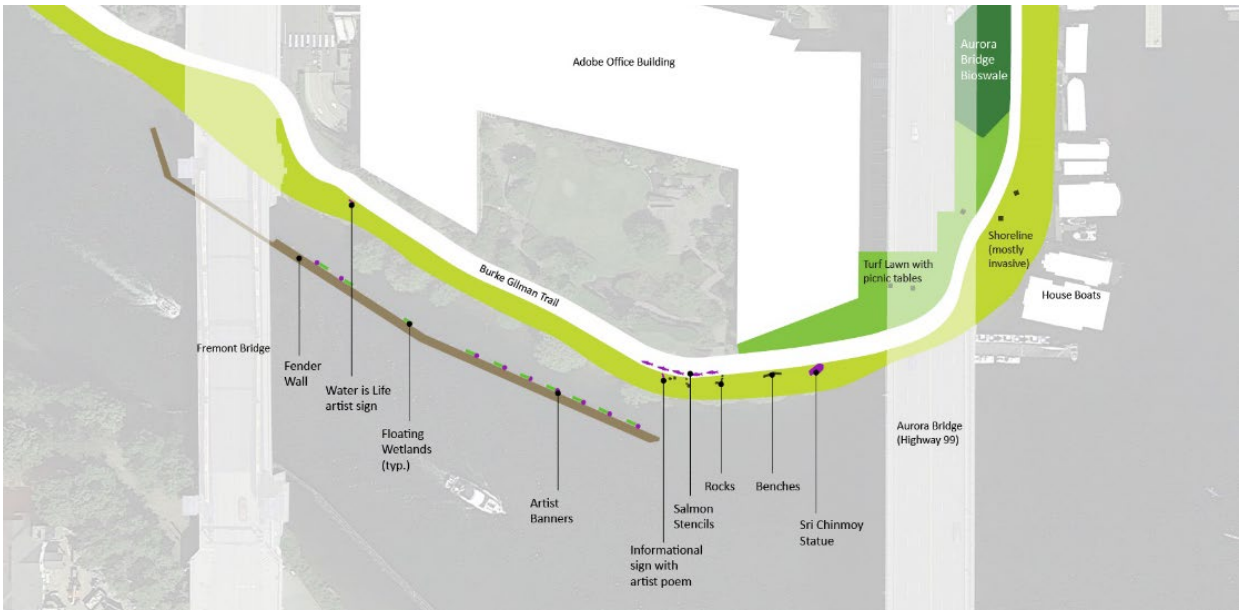
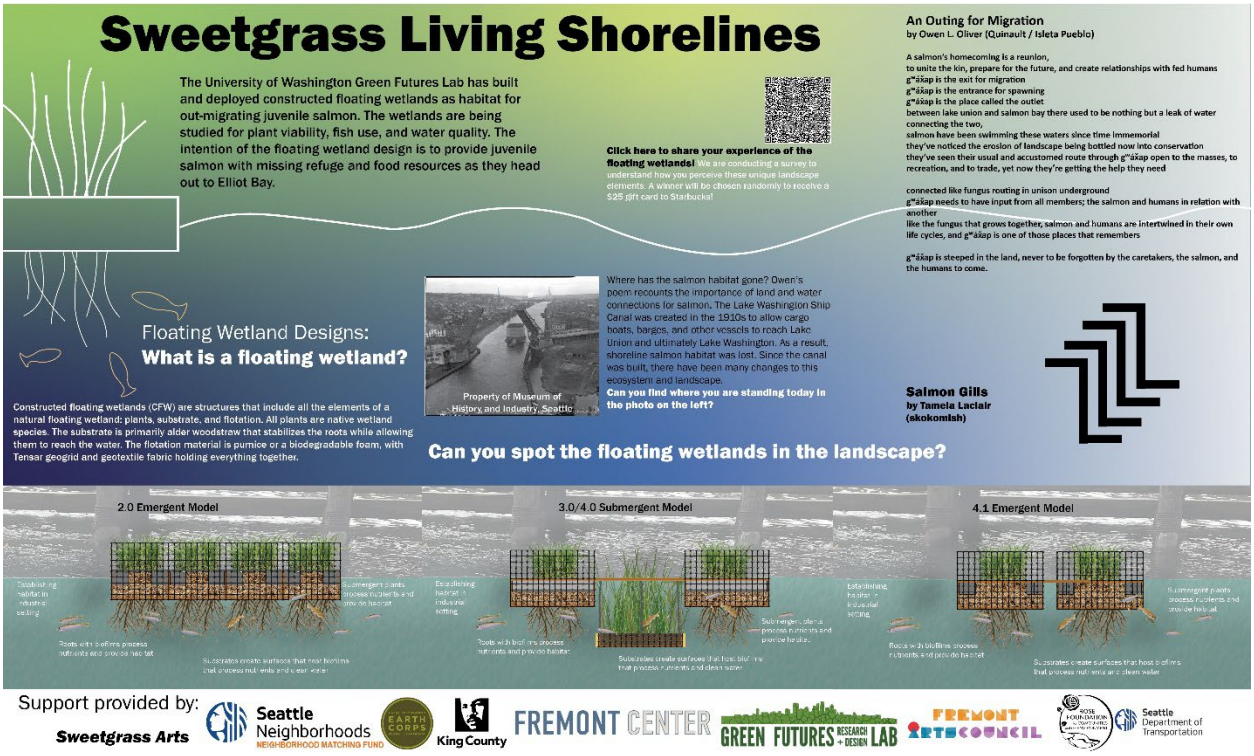


Figure 3.6

Eco art features from Sweetgrass Arts

Figure 3.7

Poster that was displayed along the Burke–Gilman trail to help explain floating wetlands, share the site history from multiple perspectives, and communicate the research goals



Ecorevelatory Design

Ecorevelatory design was developed to make more-than-human elements more visible and intentional in the landscape design instead of suppressing them (Helphand & Melnick, 1998a). In the early 1990s, this was often referred to as stormwater management and was a method to promote green infrastructure (Wenk & Gregg, 1998). When considering ecorevelatory work in a systems theory, the design reveals more-than-human elements and their relationships and interactions within the system. From this design methodology, humans can experience heightened awareness of more-than-human elements, thereby increasing ecological literacy by seeing and interacting with these elements more frequently.

In the Sweetgrass project, CFWs were the "revealing" element that exposed and regeneratively interacted with the system. They cultivated a connection between the human and more-than-human elements within the terrestrial and aquatic landscape. The CFWs near the Fremont bridge demonstrated the need for vegetation, food, and shelter for salmon and other more-than-human elements. The ecorevelatory design strategies in Sweetgrass Living Shorelines benefited more-than-human elements and brought attention to them.

Community Engagement

Relationships between elements are critical to understanding how a system functions. Intentional engagement with the community in restoration processes causes more people to learn the goals of changing the system and recognize how they benefit more-than-human elements. Such engagement is a means by which humans can show care for the system and consider their role in a large system (Haraway, 2016). Indigenous peoples talk of the mutualistic relationships in systems (Whyte et al., 2018). It is possible to build and demonstrate these relationships through community engagement.

In the Sweetgrass projects, an internal design team worked to reveal systems and connect elements. The Urban Shores Working Group supported and advised the research team. This group consisted of 20–30 professional designers, ecologists, and scientists with in-depth knowledge of salmon migration and implementation of floating wetlands in the Seattle area. The implementation team included assistance from a local nonprofit, Indigenous stewards, local authorities, volunteers, university students, and the internal team to build and install responsive design interventions. Thirty-three community members participated in the project from its implementation through its monitoring phases. This project compensated 27 individuals for their time and the work they contributed to the project. Two community members volunteered their time and materials to help install the prototypes. One was a representative of a local authority that helped with the installation. The research monitoring team included Green Futures Lab staff along with community scientists. Five artists were also engaged in the Sweetgrass Arts project and compensated for their work.

Additionally, to stimulate broader community participation, two events were held: a field trip and an eco arts event, further disseminating information about the system relationships and function, as well as inviting engagement by students and artists. The research team and Indigenous stewards led the field trip to teach middle and high school students about floating wetlands. They toured natural floating wetlands, saw where the CFWs were constructed, and visited the installed CFWs by boat. The day-long eco arts community event had booths set up for people to learn about the CFWs and install the stencil artwork on the Burke–Gilman trail adjacent to the Fremont CFWs. The event, funded by the City of Seattle Neighborhood Matching Funds Program, included food, a local deejay, and poetry performances by one of the project artists. Despite the rain, people still participated in the event. The Sweetgrass Research Team was joined by two other organizations working on floating wetland and salmon-related work in the area. Since the stencils did not stick well with the rain, an undergraduate class from a local university added more stencils during a later site visit to learn about the landscape.

The community engagement goals were threefold: first, to create opportunities for people to be involved with the project, interact with other teams, and install and monitor an intervention that helps more-than-human elements; second, to allow people to share their own narratives and knowledge about the space; and third, to educate others about the role floating wetlands could play in the ecosystem and how they can support more-than-human elements.

Results and Discussion

Landscape Literacy

Design through storytelling was implemented to develop landscape literacy among site users. Landscape literacy occurs when site users can read and understand the "environmental, social, economic, and political stories embedded in their local landscape" (Spirn, 2019). The design interventions of the Sweetgrass Arts project incorporated elements intended for people to "read" the landscape and system.

Through the public survey, landscape literacy was measured by what people saw in the space and how they understood the design story. When prompted about what art features they have noticed on site, 15% of the site users (*n* = 41) noticed the salmon stencil, 10% mentioned the banners, and 53% mentioned an unrelated statue (see Figure 3.8). These responses indicate that without prompts of what the elements are, people could identify some element of art in the landscape. However, many respondents did not consider the Sweetgrass Arts elements – banners, signs, or stencils – and often asked, "What is art?"

Among the art features added through Sweetgrass Arts, there were two signs posted: one by an Artist depicting "Water is Life" (Figure 3.6B) and the other that explained the project, history of the site, and included a poem by one of the artists (Figure 3.6C and 3.7). The latter sign was vandalized and consequently removed for part of the survey time.[10] Overall, the signs were noted by 32% of site users (*n* = 41), but when both signs were up, the sign was mentioned 47% of the time (*n* = 15), as shown in Figure 3.8. When the sign was present, there was increased attention to the art elements explaining the system and project. Without the sign, people focused more on nearby statues or graffiti murals. When asked what art or landscape element(s) told them most about the land, 25% of site users and stewards mentioned the signage (*n* = 51). Once again, when both signs were up (*n* = 15), 40% of site users mentioned the signage as an element explaining site narratives. These findings indicate that while traditional signage is not always recommended in innovative design practices, it did communicate the most detailed information about the landscape. Despite a low survey response rate, those that responded expressed an interest in learning the land story.

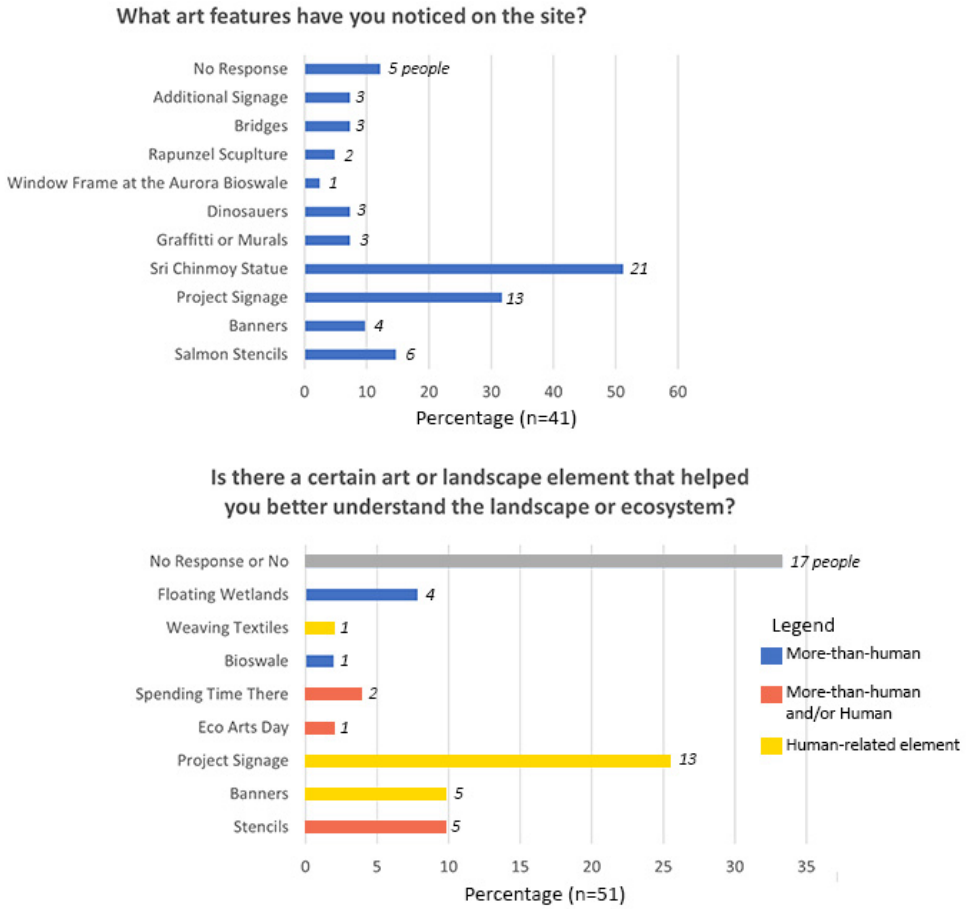
People walking along the Burke–Gilman trail had varied levels of interest in the art elements and landscape design. From site observation results, 38% of walkers noticed the sign or salmon stenciling while only 4% stopped to read the sign and poetry. This stretch of the Burke–Gilman trail also has a Sri Chinmoy statue and two waterfront benches. Twenty percent of people stopped at the statue or the benches. While people glanced over and noticed the floating wetlands, very few stopped, which could be explained by people seeing the wetland units but recognizing that they could neither approach nor physically interact with them. A higher percentage of people paused at the more permanent elements, such as the statue, which may indicate that permanent design characteristics have a stronger presence and significance in the landscape story than do temporary elements. It was interesting to observe children passing through the site and pointing out the painted fish. They were curiously noticing what was around them and sharing that with the adults that may or may not have noticed it. Designed storytelling elements need to tell the system story more permanently – one that draws people into the

[10] This sign was removed by someone outside of the research team. The sign was initially removed soon after installation. It was replaced right away and stayed up longer the second time. Unfortunately, it was slashed again and removed before the research team could repair it.

space – rather than just explaining it off to the side. Views of the floating wetlands were obscured by growing vegetation along much of the trail, which could have further hampered user perception of the wetlands and banners.

Figure 3.8

Survey results that related to landscape literacy of site users



Ecological Literacy

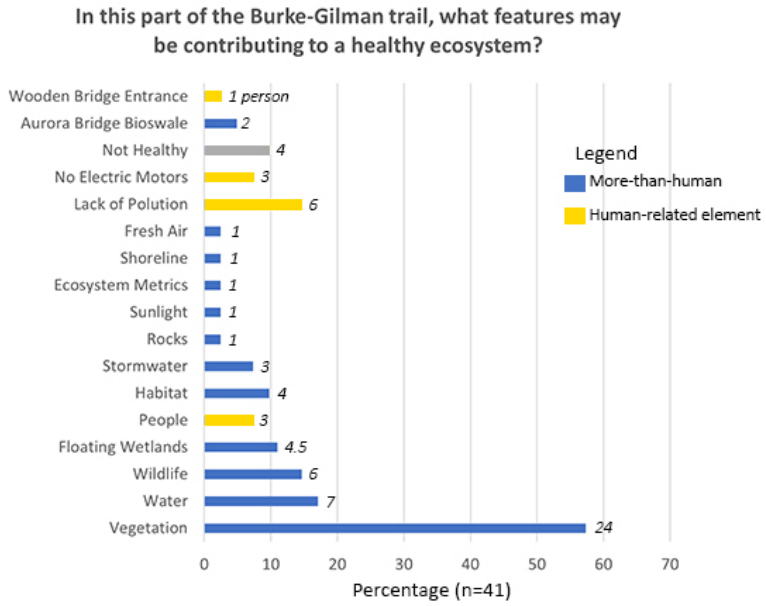
Ecological literacy encourages an understanding of systems and landscapes, specifically more-than-human elements. It was initially used to define elements important in environmental education and what is learned from exploring the land (Orr, 1992). However, since its initial conception, experiential environmental learning has focused on human knowledge gained through the understanding more-than-human elements of a system (Boehnert, 2012).

Ecological literacy is measured by site observance and user survey results to determine whether people have noticed and understood more-than-human elements on the site. For example, when observing people on the site, 38% of walkers (*n* = 184) stopped near and observed the floating wetlands or lake channel where they could be seen from the trail. This is the first indication that people noticed something other than humans in the system and stopped to observe what was happening around them.

In the survey, site users were asked to define floating wetlands in their own words. Only 48% respondents (*n* = 41) attempted to define floating wetlands. Of the 41 site users surveyed, respondents noted salmon (24%), plants (17%), and habitat (25%), which included food, bugs, invertebrates, and shelter, as shown in Figure 3.9. When asked about healthy ecosystems in the area, only 11% of respondents (*n* = 41) mentioned the floating wetlands. This level of response suggests that they recognized only a few connections to more-than-human elements and did not further examine the human elements of the site. Despite the floating wetlands being designed to help reveal more-than-human elements and the eco art banners, signs, and stencils suggesting more-than-human elements, many people did not appear to recognize the more-than-human element narratives on the site. The removal of invasive shoreline species and the creation of more outlooks along the trail could encourage people to stop and observe the floating wetlands. Additional information about salmon at larger stops along the trail, connecting to the Hiram M. Chittenden Locks, and increasing the quantity and vegetation growth of floating wetlands, are strategies to expand ecorevelatory design and heighten ecological landscape literacy.

Figure 3.9

Survey results that related to ecological literacy of site users



Place Attachment

Community engagement in a landscape can help form a place attachment to the system (Toomey et al., 2020). People can establish attachment to a landscape by showing care and respect to more-than-human elements through proenvironmental behavior (Kollmuss & Agyeman, 2002). Humans have relationships and interactions with more-than-human elements in a holistic community and demonstrate care when interacting with more-than-human elements. Place attachment can be displayed by memories people share about a place (Cooper Marcus, 1992b), their desire to help better the place (Kollmuss & Agyeman, 2002), and their desire to connect with the land (Manzo & Devine-Wright, 2012).

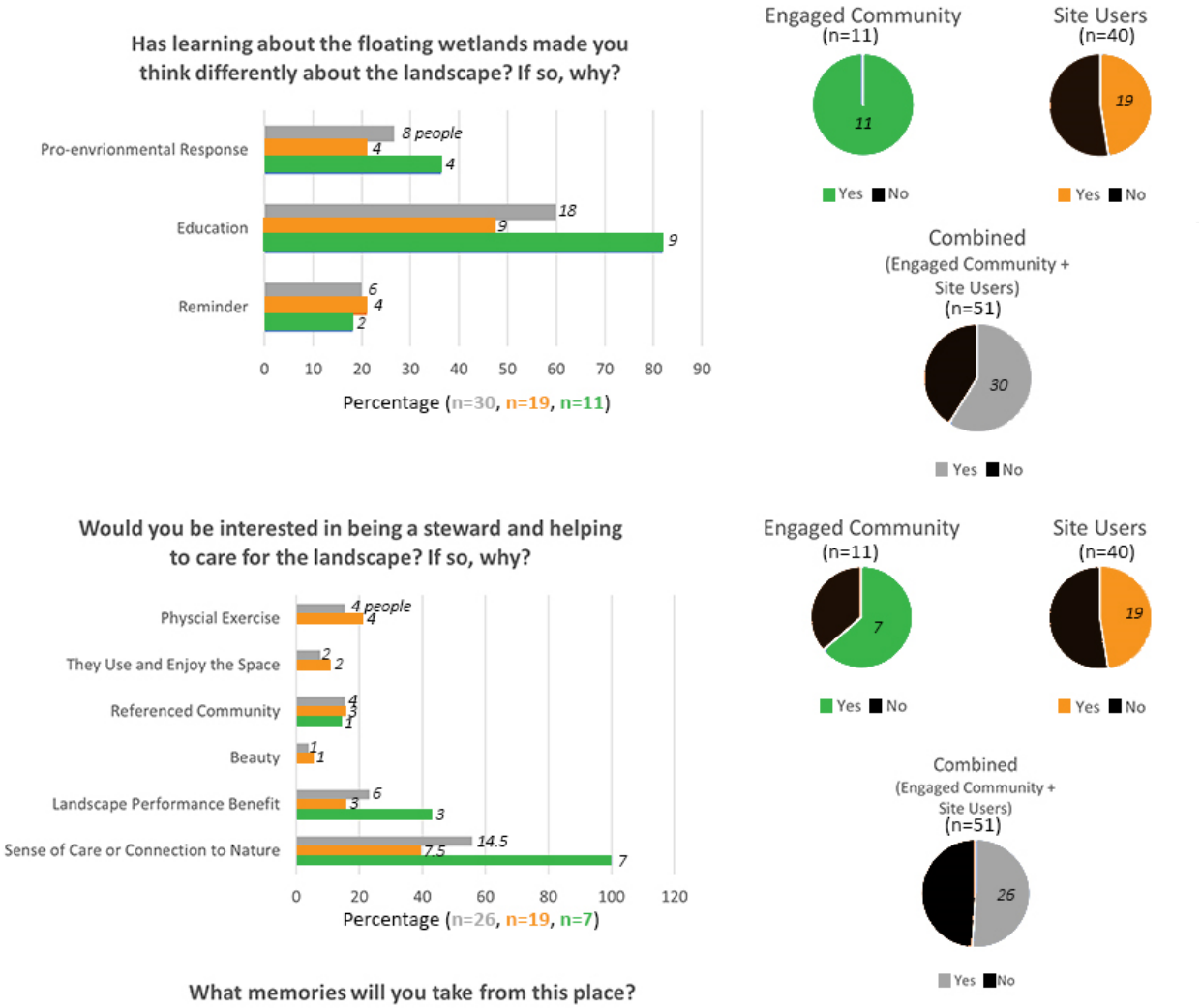
Site users (i.e., public) and engaged community members (i.e., steward, research, and design team participants) (*n* = 51) responses to the surveys showed their place attachment to the site based on the memories of the site, what they learned, and whether they were interested in helping steward the landscape (Figure 3.10). Site users (*n* = 40) reported more limited memories of more-than-human elements with their greatest recall related to social interaction and human elements (42%). In contrast, the engaged community (*n* = 11) reported that social interaction and human memories contributed at the highest level (73%) to explain their place attachment, acknowledging that they were influenced by memories of habitat or ecosystem (55%) and education, stewardship, or proenvironmental behavior (46%). These memories indicate that while human interaction was important, engaged community members linked that interaction to more-than-human elements of the system. In learning about floating wetlands, 48% of the site users came to think differently about the landscape than 100% of the engaged community participants. Of those who responded that they thought differently about the place, 60% overall noted something educational they learned that changed their perspective. Ergo, those who stopped to learn from the design intervention were gaining educational benefits while being reminded that people are a part of the landscape system. Additionally, engaged community members demonstrated knowledge and stewardship of more-than-human elements.

The survey also asked whether people were interested in being stewards. Overall (*n* = 51), 51% of the respondents were interested. Those who were not interested often stated that time was an issue. By expressing interest in becoming a steward, people are showing a desire to participate in the system and care for more-than-human elements. For those who responded “yes,” 56% (*n* = 26) felt connected to nature or mentioned caring for the land; this included 100% of the engaged community responses. Only 23% of the responses mentioned wanting to benefit the landscape performance. People are demonstrating a desire to care for the landscape and to be active participants in helping human and more-than-human elements of the landscape. This proenvironmental behavior may signal human attachment for the place and a desire to continue to improve the system relationships. Place attachment is strengthened by human understanding of landscape and ecological literacy of the site.

The engaged community responses show stronger connections to the landscape, understanding of a holistic landscape system, and care for more-than-human elements than from the general site users. People who participate in the design, implementation, and research become invested in the project and system. They build greater relationships with more-than-human elements and experience greater connectivity to the larger system. The engaged community may have come with some of those relationships, but their show of care and time indicates an ability to demonstrate those relationships in new ways or in new landscapes.

Figure 3.10

Survey results related to the place attachment of site users and the engaged community



Conclusion

Community engagement can encourage place attachment throughout a project. Engagement with community members in the design, implementation, and stewardship of the work causes those who are actively involved to exhibit care for the land and to form their own cultural place identity and connection. The Sweetgrass case study supports Toomey et al.'s (2020) efforts to demonstrate that community science can further increase people's place attachment. It exhibits stronger results for place attachment from engaged community members than site users. Throughout the project, the engaged community shows examples of care (Noddings, 2012) and proenvironmental behavior (Kollmuss & Agyeman, 2002) fostering a personal connection for people to the land. As one steward asserts, "I like to always be connected with caring for the environment and above all to educate our youth on the protection of our ecosystem." Community members focused on improving the relationships and interactions with more-than-human species through their involvement with the project.

The Sweetgrass Project considered community engagement beyond traditional data collection. Public Lab, a nonprofit organization "pursuing environmental justice through community science and open technology," defines community science as a "community-led scientific exploration and investigation to address community-defined questions, allowing for engagement in the entirety of the scientific process" (@mimiss & @purl, 2022). This study was intentional about the community involvement with a driving concern about the salmon population and habitat in the Lake Washington Ship Canal. The Urban Shores Working Group was an initial community engagement initiative that united professionals from science, ecology, design, and fisheries, as well as regulators and public officials. EarthCorps restoration trainees, students, volunteers, and stewards were another group of engaged community members who helped with the hypothesis and experiment. Stewards and scientists assisted with data collection and analysis. Community engagement occurred throughout the project by considering the design intervention as a part of the larger investigation. Artists contributing to the Sweetgrass Arts project were engaged community members willing to share landscape narratives and promote an understanding of the relationships with more-than-human elements. Community engagement strategies were also built upon community engagement work done in the Duwamish Floating Wetlands that strived to involve underprivileged communities and Black, Indigenous, and People of Color (Andrews et al., 2022). By having a diverse and engaged community, everyone contributed their own perspective and a desire to share it with others in their community. Through these system interactions, it becomes possible to show care, connection, and relationships between human and more-than-human elements in the system.

Including a broad range of community roles in repairing landscapes may increase human education about more-than-human elements. Engaged community responses expressed being "fascinated," proud, and having a desire to "see this succeed." They show this place attachment from the perspective of design involvement, not only through the collection of scientific data. The engaged community also demonstrated that they understood the design intervention and acknowledged the more-than-human elements in the system.

By emphasizing place attachment and care for more-than-human species, we can promote a paradigm shift from a human-centric design to a more holistic system, the goal of a holistic design intervention. Whether it is the "Chthulucene" (Haraway, 2016), "relationality" (Wilson, 2008), or "community" (Marchand et al., 2020), improving place attachment for humans and education about more-than-human elements is the first step to living with and making decisions in the holistic landscape.

Limitations and Recommendations

Critically, not everyone who uses the site will be an engaged community member. Therefore, clear and intentional design strategies – storytelling and ecorevelatory design – are pivotal to immerse more people with the land, helping them to recognize the system, change existing relationships, and ultimately move towards a holistic system. Landscape literacy and ecological literacy build with community engagement to form a place attachment leading to holistic thinking about the system.

The design intervention applied to the present-day Lake Washington Ship Canal at the Fremont bridge in Seattle included floating wetlands to provide novel salmon habitat and eco art elements to increase environmental education. While these interventions allowed some site users to see the system differently, the impact was limited, possibly due to their limited duration and visibility. This study supports the recommendation that interventions be permanently installed at a grander scale to have a stronger impact on the site user. Additionally, people may come to better understand the role of floating wetlands by removing the invasive blackberry on the shoreline that blocks the view of the water and by incorporating traditional shoreline restoration practices with the floating wetlands and eco art. Floating wetlands can be a visible reminder if people know what they are. But in this Sweetgrass study, the floating wetlands were difficult to perceive and, therefore, had less impact on human perceptions and understanding of the landscape around them.

Further research is needed to examine the role of landscape literacy, ecological literacy, and place attachment in designing a landscape intervention with a holistic mindset.

Summary

By examining the socioecological system and history of the site, design interventions were implemented to benefit a holistic system. This research suggests that the community needs to be engaged and collaborate in multiple facets of the design intervention. The floating wetlands created opportunities to repair more-than-human and human interactions within the system. The human connection to the landscape was measured to assess landscape literacy, ecological literacy, and place attachment. This study demonstrates that community engagement increased people's place attachment and connections with the land. The project also promoted landscape and ecological literacy but could have benefited from the inclusion of different design parameters to enhance site users' perceptions and interactions with the place. This research suggests how we can improve system interactions and relationships that advance us towards acting within a holistic system paradigm.

Chapter 4

Hunter's Point South Waterfront Park Case Study: Discovering Stories and Narratives in the Landscape and Examining the Landscape Literacy of Site Users

Landscape Narratives

Landscape designs alter system dynamics and weave new and untold narratives about the land. The land story continues to build upon itself while developing and changing over time. Historical narratives do not leave the site; instead, as designers, we build on them and amplify the narratives. The modification of the site changes not only the immediate land, but its surroundings and systems. The ripple effect through the larger land system creates a unique, complex history. This research explores that story for one New York City site, Hunter's Point South Park, measuring the impact of a design intervention on the land and system interactions.

Ann Whiston Spirn defines "the language of landscape" as a form of communication and storytelling from the past to the future (Spirn, 1998b, 2019). She elaborates, "Heidegger called language the house of being, but the language of landscape truly is the house of being; we dwell within it" (Spirn, 1998, p 16). People are a part of the landscape, and we are pieces of the larger system. Spirn writes about the need for designers to deeply understand the landscape to see the narratives fully and to reveal the past and the future. As landscape architects, we require a deep understanding of the landscape that includes human and more-than-human elements: a more holistic view. In human centered thinking, humans are the important element, but within a holistic view, more-than-human elements like trees, water, animals, and plants are critical elements and as important as humans. By further understanding the landscape, we can show care to the whole land system and foresee a holistic future for human and more-than-human elements. Although it is not enough for designers alone to understand the language of landscape, if site users and humans in general understood the landscape, the care and relationships between human and more-than-human elements could change. We could have a holistic landscape.

To view the landscape holistically, designers can work to reveal the history and narratives of the landscape through the design. If past narratives remain seen in the landscape and more-than-human elements have their own presence, we can start to educate and share the language of landscape with others.

According to Matthew Potteiger and Jamie Purinton (1998), "narrative refers to both the story, what is told, and the means of telling, implying both product and process, form and formation, structure and structuration." Landscape narrative is among the design methodologies that Potteiger and Purinton recommend when considering how landscapes convey a story. "Interpretive" or "storytelling" landscapes are additional methods that reference the history of the land or a specific plot line in the design process. More recently, Catherine Heatherington (2011) considers how even when storytelling is not the chosen design method, "traces (are often) left behind the influence the design and implicitly or explicitly contribute to new narratives" (Heatherington, 2011). Integrating past experiences may be too much for some landscapes, since understanding the future is based on how much the participant is willing to look at the past and move to the future. Key parts of the story are told through maintenance (leaving remnants of the past), symbols on the site, drawing on new narratives and meanings, and educational elements. Cultural backgrounds and ecological knowledge may impact what people gain from a site and how they interpret the layers (Heatherington, 2011, p 183). This design strategy can also

evaluate how narratives are illustrated in the design, ultimately sharing whether the landscape literacy is visible to human site users.

As landscape architects, we can use landscape narratives to illuminate the larger land story about an area. We can use narratives to tell holistic stories and to introduce or acknowledge more-than-human elements of the land. Indigenous populations have long used storytelling to pass along land knowledge (Kimmerer, 2013b; Marchand et al., 2020). They have told stories that often follow more-than-human element relationships to help us as humans understand how to care and respect other elements in the system. We can learn from this holistic storytelling and work to expose those narratives, especially the more-than-human narratives, in the landscape. By telling a story in the design about the past land systems and the process, we can better understand where the system is today and gain a comprehensive story beyond present-day human elements.

Site narratives should not reflect only past or historic landscapes. Instead, they should also communicate a current and future landscape. Because of past development decisions, our planet is rethinking design to be able to withstand climate change and increases in storm intensity. By making these resilience decisions visible within the landscape, people can become more aware of what is happening around them and within the land system of which they are a part. This system was analyzed to understand the following:

- *By designing a landscape that benefits more-than-humans, integrates historical narratives to amplify marginalized voices, and engages contemporary practices of resiliency, can people comprehend the landscape approach and recognize the larger systems functions?*

A framework for understanding the land and answering the above research question requires the researcher uncover site narratives and to explore more effectively the motivations and priorities behind the design interventions, landscape literacy, ecological literacy, and place attachment. Landscape literacy results from site users' understanding of the past, present, and future narratives revealed through the design intervention. Specifically, it will relate to the historical narratives and the interpretive landscape elements that were designed into the current landscape (Heatherington, 2011; Potteiger & Purinton, 1998). Ecological literacy refers to the more-than-human elements, relationships, and intersections that occur on the site. Do people understand those connections and the importance of more-than-human species in the landscape? In this methodology, ecological literacy is developed from ecorevelatory design strategies used to demonstrate those systems and give more-than-human elements a home in the landscape. Ecological literacy results from reading and understanding the more-than-human elements of the land, but it can also leave desires for wonder, exploration, and connections (Boehnert, 2012; Orr, 1989). Lastly, place attachment shows human elements' connections with other elements and systems, the "emotional bonds that individuals and groups have toward places of varying geographic scales" (Manzo & Devine-Wright, 2012). The relationship between human and more-than-human elements can lead to place attachment and desire to see the landscape beyond a human-only or human-separate place. This potential is further understood through community engagement.

Methodology

This question is being examined at Hunter's Point South Waterfront in Long Island City, New York. Phase 1 of the park opened in 2013, while phase 2 was completed in 2018. A landscape biography was completed to discern how the system changed over the years and how today's design reflects the historical, present, and future elements of this system The goal was to understand the greater story being told and to recognize the impact of the site design beyond the site boundaries on the larger system. A landscape biography brings together various sources that explore the history of the land. It is "an integrative, long-term perspective of landscape changes" (Kolen et al., 2017), and it seeks to explain a holistic story through multiple perspectives, especially underrepresented viewpoints from the land.

A framework of landscape literacy, ecological literacy, and place attachment was further evaluated on the current land systems through semi-structured interviews, intercept surveys, and site observations.

Semi-Structured Interview

Onsite interviews were conducted with SWA/Balsley landscape architect (Jacob Glazer), Hunter's Point Parks Conservancy (HPPC) executive director (Jessica Sechrist), and HPPC president (Rob Basch). The interviews focused on each stakeholder's themes, key events, and intentions that emerged from grounded theory (Creswell, 2009; Robson, 2002). These interviews with the designer team, SWA/Balsley, illuminate the intentional connections the designers made between past and current narratives. They started to form a relationship with the land early, discovering the narratives and bringing those into the present-day landscape. The narratives looked at past site uses, the surrounding neighborhood, relationships to larger New York City systems, and the more-than-human habitats. The design tells a story that site users can understand and gain by observing and being a part of the landscape. By interviewing HPPC leadership, we can understand what element relationships are created through their efforts and how human and more-than-human elements are stewarded. The interpretive landscape and ecorevelatory elements were noted from all three interviews and used to code survey results.

Intercept Survey

What people have learned about the landscape by being in the place can teach us more about landscape and ecological literacy. For example, the intentions and narratives of the designer who knows the landscape are not necessarily recognized nor shared by the public and site users. Overall, 76 site user surveys were collected, of which 16 were intentionally given to stewards and known active community members. The other 60 were collected by asking site users to complete a survey about the park. All surveys were completed by site users 18 years or older and distributed by paper for people to return immediately to the researcher. The survey collection area varied; nearly half the survey time was spent near the rail tracks and child and dog programming areas, while the other half was in the middle of the salt marshes. This approach allowed for multiple perspectives, whether they were focused on the human elements or spent more time with the more-than-human elements, which prevented the location from influencing survey results. All questions were free-response and open-ended (Robson, 2002). The data was coded using qualitative thematic coding and analysis, which identified keywords and landscape elements from the historical biography, research, and designer interviews in the survey responses (Creswell, 2009). In some cases, results were categorized into higher level categories like human and more-than-human elements. Results were categorized and percentages calculated for how

many people responded within each code. Additionally, percentages were calculated for overall surveys and those that responded, since not everyone answered every question.

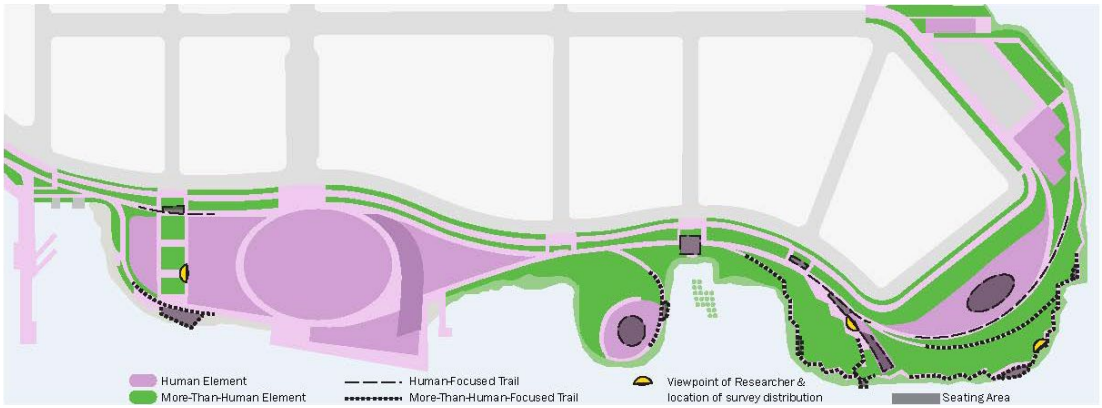
Community engagement was further understood based on surveys of the HPPC board members and stewards or volunteers. A total of 16 surveys were distributed to those active in the HPPC programming. During this time, stewards were active in weeding the landscape and caring for the native plant beds. Community engagement reveals a greater connection these people have to the landscape.

Observation

One can better understand whether visitors engage with more-than-human elements by formally observing how people use the space. Methods were based on Jan Gehl's Public Life Tools but modified to fit this site and the research questions (Gehl, n.d.; Gehl & Svarre, 2013). Three observation locations were chosen along a human to more-than-human spectrum. Each location had a path near the water that had a higher number of more-than-human connections and one closer to the road that was more human-dominant (Figure 4.1). People were recorded each time they passed through a space; I noted whether they walked, ran, biked, or rode scooters, and whether they included children or dogs. Additional notes were made if people stopped along their trail, engaged with the plantings, or stopped to read the signage. These notes told us about the site users' observance and their interactions with other elements in the system.

Figure 4.1

Human-dominant elements vs. more-than-human elements of the site

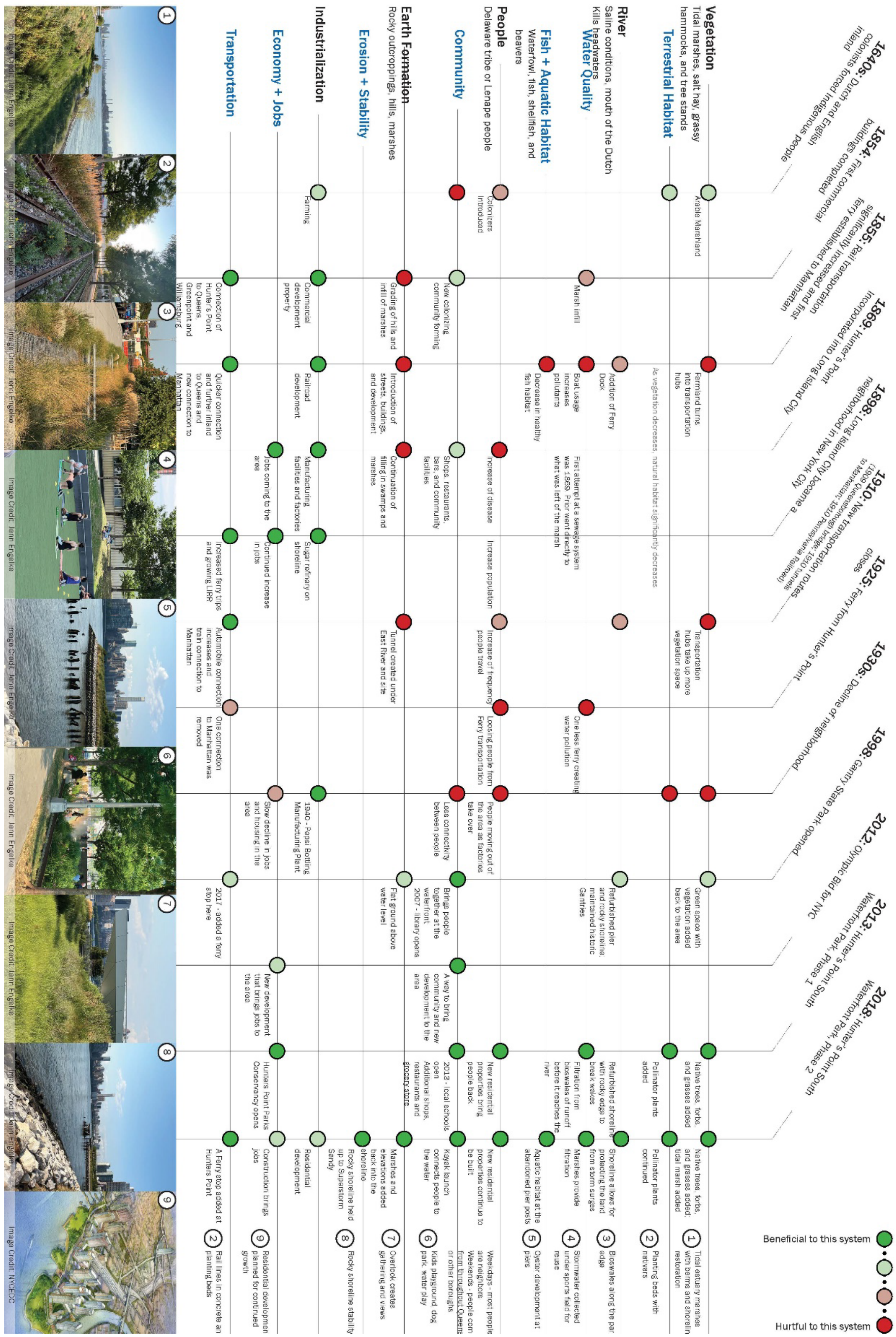


Landscape Biography: Hunter's Point

This land was the pre-European colonization home to the Delaware Tribe or Lenape people. They lived with the land and viewed the land as "[belonging] to the Creator" and interacted as a way of shelter and food sources ("About the Delaware Tribe of Indians," 2022). The Lenape people fished from these streams (Seyfried, 1984, p. 75). The land had tidal marshes that were filled daily with deposits from the East River (Seyfried, 1984, p. 75). These salt marshes served as a mouth for the Dutch Kills headwaters. Saline conditions were mixed with this freshwater influence and were home to "salt hay" and "grassy hammocks" (Seyfried, 1984, p. 75) along with waterfowl, fish, shellfish, and beavers. Rocky outcroppings and hills allowed the growth of tree stands. The area is shown as underwater and a part of the East River in the Welikia Maps of 1609 (Sanderson, 2017). These system elements changed over time; they are further explained below and mapped in Figure 4.2.

Figure 4.2

Timeline showing change of the system through history



The present-day Hunter's Point area was initially an island surrounded by a tidal marsh (Seyfried, 1984, p. 83). As Dutch and English colonists began to arrive in Long Island City (LIC; see Figure 4.3), the Lenape people were forced inland, while the colonists used this land as farm settlements. Between the 1640s and early 1800s, the land was passed down through generations of family farmers. The land was eventually named after Captain George Hunter, whose wife was an original descendant of a Dutch family that landed in LIC (Seyfried, 1984, p. 75). Hunter's Point maintained an arable tidal marsh with rocky pastures of mostly grasses and some shrubland (Seyfried, 1984, p. 83), as shown in Figure 4.3. After George and his wife Ann passed away in 1825 and 1833, respectively, Hunter's Point was sold; Erie Basin and Red Hook were filled in, and the land became commercial development property (Seyfried, 1984, p. 83).

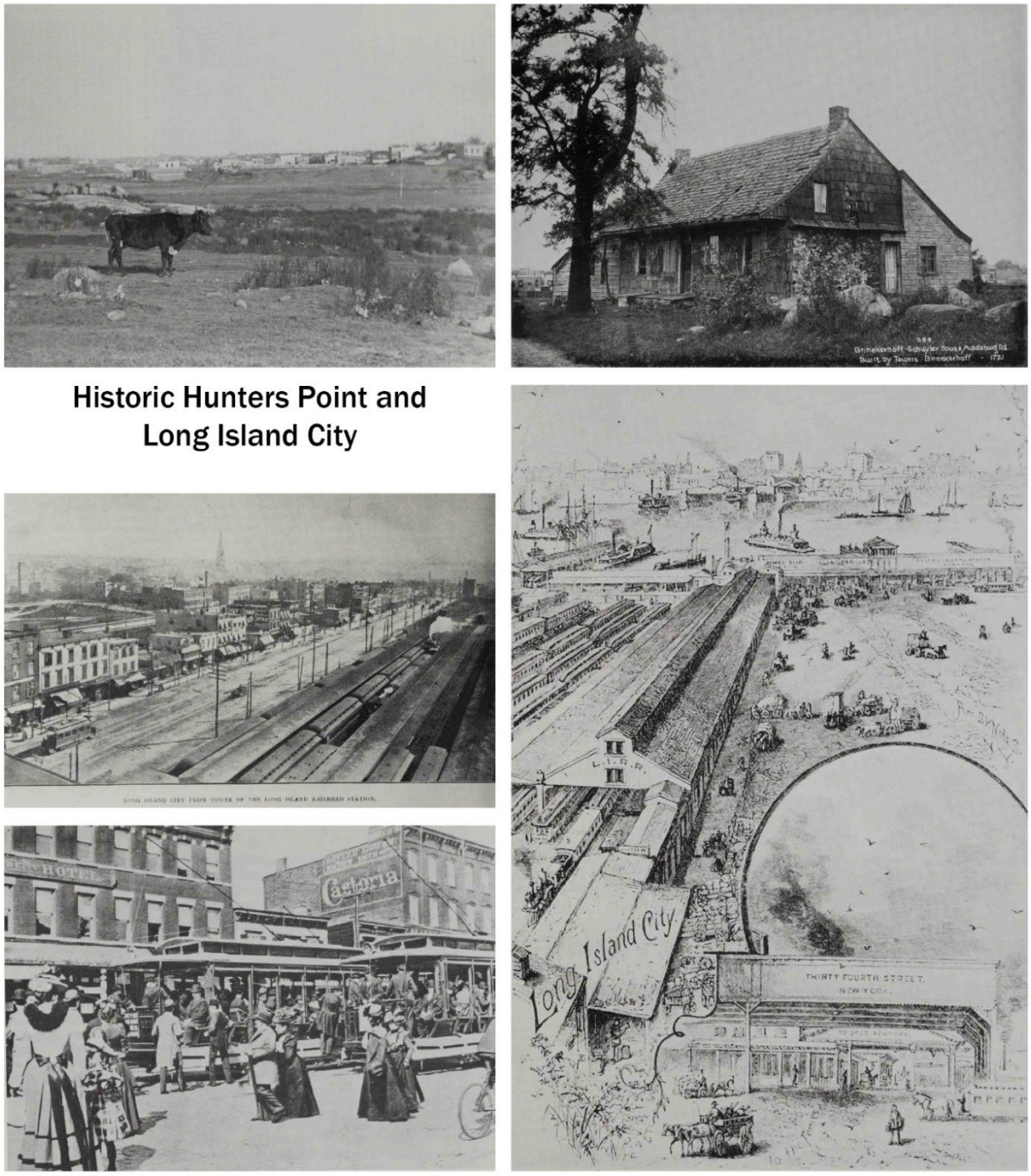
The first commercial building was completed in 1854 and became the start of connecting Hunter's Point to inland areas of Queens and across the Newtown River to Greenpoint and Williamsburg. The 1850s were a time when rail transportation in the area grew rapidly and the majority of farmland in the area was sold to be used to construct rail stations (Seyfried, 1984, p. 85). The first ferry from Hunter's Point to 34th Street in Manhattan was also established in 1855. The original ferry dock was not built to usable conditions, so the land was filled in for a more suitable use (Seyfried, 1984, p. 85). The land and terrain continued to be manipulated by the Long Island Railroad (LIRR), which opened in 1861 (Seyfried, 1984, p. 76). The LIRR was a way to expand travel options into inland areas like Flushing and Jamaica for Hunter's Point (Figure 4.3). The hills were graded and the soil removed to use to fill in lowland areas (Seyfried, 1984, p. 84). The area began to develop into a community of working class citizens (Seyfried, 1984).

As the infill occurred, streets, sewerage runoff, buildings, and development became the landscape's dominant features, replacing plants, animals, and water. More-than-human elements were eliminated, and humans further altered the land conditions primarily for their use and desired functions. Little consideration was given to how the marsh plants and animals would survive in this new urban setting. Water was previously tidally with an influx of fresh water from Dutch Kills and Newtown River. Water flow at this time was planned to runoff into the Newtown River or East River, prompting concern about the area's water quality.

With significant transportation and population increases, Hunter's Point began its first school in 1861 (Seyfried, 1984, p. 88). The community was self-sufficient with shops, restaurants, bars, community facilities, and manufacturing facilities, including oil, tar, and coal plants (Seyfried, 1984, p. 89). Between the factories and the transportation hub that emerged in the area, it was becoming a "smelly" neighborhood (Seyfried, 1984, p. 91) and the filling of more swamps and marshes with soil and human infrastructure continued at a rapid rate, especially with the establishment of water and gas access from Brooklyn. Waste freely flowed into the marsh and rivers, since the area did not have sewage treatment plants. Runoff from the factories further contaminated the waters. The first attempt at building a sewage system occurred in 1869, but the rate of development continued increasing the amount of waste that needed to be managed. Public health concerns echoed through the neighborhood when malaria began to spread ("Public Health Response," 1869 from Seyfried, 1984, p. 94). Disease and waste were running rampant in these humans-dominated systems. The infill of marshland was completed in 1880 (Seyfried, 1984, p. 106). Through the development of Hunter's Point, the area continued to grow with factories, businesses, and development. Figure 4.2 shows the increase of red circles, or harm to the system, for more-than-human elements in the system, which increased during this time.

Figure 4.3

Images from 300 Years of Long Island City 1630–1930 by Vincent F. Seyfried. Upper Left – Looking towards Hunter's Point: This image illustrates the arable land with rocky outcrops and open fields or marshes in 1900 (Van Riper College). Upper Right – One of the early Dutch or British farmhouses built in the 1700s: Remnants of the farm equipment can be seen in the landscape (William A Holst Sr.). Middle Left – Overview of the LIRR train stop and was built on fill of the marsh in 1895. Lower Left – Showing the transportation that was near the 34th St. ferry terminal in the center of Hunter's Point around 1898 (Sid Silleck photo). Lower Right – The transportation hub of LIC and the connection back to the water and Manhattan



Hunter's Point was incorporated into LIC in 1869. In 1897, a sugar refinery dominated the development along the shoreline and supported the continuing development of the area (NYC Parks, 2018). In 1898, LIC became a neighborhood in New York City. By 1900, there was significant growth in LIC, and the population grew to 48,272 people, from only 15,609 people in 1875 (Seyfried, 1984, p. 133). The ferry made regular trips to Manhattan, and the LIRR was active throughout Queens and beyond. In 1910, the Pennsylvania railroad to LIC was opened to Queens. The rail had long ended in New Jersey, but officials decided to extend it to Manhattan. Because there was no place to turn the trains around in Manhattan, the rail line was extended to LIC and went directly under Hunter's Point. Due to the Pennsylvania Railroad tunnels, many streets, buildings, and city lots were displaced and reconfigured (Seyfried, 1984, p. 138).

With increased access to Manhattan due to the Pennsylvania Railroad, the Queensborough bridge opened in 1909. Additional access tunnels to Manhattan opened in the 1910s, while the ferry from Hunter's Point closed in 1925 (Seyfried, 1984, p. 139). Consequently, people coming to Hunter's Point began to decline, and the area became a "ghost town of shabby and neglected buildings" (Seyfried, 1984, p. 139). As the neighborhood lost the community elements that allowed human systems to thrive, minimal functional elements and systems remained.[11]

Today, Hunter's Point South is the focus of a design intervention that has transformed an industrial area into a thriving residential community in LIC. The park is a gathering place for community neighbors on the weekdays and a weekend destination for all residents of Queens. Hunter's Point Park is a city park that builds upon the south side of the waterfront park of Gantry State Park, the latter being developed in 1998. SWA/Balsley designed Gantry State Park to incorporate the old shipping gantries that visually identify Long Island and have become iconic to the shoreline. The area was previously home to a Pepsi-Cola bottling plant, and the recognizable Pepsi sign was preserved and moved to the park. The original piers and shoreline were also preserved and speak to the industrial shipping past of the land. See Figure 4.4 for interpretive elements that display historical narratives in Gantry State Park.

As part of the New York City bid for the 2012 Olympics, the Hunter's Point land was designated as a place to build athlete housing. It was an area that the New York Economic Development Council (EDC) wanted to invest in and turn the existing park into a destination for Queens residents. The bid for the Olympics failed, but the EDC still viewed it as a potential location where mixed-use, rent-controlled housing could be used to re-establish the shoreline to the community and the vibrant community hub it once was. For the development to occur, the shoreline needed to be stabilized and redevelopment designed to protect the neighborhood from flooding and storm surges. The land to be redeveloped was dug out and fill was added along the shoreline. This landfill area was then ripe for development, a new park space, and the next chapter in the land's story (Hunter's Point Parks Conservancy & Kapochunas, 2021).

[11] According to letters from Long Island City Docks, September 16, 1937, by John Drennan of the Nassau County Museum Reference Library and "Carfloats" on the East River at Long Island City, February 3, 1945, from the Queens Borough Public Library, the docks became industrial shipping centers that served Queens and the rest of New York (Seyfried, 1984).

Figure 4.4

Gantry State Park design elements that relate to the land's story

In 2013, the first phase of Hunter's Point South was completed and opened to the public. This area connects with the existing community and features a children's playground, an oval lawn space, a dog park, a pavilion, and a beach volleyball court. Although many areas were human-centric, they still had ways to include historical and ecological narratives, as mapped in Figure 4.5. One of the main planting beds leading to the playground and dog park has old rail lines intermixed with native plants to showcase the historical rail connection of this land (see Figure 4.6). This site also has a story of resilience critical to the design. The native, nativar, and cultivar plants create pollinator habitats and are home to butterflies,

bees, and birds. Another design element was an artificial turf oval that serves as a lawn for the community, teeming with people of all ages exercising, children at play, dancing, and other community activities (see lower left image of Figure 4.7). The area also collects water below the surface and serves as a holding spot to prevent flooding and storm surges. A bioswale with a gabion filter was designed along the bike path near the street. This bioswale filters water as it runs off the bike trail and before reaching the East River. The shoreline has concrete revetment walls from a previous time that served as the boundary installed by the US Army Corps of Engineers. Additional riprap was added below the concrete wall to soften the edge.

Figure 4.5

Design elements that relate to the land's historical story

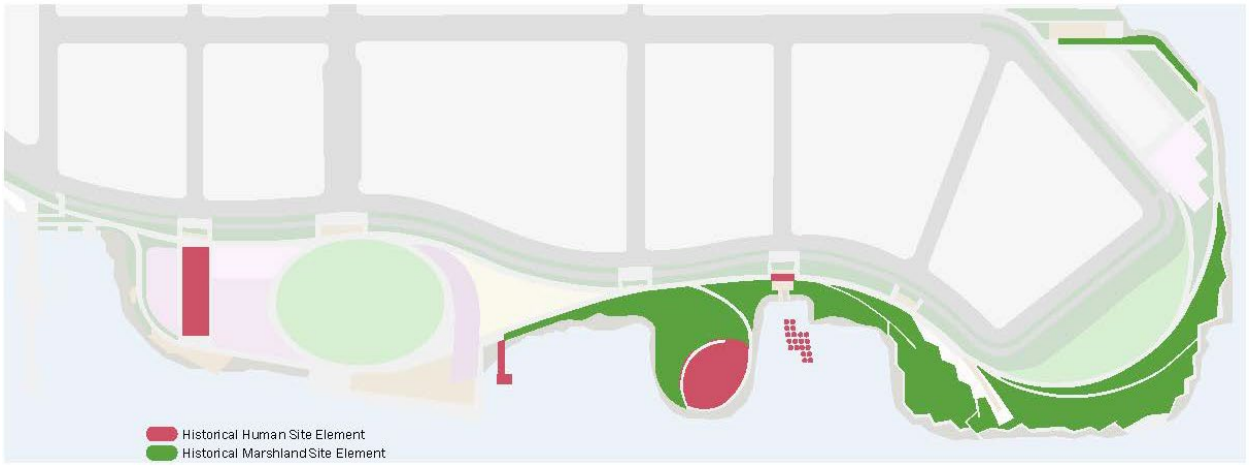


Figure 4.6

Interpretive landscape elements of historical narratives at Hunter's Point South

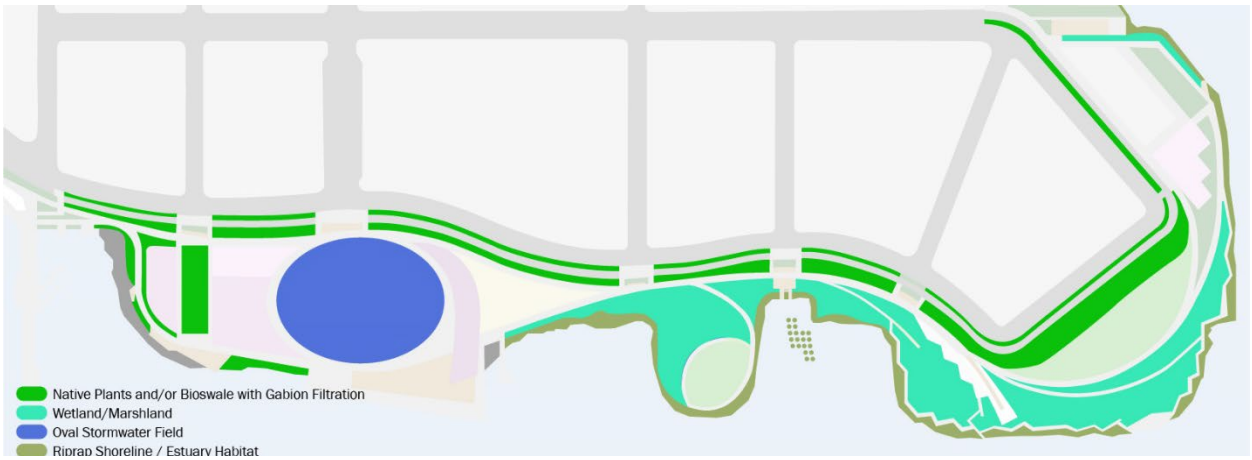
In 2018, the park's second phase was completed, and it focused on both human and more-than-human elements. The park uses salt marshes created from a berm edging (see Figure 4.7). The shoreline uses riprap for stabilization and to prevent erosion. The salt marshes address present and future concerns of storm surges, sea level rise, and wetland mitigation. See mapped locations of more-than-human elements in Figure 4.8. They are a nod back to the historic marshes of the area and mandated by the city for mitigation efforts from further upstream. Throughout the berms and salt marshes, many trails, overlooks, and resting points were created to bring people near the water. Trails along the berms were intentionally built four feet wide to make people feel closer to the more-than-human elements of the salt marshes (Glazer, 2022). Additional elements included a kayak launch to physically connect people to the water. The bioswale continues along the bike trail and serves as a unifying element across the park (Figure 4.7). SWA/Balsley elaborated the concept by extending the bioswale into one of the streetscapes and linear parks connecting to the park. This stretch illustrates the soft shoreline with riprap instead of a concrete wall for a shoreline edge. The soft shoreline was made possible by this area being built from fill dug up from the development construction. Fortunately, the fill was considered clean and not contaminated from historical site uses. Rail lines were built into the pavement and align with old pilings in the water, as seen in Figure 4.6. The old pilings were preserved as much as possible to keep the estuary habitat that they create (Glazer, 2022). Design elements convey the community's most recent history, but also reach to its historic past as the land histories kept building on one another.

Figure 4.7

Ecorevelatory elements at Hunter's Point South

Figure 4.8

Ecorevelatory design elements of the site



The more-than-human benefits of the park are designed to assist in mitigating potential storm surges and sea level rise, increase pollinator and bird-friendly plants, and accommodate stormwater flooding. For storm surges and sea level rise, the oval in phase one accounts for 557,766 gallons of stormwater retention (DuRussel & Singh, 2018). In phase two, the salt marshes were added and intended to hold estuary water during high tides and storms. The plant life comprises native plants and cultivars or nativars developed by plant breeders and not previously found on the site. This cultivation has allowed for birdwatching and nature walks to occur during peak migration periods. Over 120 different bird species have been recorded at Hunter's Point South, with 113 at Gantry State Park ("Hunter's Point South," 2022). Furthermore, Cormorant Island, a bird sanctuary, is nearby in the East River. This parkland adds to the area for the birds. Lastly, the bioswale continues along the edge of both phase one and phase two implementations to collect street runoff before it heads into the East River. This bioswale includes a gabion ribbon to help with filtering the water. The surrounding streetscape development also includes proper-sized silva cells that create the right place for tree growth (Glazer, 2022). Not all these areas were planted with trees yet, but the silva cells were still added in anticipation of future growth.

Overall, the system relationships focused on more-than-human elements early on and transitioned to human elements over time. The shift became stronger as more development occurred in the 1850s, and the marshland continued to be filled for human infrastructure. A change to include more-than-human elements in the system function occurred as the shoreline park was built in 1998 and helped engage the water and more-than-human elements. Diagrammatically, this transition is shown in Figure 4.9. The connections between historical human and more-than-human elements with current-day design elements are shown in Figure 4.10.

Figure 4.9

Diagrammatic timeline showing system relationships overtime

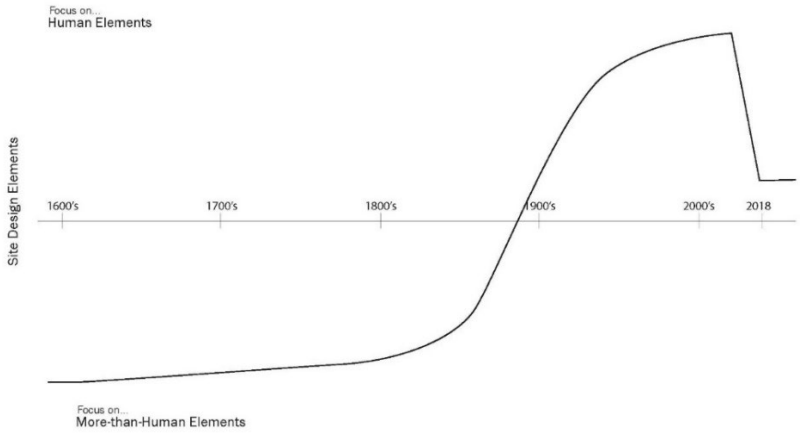
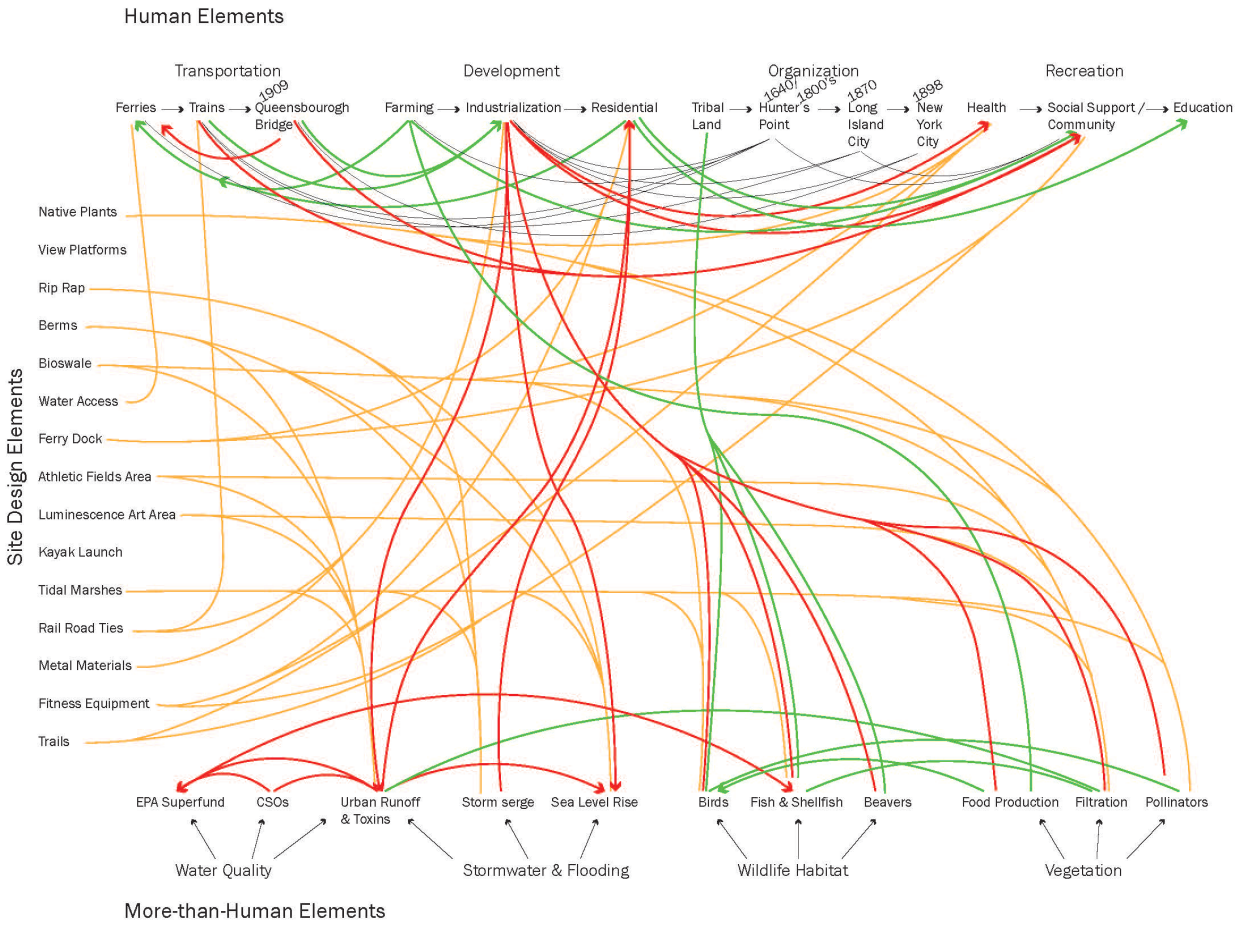


Figure 4.10

System relationships and historical growth of present-day Hunter's Point South, demonstrating how history has grown and impacted the system relationships over time. The current design elements also connect to past themes and system elements

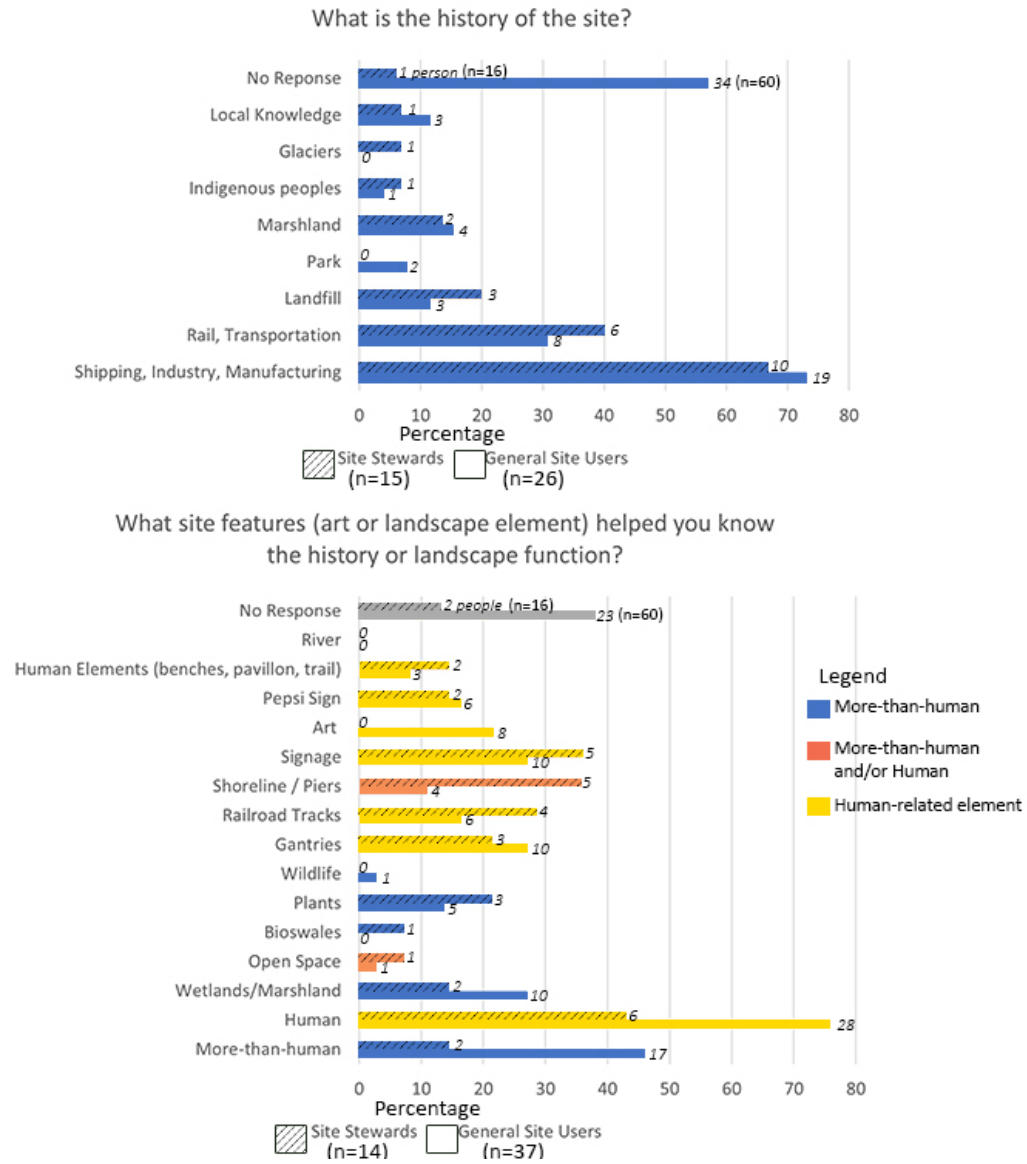


Results

Storytelling Through Design. The two stories highlighted by the landscape architect were stories of the land's history and the land's resilience. The land's history was identified through the landscape literacy of the site, while the land's resilience is measured by the ecological literacy of the park users. The intent of the landscape architect was evident to the researcher and designer, but how did site users understand the land? Forty-three percent of general site users and 94% of stewards who gave an account of the site's history included marshland, transportation, and industry. In addition, 62% of general site users and 88% of stewards could identify what helped them to know the history or landscape function. Figure 4.11 presents the results for both questions.

Figure 4.11

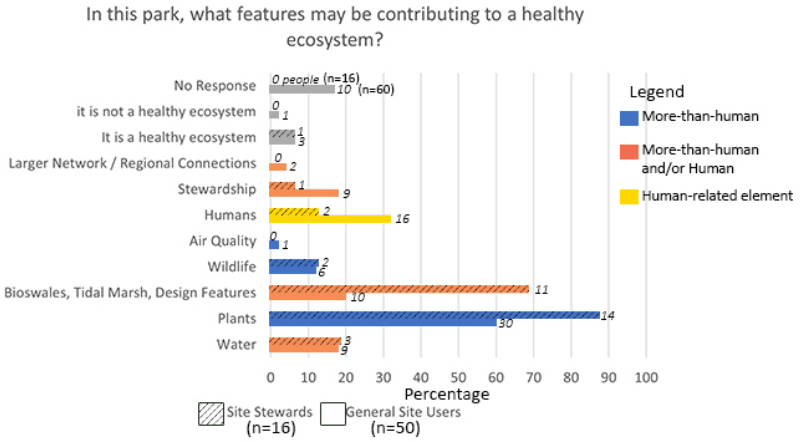
Landscape literacy survey results showing the percentages of general site users and site stewards who responded

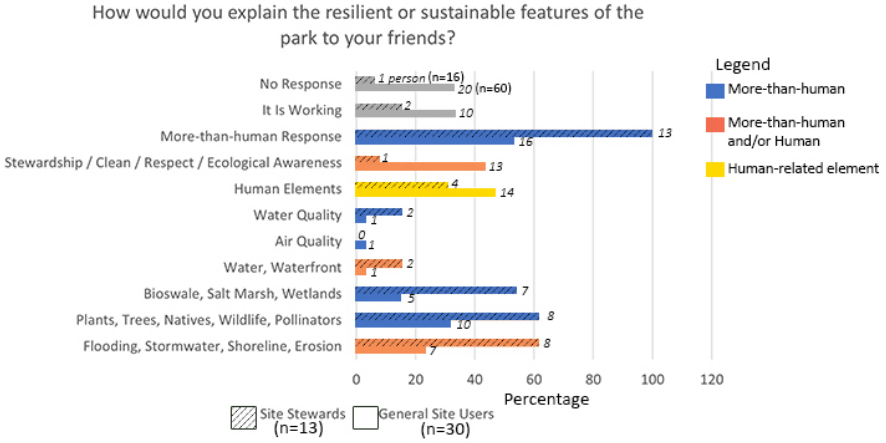


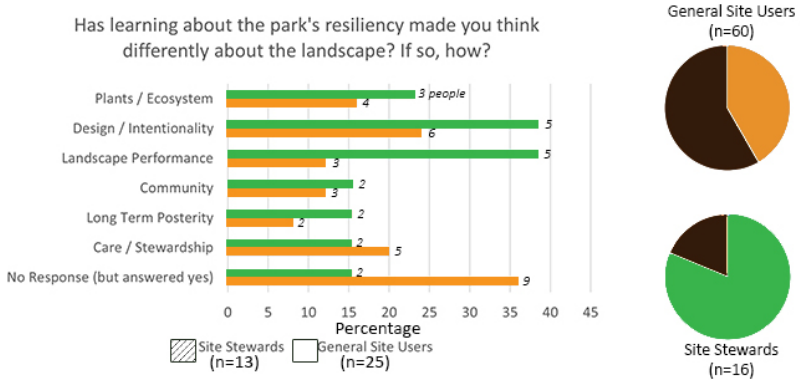
Ecorevelatory Design. The site clearly demonstrates how more-than-human elements are visible in the landscape and not hidden underground. The marshes, bioswales, and stormwater management are evident to the researcher when walking around the site. Eighty three percent of general site users and 100% of stewards described what was contributing to a healthy ecosystem. In addition, 50% of general site users and 81% of stewards responded about what made the park sustainable or resilient. Lastly, 60% of general site users and 81% of site stewards felt differently about the park after learning about the landscape. Detailed responses are found in Figure 4.12.

Figure 4.12

Ecological literacy survey results with percentages of those who responded



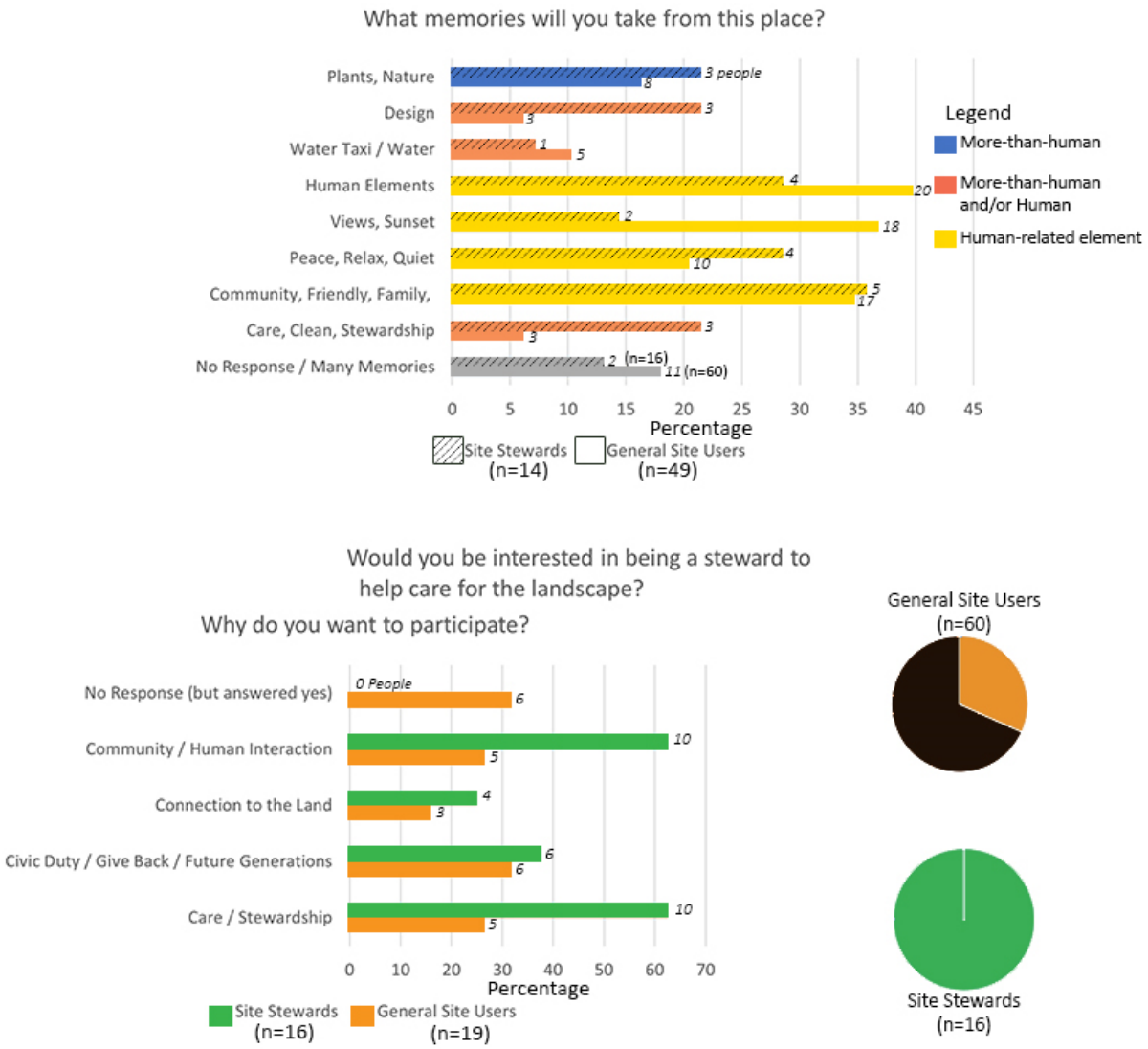




Community Engagement. Hunter's Point South Park is maintained by the New York City Department of Parks and Recreation with help from the Hunter's Point Parks Conservancy (HPPC). HPPC is a nonprofit organization that develops and provides community programming for the park to serve all ages of park users. Stewardship clean up, planting, and weeding are regular activities that bring people together and help human and more-than-human elements interact (Sechrist, 2022). Additionally, HPPC works with the local schools, libraries, and communities to integrate ecological education into their curriculum and programming. Eighty two percent of general site users and 88% of stewards responded with memories they have of the place, while 32% of general site users and 100% of stewards were interested in caring for the land and showed connection to the human and more-than-human land systems. Figure 4.13 parses the results.

Figure 4.13

Place attachment survey results with percentages of those who responded



Discussion

Landscape Literacy. The landscape literacy of Hunter's Point South looks to the historical land story told through the site and intentional design elements. The story of industrial, manufacturing, and shipping industry is shown through the existing shoreline, gantries, and signage throughout the park. The transportation and rail stories are found in the railroad tracks designed into the planter beds in phase one or embedded in the concrete walk in phase two (see Figure 4.6). The marshland history is seen with the new salt marshes, which acknowledge the historic marshes of LIC. The park's second phase is also built on a more recent landfill area that shows positive uses of development areas.

In examining how site users understood the site's history and the land's context, park participants were asked for short answer responses to describe the site's history. Overall, 54% of those surveyed (*n* = 76) described some sort of history regarding the land (e.g., shipping, industry, rail, transportation, landfill, park, marshland, Indigenous peoples, glaciers). This level of response tells us that at least one of every two people understood something about the land's history. In reviewing the steward responses, all but one steward (*n* = 16) responded with something relating to the landscape's history. This indicates that if people were involved, they often knew more about the land's story. Of all who responded to these questions (*n* = 41), 71% of people mentioned the shipping or manufacturing industry background, 34% mentioned the railroad or transportation history of the site, 15% noted the landfill, and 15% mentioned marshlands. These results tells us that the shipping and manufacturing industry was the component most strongly impressed upon site users by the waterfront piers and the historical shoreline. It is also the most recent component of the site's history. The large gantries from the shipping industry and the Pepsi sign from the bottling plant have become fixtures for people on the LIC waterfront.

Considering what helped people understand the history, site users and stewards were asked what helped them know the history and how the ecosystem functioned. Sixty-seven percent of those surveyed (*n* = 76) mentioned at least one element that helped them understand the landscape system function of the site, either the historical perspective or the present landscape function. Further, two of every three people could notice and identify something about the landscape. Of those who responded (*n* = 51), 37% mentioned more-than-human elements, while 67% mentioned human-focused elements. These response rates suggest that people tend to think about human or human-related elements for the site and position people dominantly within the landscape. Signage (29%), wetlands or marshlands (27%), gantries (25%), and railroad tracks (20%) were the elements most commonly identified. Seeing the more-than-human marshland emerge among the recognized elements was positive. All design elements related to the historical landscape story with the signage being the most overt way of learning about the landscape's history. Thirty-six percent (36%) of the stewards (*n* = 16) also identified the shoreline or piers as a major element at the site. Once again, they have more knowledge and connection to the landscape function and could consider the importance of the historical piers and shoreline protection for current-day storm surges.

Overall, landscape literacy was not prevalent among respondents, except those who familiarized themselves with the landscape, observed their surroundings, and took time to read the signage about the land. Those respondents were more informed and better able to identify the design elements related to the land's story.

In addition to the landscape design, a six-part YouTube series was created during the Covid-19 pandemic that highlighted the land's history from a local historian's perspective (Sechrist, 2022). Each of the

videos have between 112 and 361 views that show a desire to learn more and engage with the land's story and history. A few people recalled those videos as they told me about the site's history. While the videos do not tell a story through the design, people are still learning landscape literacy that they can apply in future visits to the land.

Ecological Literacy. The other story critical to this design is a one of resilience and sustainability. Landscape architect Tom Balsley was quoted as saying, "built to bend and not break" (DuRussel & Singh, 2018). The designers wanted to have a design intervention that was bendable and flexible with a healthy ecosystem. Overall, 87% of respondents could identify an element that contributes to a healthy ecosystem (*n* = 76). Therefore, they recognized a more-than-human component to this landscape. Of those that responded (*n* = 66), 67% mentioned plants followed by 32% of respondents mentioned bioswales, tidal marshes, or other green infrastructure (GI) design features. Percentages for stewards were significantly higher than the general public's responses, 21% higher for plants and 37% higher for GI. The higher steward responses underscore evidence of site users being aware of more-than-human elements and design elements that intentionally served more-than-human elements. In understanding more-than-human elements compared to human elements, 32% of the general public (*n* = 50) mentioned more human-focused elements compared to only 13% of the stewards (*n* = 16). This tells us that there is more of a human-dominance for the general public and that if one stewards and cares for the land, one is more likely to reflect on the more-than-human elements of the site. Even most of those people who were not site stewards could identify a healthy element in the ecosystem.

People were further asked, "If they were to describe the sustainable or resilient features to their friends, what would they say about the park?" Overall, 56% of the respondents offered something detailed about the site relating to sustainable or resilient systems (*n* = 76). Sixteen percent of people simply mentioned that it was sustainable or working without explaining their comments, while 28% did not respond. Anecdotally, many asked what a resilient landscape was. They easily knew what "sustainable" meant but were not as familiar with the term "resilience." This term is often used by design professionals, but it must be elaborated for the public. Of those who gave a detailed response (*n* = 43), 42% mentioned human-related elements (47% general, 31% stewards). These responses were frequently written with reference to design elements of the waterfront or to trash receptacles. People often viewed this question as probing the elements that made the place sustainable. By focusing on human-related elements, we see humans as a part of the ecosystem and as controlling people's narratives of sustainability. Thirty-three percent of the respondents who wrote detailed responses (*n* = 43) mentioned stewardship, cleanliness, respecting the land, or the ecological system (43% general, 8% steward). These responses show that many were trying to think of something other than humans by mentioning cleanliness and respect for rules. That perspective remains human-dominant, but it shows a positive sign of care for the land, expressing a worldview that transcends the self. For those who provided detailed responses (*n* = 43), 67% mentioned something that related to more-than-human elements of the site, including 41% who mentioned plants, trees, wildlife, or pollinators (32% general, 62% steward). Further, 35% of respondents mentioned flooding, stormwater, shoreline, or erosion (23% general, 62% steward), and 27% cited the bioswale, salt marsh, or wetlands on the site (15% general, 54% steward). Hence, people were aware of the system around them and the more-than-human elements of the site. The higher percentage of steward responses further identifies that if people are active in caring for the landscape, they are more likely to see the landscape's more-than-human

elements and system function. Overall, this finding offers hope that respondents did identify more-than-human elements of the system.

Lastly, people were asked whether they felt differently about the landscape after learning about it. The survey responses reflect what they learned from being in the space, since the researcher did not provide any information about the site. Overall, 50% of the survey respondents wrote that they felt differently about the landscape after learning about its resiliency (42% of the general users, 81% of the stewards; *n* = 76). Of those who responded "yes" (*n* = 38) to the question, design intentionality had the greatest impact on people seeing the site differently (overall 29%; 24% for general users, 38% of the stewards). Landscape performance had the second greatest impact on people's view of the site (21% overall) but was higher in the steward category when it increased to 38%. Of the respondents, 18% mentioned plants, nature, or the ecosystem as something they learned about (16% general, 23% steward). Care or stewardship was mentioned by 18% of the respondents. These responses suggest that being in the landscape impacted half of the people on the site. Site users think about the landscape system and can communicate how the system has changed or recognize how the system functions now and how it may function in the future. People are showing their recognition of the land's system and beginning to connect elements, seeing their relationships.

Youth environmental education programs are scheduled at the site to promote ecological literacy within the landscape. These programs include gardening with middle school students, an urban ecology curriculum with Newtown Creek Alliance, Leave No Trace coloring pages with The Blue Bus Project, and a future curriculum that is in development (Sechrist, 2022). These programs are helping to educate a younger population about landscape systems and to encourage care, stewardship, and respect for more-than-human elements of the landscape.

Place Attachment. Place attachment is one way that people can display a connection to the land. A person's connection with more-than-human elements can be strengthened when they steward or care for the landscape. Demonstrating connection increases human relationships with other elements and promotes the goal of understanding what it means to have a more holistic landscape. Hunter's Point Parks Conservancy has activities planned to help with weeding, planting, picking up trash, weekly walks, exercise classes, movie nights, and children's educational programming. These activities allow people to connect with the land and their neighbors strategically and intentionally (Sechrist, 2022). Their dedication and care for the land demonstrate a level of place attachment. Place attachment can also be found in people's memories of the space. Clare Cooper Marcus has written about the importance of environmental memories and the connection people make to the landscape from those experiences (Cooper Marcus, 1992b). Both stewards and site users were asked about their memories of the site to see whether people connected with more-than-human elements and a larger holistic landscape.

As a part of the survey, the public was asked whether they would be interested in being a steward and why. Forty-six percent of all respondents (general + steward) said they would be interested in being a steward to help care for the landscape (*n* = 76). The stewards are already volunteering and showing that interest. Of those who were only site users (*n* = 60), 32% indicated an interest in being a steward. Of the general respondents who were interested (*n* = 19), 32% mentioned doing it because it is their civic duty, they desire to give back, or they want to leave it well kept for future generations. Additionally, 26% mentioned interest in caring for the land, and 26% wanted to connect with their community, get to know their neighbors, or have more human interactions. These responses suggest that although there is

some interest, the general public is not highly interested in volunteering and caring for this site. Those interested in stewardship activities showed a sense of care, desire for connection, and altruistic behaviors for other elements and people on the land. They had a desire for a sense of connection. Of the steward responses (*n* = 16), 63% mentioned their interest in caring for the land, 63% also said community and human interactions were desired, 38% expressed their goals to give back and leave this place kept well for future generations, and 25% of the stewards mentioned connecting with the land. The stewards showed much higher interest in care, connection, and community than did the general public. With their stewardship, they have seemed to develop connections with the land and with each other; there are signs of place attachment with the most noticeable being a larger sense of community and care for the land system.

Place connections also form from the memories that people have of the place. Clare Cooper Marcus considered the attachment people have to the land from their memories and experiences with the landscape (Cooper Marcus, 1992b). Knowing people's memories gives us insight into how or why they feel connected within the system. Of those that responded (*n* = 63), 35% mentioned human-centric moments (community or family); 37% related to human design elements like a dog park, children's playground, exercising, or the pavilion; and 32% noted the views or sunset from the park. These responses confirm a sense of connection to human elements and community. The views or sunset could have some connection to the East River, but that was not specified in the responses. This view likely demonstrates a connection to Manhattan, which was also historically important to the site. Twenty-two percent of respondents (*n* = 63) voiced a sense of peace, relaxation, or quietness compared to the city around them. They related that this place is special and something different from the urban environment surrounding them in the neighborhood. Nearly 17% of respondents (*n* = 63) mentioned plants or nature as being in their memories, while 10% mentioned water and 10% mentioned caring for the land, cleanliness, or stewardship (6% general, 21% stewards). This response highlights a portion of the community that looks for larger, more-than-human connections and memories. The people relate to and connect with more-than-human elements in an urban setting surrounded by human-dominated elements.

Observational Findings

By observing how people use the landscape, we can better understand what people's preferences are in moving through the space and how they relate to the more-than-human elements of the landscape. Of the overall number of passes made through the park by people (walking, running, biking, children, etc.), 46% of them passed close to the water and through more-than-human areas. Figure 4.1 facilitates a comparison of the human versus more-than-human details of the site. People made relatively even passes between the more-than-human and the human pathways. People did not avoid the more-than-human areas even when the walkways were smaller and designed to slow people down and bring them closer to more-than-human elements. Reviewing the number of times people stopped along the more human-focused trail (human areas vs. more-than-human areas), 51% of the stops were at human areas while 49% were along the main trail. Again, this tells us that people were comfortable stopping and looking at the views or finding a bench for a break along the main trail and in the more-than-human areas.

While walking across the park people showed use and connection with both human- and more-than-human-dominated paths. This study also wanted to see how people used individual spaces, specifically

focusing on how many people were using the spaces. The data was calculated at different times of the day and on different days of the week. Due to the varying time intervals, the data was calculated as people per minute using each space, enabling comparison of the different areas. In a comparison of the number of passes through an area, the water spray zone (the most human-dominant area) had the most passes per minute (4.24 in the upper and 4.27 in the lower trails). The upper lookout is off the human-dominant trail but in a more-than-human area. This area had fewer passes per minute (3.05 in the upper and 1.99 in the lower trails). The most more-than-human-dominant area, the salt marsh, had the least passes per minute of observation (0.86 for the upper and 0.78 for the lower trails). One thing to note is the salt marsh included a Friday early evening observation but did not include weekend observations. In general, weekend numbers tended to be higher than weekday, but large numbers of people were still found on the weekdays. As such, more people spent time at the design elements programmed for humans and fewer spent time at the design elements programmed with more-than-human elements in mind.

While people passed through the spaces, the people who stopped in the space spent more time and made visible connections to the landscape around them. A comparison of the number of stops or views to the number of passes indicates that 21% of the passers in more-than-human areas stopped, while fewer stopped (19%) in human areas. More specifically, the water spray area saw 17% of passers stop (19% from human-dominant paths; 14% from more-than-human paths). The human-dominant areas saw a higher number of stops occurring at the water spray area, a very popular viewpoint, particularly on warm days. The upper lookout area averaged 20% of the passers stopping (17% from human-dominant paths; 25% from more-than-human-dominant paths). Lastly, the salt marsh averaged 41% of passers-by stopping (26% in human areas; 59% in more-than-human areas). Evidently, people who come to the salt marsh, water, or more-than-human areas tend to stop and acknowledge the water and more-than-human elements of the site, manifesting a connection and relationship people are acknowledging with the more-than-human elements.

Lastly, people were observed if they were reading signs or looking at the plants. People specifically looking at plants were noted for the last seven observations. In doing so, the times people looked at plants specifically was highest during the upper lookout (0.42 plants per minute), followed by the water spray area (0.23 plants per minute) and salt marsh (0.09 plants per minute). The lookout area may be higher than otherwise noted because data for this was not collected every day and the day it was collected was a weekend. The higher number of people stopping to observe at the spray area relates to the native plant bed built around the rail tracks that is attracting people's attention. If people are fully immersed and walking through the salt marsh, they spend less time specifically looking at the plants.

These observations reflect a balanced connection made by people between the human and more-than-human paths while illustrating the opportunities people made to stop and observe the more-than-human elements around the paths. People demonstrate some connections and awareness of the whole landscape while still preferring the human-dominant elements of the park. This observation relates back to how the area was designed to provide places for larger human functions and places designed for more-than-human habitation with some human interaction. People use all the spaces, and all seem to enjoy the landscape for whichever use they choose.

Limitations

This study had limitations that should be considered for future work. Surveys were printed only in English, and the surveyor spoke only English. Queens is the most diverse borough in New York City, with 138 native languages spoken throughout the borough (Koyfman, 2017). Because the language was language unfamiliar to them, not all people asked could respond. A few children tried to translate for their parents, and they wanted to participate, but answers were limited due to the communication barriers between the surveyor and the respondents.

During the observations, the number of times humans observed plants was not recorded in the first three observation sessions. This information may have offered more information about those specific places. The surveys were also done within a two-week period. There were activities scheduled for other times of the year including Watercolors on the Waterfront and Nature Journaling. These activities put into practice different approaches to translating the site and people's awareness of the elements found in the park. They could produce new experiences and connections between people and the land and help people to identify signs of ecological literacy and education. Unfortunately, the timing of this study did not allow interviews or surveys of people in these classes to understand their connection and how these programming activities influenced their narratives.

Conclusion

Landscape literacy is a design piece considered and incorporated into Hunter's Point South. SWA/Balsley was conscious of the history of the land and used historical elements as creative pieces within the design. If placed into Pottinger and Puritan's narrative typology, it would be under the "interpretive landscape" (Potteiger & Purinton, 1998). The designers showed the intention to have an interpretive landscape to tell a historical story and an ecological story. The railroad tracks, signage, ferry dock, and visual views of Manhattan relate to the historical story and the site's significance to people living in urban environments. The gantries and Pepsi sign from Gantry State Park also add to that historical story in a blurred line between Gantry State Park and Hunter's Point South.

It is not enough for only the designer to know this information. If the public is not educated and aware of the land history (e.g., how the system functions, and how changing the system impacts a holistic system), we will continue to view a system through a human-dominant lens. Based on the surveys, some site users of the place have spent time understanding the system, yet many site users neither understand nor care about the landscape. Those who know about the site could tell me significant details about the land. Even more, those who are most informed about the landscape already volunteer and function as stewards who care for the land. It is the other people that design elements need to reach to increase environmental literacy and to develop an environmental ethic of the land.

Hunter's Point South is a break or refuge from the urban concrete that surrounds New York City. The park did a fantastic job of creating a place where people feel connected, refreshed, and engaged in the community. Nearly everyone who filled out the survey made a remark that they were willing to do it because they loved the park. People connect to the area but cannot always articulate what that connection means. Through landscape literacy, it is our responsibility as landscape architects to make visible to the public and that connection significance.

It is critical for people to connect with the land and for the land to be a system wherein all elements converge and continue to tell the land's story. Hunter's Point South was designed to acknowledge its historical story and grow with the current and future community. It acknowledges the human community needs and how more-than-human elements interconnect in landscape. Landscape literacy prevails in the design intervention; over 50% of the site users understood something about the site from being there. Ecological literacy was evident to most site users being able to convey something sustainable, but just over half could describe the system and its sustainable features. People were choosing to seek out more-than-human places and stopping to enjoy time in those spaces, which is the first step in getting people to comprehend sustainable features. Lastly, place attachment was evident from people saying they love the park, but the reason for this affection and an acknowledgement of a holistic system were most telling among stewards. The difference between the steward and general site user responses further emphasizes that if people are stewards and care for the land, their understanding of the holistic land around them and their place attachment strengthen.

Chapter 5

Menomonee Valley Case Study: Ecorevelatory Design Within Systems Theory

When considering ecorevelatory design and landscape architecture in the realm of systems theory, the design style seeks to demonstrate more-than-human elements, their interactions with each other and with humans, and the resulting function. More-than-human elements such as vegetation, water, air, and wildlife are critical components of the landscape. Design can be used to celebrate, demonstrate, and reveal the important roles, relationships, and functions of these elements in the landscape system. Although the system is understood from a site user perspective today, it relates to past landscape narratives and connects to the future functions expected in the system.

In August of 1997, the University of Illinois faculty launched the *Eco-Love* lecture series and an exhibit of invited work from professionals that considered the importance of revealing the "ecological" elements of the landscape (Brown, B., Harkness & Johnston, 1998). These events made the focus of revealing the landscape's ecological side more prevalent. In 1998, a special-issue, *Eco-revelatory Design: Nature Constructed/Nature Revealed*, was published in *Landscape Journal* that considered practice and academic approaches to landscape design that emphasized the revelation of strong ecological narratives (Helphand & Melnick, 1998b). Ecorevelatory design has been criticized for being too theoretical and not practical, with cues to sustainable landscapes or ways to connect with ecological education (Arisoy, 2013; Eisenstein, 2001). However, Joan Nassauer provided a "cues to care" predecessor that attempted to bring ecological education into design (Nassauer, 1995). Nassauer later reflected that "cues to care" was not enough and that ecological literacy was necessary at the forefront of the design to create a paradigm shift (Nassauer, 2020). Ecorevelatory design focuses on the land's more-than-human elements but also on how the human elements interact and understand the more-than-human elements.

Systems-based theory comes from an understanding that all elements in an organization – both the human and the more-than-human – interrelate and combine to enable the system structure to function and process (Scheffer, 2009b). In its most basic definition, a system is defined by three components: elements, their interactions, and a resulting function. Systems cross human-defined boundaries and scales to shape the landscape we know today. For example, Menomonee Valley Park is defined with road and development edges to be the park-like setting surrounding the river. Each landscape element has its own narrative that has a place in the past and present. The park encompasses several different systems, including habitat, human, developmental or industrial, and river systems. Each of these systems crosses the site boundary and connects with the larger landscape. The resulting system function that we see in Menomonee Valley Park is how the systems overlap and interact. The complexity created in the landscape focuses on these systems being nonlinear, with multiple feedback loops and causalities making each site unique. Closed systems work within the defined site boundary; in Menomonee Valley, this boundary could be the art system focused on providing environmental education. However, most systems on a site are open systems with porous boundaries and reach a broader audience. In Menomonee Valley, such open systems are most common with the people, wildlife, and water systems in the park. People and wildlife come and go from the site to other locations, while water starts much higher in the watershed and flows through the site to eventually reach Lake Michigan. The open systems connect with larger areas. As a result, considering systems and system relationships in the landscape becomes highly complex.

This study investigates human and more-than-human system relationships in Menomonee Valley, Milwaukee, Wisconsin. The Menomonee Valley landscape, most recently known as Three Bridges Park and Menomonee Valley Stormwater Park, was designed and constructed from 2002–2013 but had a longer history and larger community than defined by its boundaries. This research examines the history, relationships, community, and systems understanding of these sites and asks the following questions:

- *How do human site users understand the landscape narratives? (Landscape Literacy)*
- *Are site users ecologically literate and what about the design helps them better understand the system relationships? What role has ecorevelatory design of the parks played in their system understanding? (Ecological Literacy)*
- *How are people caring for and stewarding the land and more-than-human elements, and have human site users developed a holistic connection with the land? (Place Attachment)*

By being cognizant of system elements, interactions, and functions, we can modify systems to enhance our holistic understanding of all elements found within the system landscape, especially nonmajority elements. Storytelling through design (Heatherington, 2011; Potteiger & Purinton, 1998), ecorevelatory design (Arisoy, 2013; Brown, B., Harkness & Johnston, 1998; Nassauer, 2020), and community engagement can be used to measure landscape literacy (Spirn, 2017), ecological literacy (Boehnert, 2012; Orr, 1992), and place attachment (Manzo & Devine-Wright, 2012). We can foster a holistic world if humans understand how a system functions and consider more-than-human elements as critical components of the landscape.

Methodology

By recognizing past system elements, interactions, and relationships, we can closely examine how landscape narratives have changed over time and how they relate to the system we see today. A landscape biography explores the transformation of a landscape from past to present to future (Kolen et al., 2017). This research method inherently embeds humans in landscape history and function. The methodology becomes a vehicle to comprehend what happened in the landscape and how people arrived at the systematic point they are now experiencing. In this study, the landscape biography explains the most recent implementation of the Menomonee Valley Stormwater Park and Three Bridges Park, along with how their designs incorporated storytelling through design and ecorevelatory design. Through conversations with the design and implementation team, we illuminate how this system was intended to incorporate past narratives of human and more-than-human elements and share those narratives with human site users.

This study conducted interviews, onsite observations, and intercept surveys to determine how people used the space and the effectiveness of the system intervention.

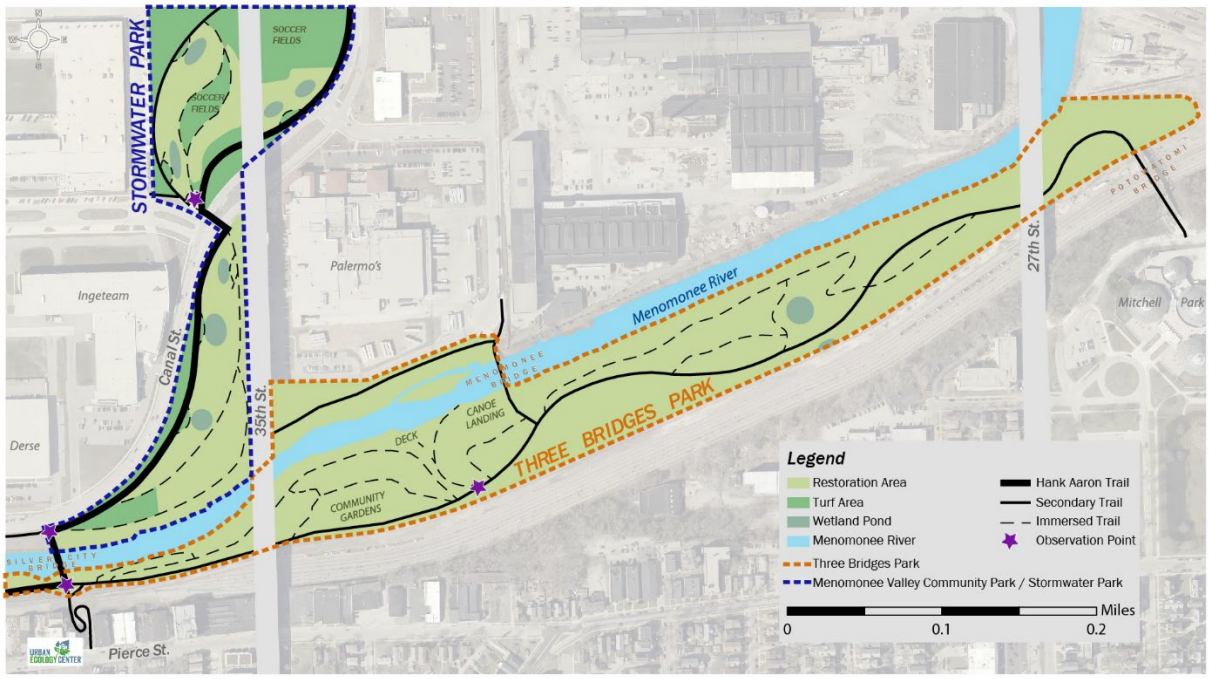
Semi-structured interviews (Creswell, 2009) were conducted with the design landscape architect (Wenk, 2022), local landscape ecologist/landscape contractor (Marek, 2022), the nonprofit center that manages programming and stewardship for the park (Sánchez, 2022; Veglahn, 2022), and the economic development nonprofit that spearheaded the redevelopment of the site (Zetts, 2022). These interviews provided an understanding of the site history and its functional intervention goals, design elements, site ecology, the implementation of the design, and the communication and education of the public, which produced thematic analysis content and categories to qualitatively code the survey results.

Observations were recorded at differing times throughout the day and week over eight days; it was intentional to have weekday and weekend observations as well as morning, noon, and afternoon time slots. Observations occurred in selected spaces throughout the parks were chosen for observation (Figure 5.1). The selected locations intentionally include both primary and secondary human paths to understand whether the areas provided different human responses to the landscape. Interview methods were modified from Gehl's Public Life Tools (Gehl, n.d.; Gehl & Svarre, 2013) to fit the site and focused on whether people recognized more-than-human elements or utilized pathways that encouraged more-than-human interactions.

Intercept surveys (Robson, 2002) were used to gauge how general site users understood the systems and land history. In total, 49 surveys were distributed to site users over the age of 18 and willing to participate in the survey. Surveys asked questions to determine whether people understood the landscape narratives, function, and more-than-human elements. The survey tool also asked whether people had participated in educational or stewardship activities and why they chose to engage in them. Thematic qualitative analysis was conducted on the free-response questionnaire responses, based on the interviews and landscape design intent.

Figure 5.1

Site map showing trails, restored areas, park boundaries, and observation points. Map is modified from the UEC trails map



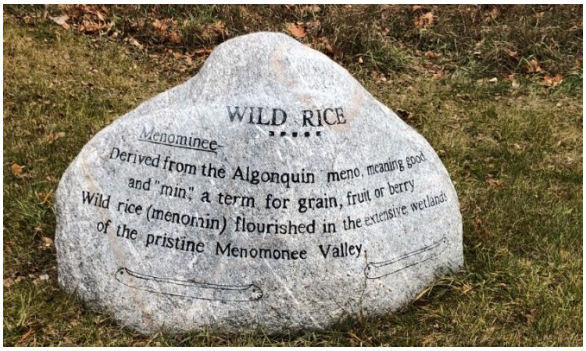
Landscape Biography: Menomonee Valley

The present-day Menomonee Valley history dates to the presence of Indigenous communities and glacial landscapes. Indigenous peoples including the Fox, Ojibwa, Ottawa, Sauk, Winnebago, Mascouten, Potawatomi, and Menominee tribes each called the Menomonee River Watershed home at some point in history (Menomonee Valley Partners, 2022; Wisconsin Department of Natural Resources, 2010).

Before colonization, the area was known for hills and valleys created by the glacial movements. The soil was silt-loam on the surface, and subsurface materials were loamy and clay tills. The vegetative landscape was classified as prairie, oak forests and savanna, or maple-basswood forests. The low-lying areas were dominated by wet-mesic prairies, southern sedge meadows, emergent marshes, and calcareous fens (Wisconsin Department of Natural Resources, 2010). In the Menomonee Valley, the land was historically a wild rice field that took advantage of the topography and Menomonee River flooding to produce wild rice (Menomonee Valley Partners, 2022). This precolonial sign of care and landscape management utilized local elements and maintained the health of more-than-human elements. The name "Menomonee Valley" echoes this history and derives from the Algonquin word "menomin," which means *good grain* or *wild rice* (Menomonee Valley Partners, 2022). See the rock explaining the narrative in Figure 5.2.

Figure 5.2

Wild Rice rock near Menomonee Valley Community Park describes the Indigenous history of the land



Fur trading began in 1795 in present-day Mitchell Park.[12] As colonization began to displace historical land uses with the founding of the state of Wisconsin in 1848, industrial trade between the Europeans and the Potawatomi people began in the Menomonee Valley the following year (Menomonee Valley Partners, 2022).

By 1879, heavy industrial production took over the valley, resulting in significant changes to landscape morphology. Land areas were filled to create buildable grounds for factories, rivers were straightened to control flooding, and canals were dug to create deeper shipping routes (Menomonee Valley Partners, 2022). Milwaukee Road Shops was a main production line for rail cars, locomotives, and freight cars for Chicago, Milwaukee, St. Paul, and Pacific lines (Wisconsin Department of Natural Resources, 2009a). By 1922, Milwaukee Road Shops was the third largest railroad and rail car producer in the United States (Wisconsin Department of Natural Resources & Menomonee Valley Partners, 2013b). With increasing industrialization, more vegetation was removed, soils became contaminated with petroleum, lead, and other chemicals, and water quality in the Menomonee River declined quicky following the straightening of the channel (Wisconsin Department of Natural Resources, 2009a). Workers houses were built near the industrial sites to them to walk to the factories and rail yards. This need for walking routes that crossed railroads and topography changes further limited the land area that could support precolonial natural functions and benefits.

[12] Mitchell Park is a Milwaukee County Park that is home to the Mitchell Park Historical Conservancy, or The Domes. It is adjacent to the eastern most bridge in Three Bridges Park.

More factories were built in the valley as industries boomed, including the Milwaukee Stockyards in 1929 (Sutherland, 2004). The stockyards were once a vibrant urban stockyard that traded "1,500 horses, 100,000 sheep, 290,000 cattle, 530,000 calves and 540,000 hogs" per year (Sutherland, 2004). Unfortunately, while the stockyards bolstered the valley's economy, they increased pollution because they generated significant animal waste. Further, since the vegetation had been removed when clearing the land for buildings, no vegetation remained to capture or filter the runoff from the stockyards. As such, untreated animal wastes flowed directly into the Menomonee River.

The Menomonee River saw an increase in invasive alewive fish in the 1960s (Billock, 2019). The alewive impacted native fish in the river, as they were predators, and negatively affected air quality from their annual die-off on the shorelines. The Wisconsin DNR introduced Chinook and Coho salmon to the river as predators to the alewive fish. They stocked salmon to migrate to Lake Michigan, then return to the Menomonee River for spawning. This strategy changed relationships between elements in the ecosystem and promoted a decline in alewive, plus it introduced salmon fishing to Milwaukee (Billock, 2019). Unfortunately, the water quality in the watershed continued to decline with runoff from cattle pastures, waste from slaughterhouses, human sewage, and the damming of the river (Wisconsin Department of Natural Resources, 2010). By 1984, only eight species of fish were in the Milwaukee River,[13] and most were invasive carp (Billock, 2019).

In the late 1950s, Interstate-94 was constructed in Wisconsin, traveling along the Menomonee River Valley. The interstate increased the volume of vehicular transportation to and from Milwaukee and created a divide between the northern neighborhoods and the Menomonee River Valley. The railyards and Menomonee River separated the southern neighborhoods from the factories. Workers' walking access to the valleys was limited (Zetts, 2021). Large bridges and viaducts were constructed to cross the valley from the north to the south. Menomonee Valley became a racial divider for the city; minority and underserved communities were advised not to cross those bridges. Consequently, it has taken decades for the Black communities in Milwaukee to feel comfortable crossing the bridges (Zetts, 2021).

In 1985, the Milwaukee Road Shops went bankrupt and the railyard closed (Wisconsin Department of Natural Resources, 2009a). The former railyards and buildings sat vacant, resulting in a tremendous loss of jobs, contaminated soils, and continued runoff flowing into the Menomonee River. In 1993, over 403,000 Milwaukeean's became ill while 69 died from *Cryptosporidium parvum*, an illness found in tap water (Gradus, 2014). The south side of Milwaukee was most impacted and is home to historically disinvested minority communities (Zetts, 2021). The condition of the tap water and outbreak of illness was a wake-up call to Milwaukee to improve the water quality in the rivers and the drinking water reserves. While $417 million was invested into water quality for Milwaukee, investments into stormwater management in the Menomonee River Valley did not occur until 1998 (Wisconsin Department of Natural Resources, 2009b). The Milwaukee Stockyards activity decreased significantly over the decades; they finally closed and relocated to Dodge County in 2004 (Sutherland, 2004).

While the human elements in the system were declining, in 1994 another fish study was conducted, revealing greater fish diversity, with 40 species (Billock, 2019). This study also showed an increase in beavers, otters, deer, and other wildlife in the area. The more-than-human elements in the system were

[13] The Menomonee River flows into the Milwaukee River approximately 3 miles downstream from Three Bridges Park.

recovering, increasing connections and habitat in the Valley. Even with their growth, vegetation and water quality still needed significant improvement to substantially support the wildlife.

The 16th Street Community Health Clinic, a long-standing public health clinic that served Milwaukee's south side, recognized the need to introduce jobs, open space, and clean water (Wenk, personal communication, September 7, 2022). The clinic worked with the City of Milwaukee, the Menomonee Valley Business Association, and the Milwaukee Metropolitan Sewage District to establish the Menomonee Valley Partners (MVP), a nonprofit, public–private partnership that advocates for the Valley's redevelopment (Menomonee Valley Partners, 2022).

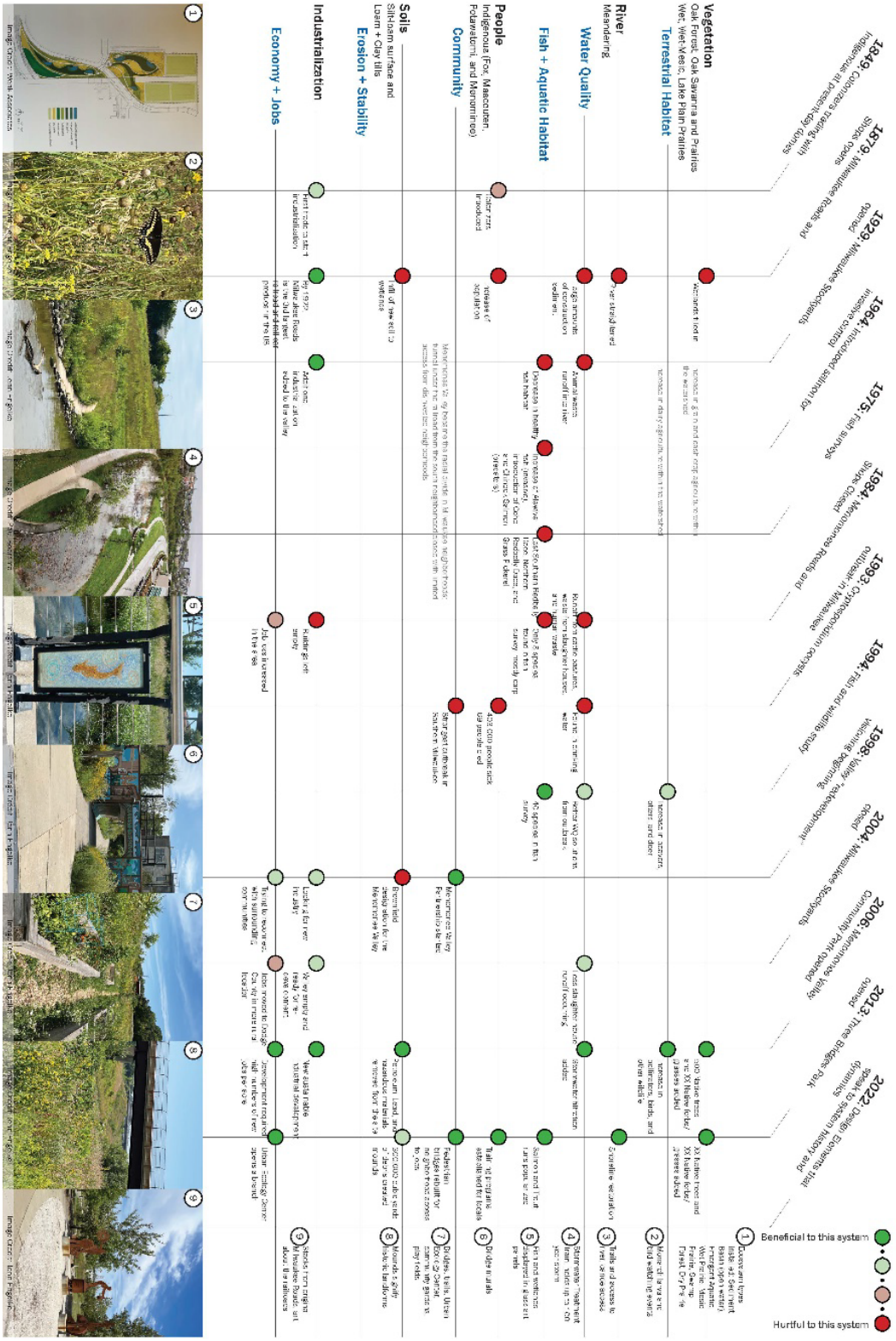
MVP launched a national design competition in 2002 that included community meetings to understand what local neighborhoods desired. The competition goals embraced the following concepts: "family supporting jobs," "sustainable design," connecting people to natural features and recreational activities, and "generating enthusiasm for change" while building partnerships (Sixteenth Street Community Health Center, 2002). A winning design from Wenk Associates and their partners HNTB and Applied Ecological Services (AES) addressed each of these goals and was practical for installation. The design transformed the 140-acre brownfield site into a stormwater park that currently can hold excess water delivered in a 100-year storm event, new light-industrial development that brought over 5,200 jobs to the area, and over seven miles of trails and open space for local communities (Landscape Architecture Foundation, 2010; Menomonee Valley Partners, 2022). In addition, this site design acknowledged the site's history and promoted improvements in the human-to-human and human to more-than-human relationships in the valley.

Menomonee Valley Stormwater Park was built in 2006, while development in the Valley continued to grow. Palermo Villa (a frozen pizza manufacturer) was the first new industrial company to settle into the valley, creating jobs for local neighborhoods. The Menomonee River restoration and Three Bridges Park (formerly Airline Yards) were completed in 2013. System elements of both parks are shown in Figure 5.3. As part of the site stewardship and community engagement, the Urban Ecology Center, a nonprofit "engaging communities in restoring local ecologies," built a third location adjacent to the park (Milford, 2022).

To restore the area, existing factories needed to be removed, contaminated soil capped and backfilled with clean soil, development moved above flood level while maintaining stormwater storage, and additional fill from the Marquette interchange project (I-94 and I-43) needed to be repurposed. Oversite of the efforts became difficult to navigate. Wisconsin's Department of Transportation (DOT), Department of Natural Resources (DNR), and the City of Milwaukee's Redevelopment Authority had some ownership or regulatory regulations over the site. MVP collaborated with each entity to develop the first phases of the park (Menomonee Stormwater Park and Industrial Development), while the DOT managed Three Bridges Park construction, including communicating with existing railroads to maintain some tracks through the site.

Figure 5.3

Graphic timeline of Three Bridges Park and Menomonee Valley Community Park development. The graphic shows the relationship change major interventions had on various elements within the landscape



Storytelling Through Design. The design team intentionally included design features that represented the historical narratives of the landscape. The glacial landscapes, known for their hills and valleys, were shown through the hills created in the Three Bridges Park design (see Figure 5.4A). The fill used to make the hills was the rubble from the Marquette interchange. While the landscape was not restored to its original wild rice marsh, native plants known to have grown in these local ecosystem types were planted to create biodiverse landscapes. The industrial history of Menomonee Valley was seen in the original chimney stacks that stood in Menomonee Valley Stormwater Park. Over the years, the stacks became structurally compromised and were removed for safety reasons. In 2020, steel was used to "honor and celebrate the thousands of workers" who formerly worked for Milwaukee Road Shops (Taylor, 2020). The art sculpture, *People of the Road* (shown in Figure 5.4E) was created from historical photographs of people working at Milwaukee Road Shops. Picnic benches in the park were created from the former stockyards' wood by the only manufacturer left in the Valley, Falk Corporation, now Rexnord Corporation (see Figure 5.4B). The original bridge from 37th Street/Pierce Street across the Menomonee Valley was rebuilt to increase access to the site. The tunnel under the railyard was reopened to invite the neighborhood into the park. As a part of the tunnel, Valley Passage, a mural reflecting Wisconsin and the Valley's history, was painted by local artist Chad Brady in 2011. This mural visualized the landscape narratives of Indigenous peoples, community neighbors (Silver City and immigrants), historical industrial workers (train workers), present-day industry (Harley Davidson), baseball legends (Hank Aaron), Wisconsin designers (Frank Lloyd Wright), and the Urban Ecology Center (see Figure 5.4C). It reflects connections to the Wisconsin State Fair Park, American Family Field (formerly Miller Park), and the Milwaukee Art Museum. The mural also includes more-than-human elements, with the fish, birds, and wildlife that call this land home. Another design element that helps tell the landscape story is the recycled glass panels from Miller Brewing Company along the stormwater park (Landscape Architecture Foundation, 2010), as shown in Figure 5.4D. Each of these panels demonstrate a more-than-human element of the landscape and encourages people to consider such elements in the system. The history of the glass also relates to the historic Milwaukee brewing and bottling industry, as well as the Miller Brewing plant less than two miles from the site. As seen in many locations, interpretive signs give more detail to those who wish to stop and learn about the land's story. Sign topics span the human to more-than-human spectrum and include historic industrial company headquarters, stormwater, wild rice farming, and Silver City[14] among others.

[14] The adjacent neighborhood was named Silver City, since it was where workers would spend their earnings, silver dollars. In 2000 the neighborhood became home to Hmong and Hispanic immigrants (Wisconsin Department of Natural Resources & Menomonee Valley Partners, 2013a).

Figure 5.4

Nontraditional storytelling strategies on the site included: A) topography that mimicked the glacial mounds, B) picnic benches built by Falk Corporation with wood from the former Milwaukee Stockyards, C) Wisconsin-focused murals, D) more-than-human focused glass panels created from Miller Brewing Company glass, and E) People of the Road sculptures depicting the former railyard history.

Ecorevelatory Design. Many of these elements in the design create an interpretive and storytelling landscape (Potteiger & Purinton, 1998). Each of the art elements depict different times in history and showcase different "scenes, events, [or] characters, etc." (Potteiger & Purinton, 1998, p. 11). These art elements showcase cultural narratives that have been imbedded in this site for decades. They reflect the narratives seen in the biography and create points of interaction and understanding for humans of the landscape system and narrative. One goal in incorporating these elements was for people to become more literate about the land narratives and function (Landscape Architecture Foundation, 2010). Because of the number of narratives seen on this site, it can also be seen as an interpretive landscape; one that worked to connect existing narratives to the historic narratives. Bill Wenk referred to this as a "working landscape" from the time that wild rice was harvested until today (Wenk, 2021). While they are very different types of working landscapes, the stormwater collection, treatment, and mitigation maintain a strong role in how this system functions. Ultimately, the interaction between elements in a system make working landscapes function and benefit both human and more-than-human elements within a system. By showcasing how this is a working landscape to humans, we can better understand how the system functions and that we are not the sole element within the system; more-than-human elements of the system are also crucial.

For Menomonee River Valley, ecorevelatory design was critical to displaying the more-than-human elements and function within the landscape. Although this area has long been home to wildlife, the habitat needs of food, water, and shelter were invisible in the area. The Menomonee River attracted wildlife, but its water was contaminated with pollutants from runoff upstream and from adjacent properties. Available habitat has expanded and improved with the integration of seven different Indigenous prairies and wetland ecosystems design at the site (see Figure 5.5B). The design begins to reveal the wildlife habitat areas and blend them with trails for people. The trails lead people through each of the habitats and demonstrate wildlife essentials. Water is another element intended to be observable within the landscape and to help show how the landscape system functions. A stormwater treatment train in the Menomonee Valley Stormwater Park was designed to hold a 100-year storm event with runoff from the surrounding industrial valley. The stormwater park filters and cleans water before it discharges into the Menomonee River. This benefits salmon and other fish that use the Menomonee River and the surrounding neighborhood that no longer experiences floods. There were also rainwater cisterns installed under the viaduct to collect water from the bridge and irrigate the median (see Figure 5.5A). Lastly, water runoff from the railroad tracks was a concern with Three Bridges Park; if there was an overturned railcar or accident, that runoff could damage the native ecosystems and the Menomonee River. Instead, a runoff collection system was designed to capture the water from the railroad and slowly seep it back into the landscape via a designed water spring. This spring was designed and built on the site, mimicking the natural water sources often found in the area (Marek, personal communication, August 26, 2022).

Figure 5.5

Ecorevelatory design: A) artful rainwater capture from the viaduct, B) restored shorelines, C) a butterfly resting in the prairie, and D) a person running the immersed trails through the hills and restoration

Community Engagement. Community involvement was first solicited during the design phase, when neighbors were asked what they desired for the site. MVP heard from the team that they wanted soccer fields for kids, living-wage jobs to support the community, and easier access to the site and river (Zetts, personal communication, August 17, 2022). This neighborhood was on the edge of an area that historically lacked park access. As neighbors noticed their ideas in the design competition, especially soccer fields, support for the project started to be generated (Zetts, personal communication, August 17, 2022).

The Urban Ecology Center (UEC) was asked to build a new location adjacent to Three Bridges Park to foster community engagement and stewardship. They were tasked with leading site stewardship and maintaining the parks. UEC also provides programing for the site with day camps for children in the summer and daily school programming for all schools located within a two-mile radius. They have successfully introduced children to the park to learn, explore, and appreciate their surroundings. Even with the park being in many children's neighborhood or backyard, many had not been there before. In the UEC programming, children learn about and interact with insects, animals, trees, plants, and water. UEC staff members also collaborate with neighborhood organizations to embrace the Latino/a community that heavily populates the adjacent neighborhood. All UEC staff are bilingual and many live in the neighborhood (Sanchez, personal communication, August 23, 2022). Between MVP and UEC, the neighborhoods are queried multiple times a year about their interests for programming, park improvements, and system changes. The nonprofit organizations strive to retain strong community engagement relevant to the neighborhood systems. For example, one component of the initial design that was not completed was improved connections to the north neighborhood, a predominately black neighborhood. As a result, MVP continues to explore ways to help this historically marginalized

community neighborhood feel more welcome and connected to Menomonee Valley (Zetts, personal communication, August 17, 2022).

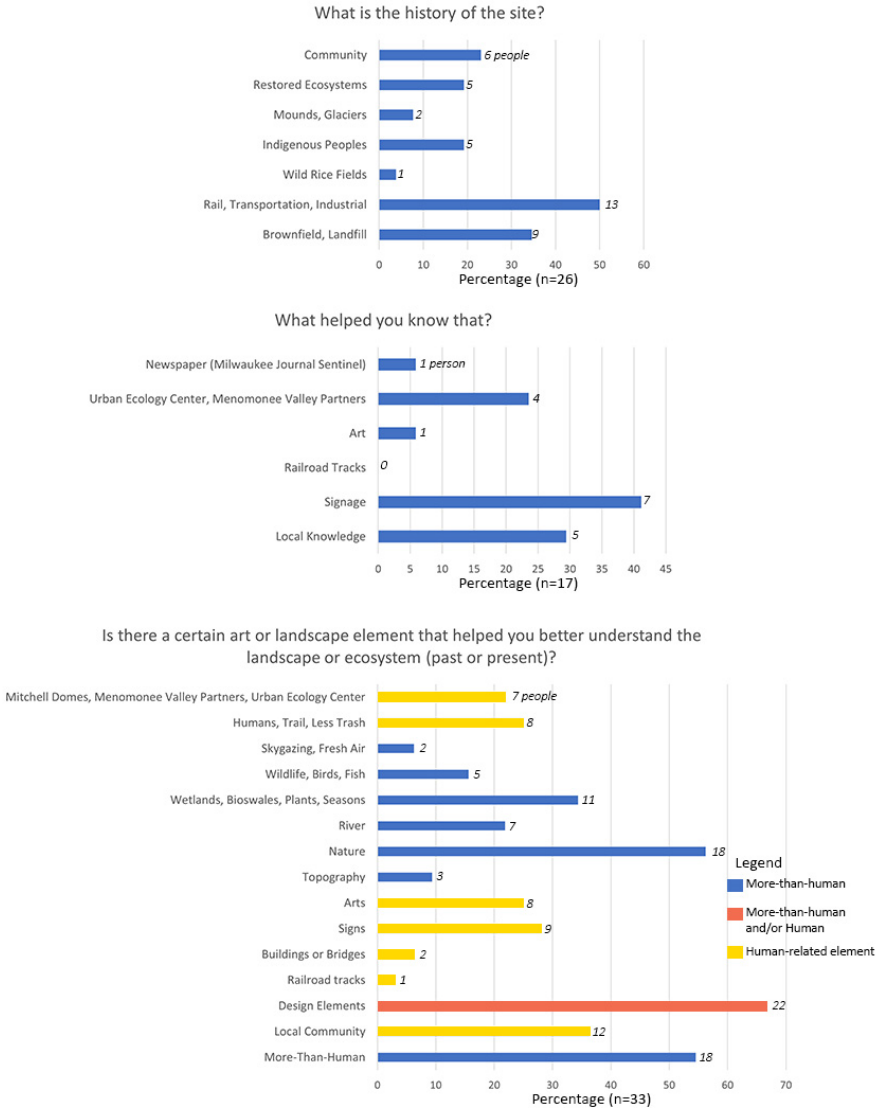
Results and Discussion

Landscape Literacy. To understand whether people recognized the historic narratives and storytelling through design, people were asked, "What is the history of the site?" Forty-seven percent of those asked did not know or gave no response. Of those who responded (*n* = 26), 50% mentioned something about the industrial history, often relating to the rail or transportation industry; 35% of respondents mentioned the brownfield and landfill site; 23% mentioned neighboring communities; 19% mentioned Indigenous Peoples; and 19% mentioned restored ecosystems (see Figure 5.6). This distribution of responses indicates that over 50% of people have some idea about the history of the site. When asked how they knew that, of those who responded (*n* = 17), 41% referenced the interpretive signs, 29% mentioned local knowledge, and 24% pointed to either UEC or MVP. Only one respondent mentioned the art. Figure 5.6 offers a more detailed breakdown. This correlates with Bill Wenk's position that the art did not push these narratives far enough (Wenk, personal communication, September 7, 2022). More literacy opportunities and connections to the historic narratives would be beneficial. For those who did have some knowledge, it came from longstanding involvement with the neighborhood or valley (see Figure 5.6). While collecting interviews, I heard multiple stories of people growing up in the area and their experience watching the landscape system change over time. One site user spoke about growing up in Pigsville, a neighborhood adjacent to Menomonee Valley, and how they would come down to the rail yards to hunt rabbits and get chased away by the police. This individual was proud to watch how Menomonee Valley has grown over time and noted that many of the industrial business owners or families have longstanding ties to the area. People have demonstrated great pride in the history and invested in the sustainable redevelopment of the site.

In considering site users' knowledge, people were asked whether a certain art or landscape element helped them better understand the landscape or ecosystem (past or present). Of those that responded (*n* = 33), 67% mentioned an element that was intentionally designed or preserved to consider historic narratives of the landscape. Furthermore, 55% of people cited more-than-human elements such as the river, nature, wetlands, wildlife, stargazing, and topography, demonstrating observations beyond a human-centric lens. Lastly, 33% of people mentioned local community, which speaks to the role the park may play within a larger system. While not all respondents related their answers to the historic narratives, they (*n* = 32) did notice things around them that relate to the landscape narratives and design including art (25%), topography (9%), wetlands/bioswales (34%), and the river (22%), as Figure 5.6 demonstrates.

Figure 5.6

Landscape literacy results from survey understanding whether people understood the history, what helped them know that history, and what site elements helped them understand the landscape



Ecological Literacy. The design encourages people to notice more-than-human elements in the site. With the ecorevelatory goals, the site was intended to expose more-than-human elements and encourage people to see elements beyond humans. When people were asked, "What defines a healthy ecosystem here?" 68% of respondents (*n* = 44) talked about vegetation, biodiversity, or open space; 41% mentioned wildlife, including fish and insects; and 27% considered stewardship or sustainability in their response. Overall, 93% of respondents (*n* = 41) mentioned something about more-than-human elements, while 27% considered human elements (see Figure 5.7). These responses suggest that people see more-than-human parts of the system and consider system relationships.

To further evaluate whether people understand relationships and system function, people were asked, "How would you explain the sustainable features of the park to your friends?" Of those who responded (*n* = 33), 58% considered more-than-human elements in their response that included stormwater/river

(30%), plants/seasons (42%), wildlife (15%), and soil (3%). At the same time, 45% of respondents mentioned something human-related including peace, beauty, the trails, brownfields, or historical change. This response reflects people seeing change and benefits from the site and what gain from it. Overall, 30% of respondents mentioned community science programs, stewardship, or caring for the land (see Figure 5.7). Again, based on the responses, the relationships humans build with the land and interactions between human and more-than-human elements are perceived to be beneficial.

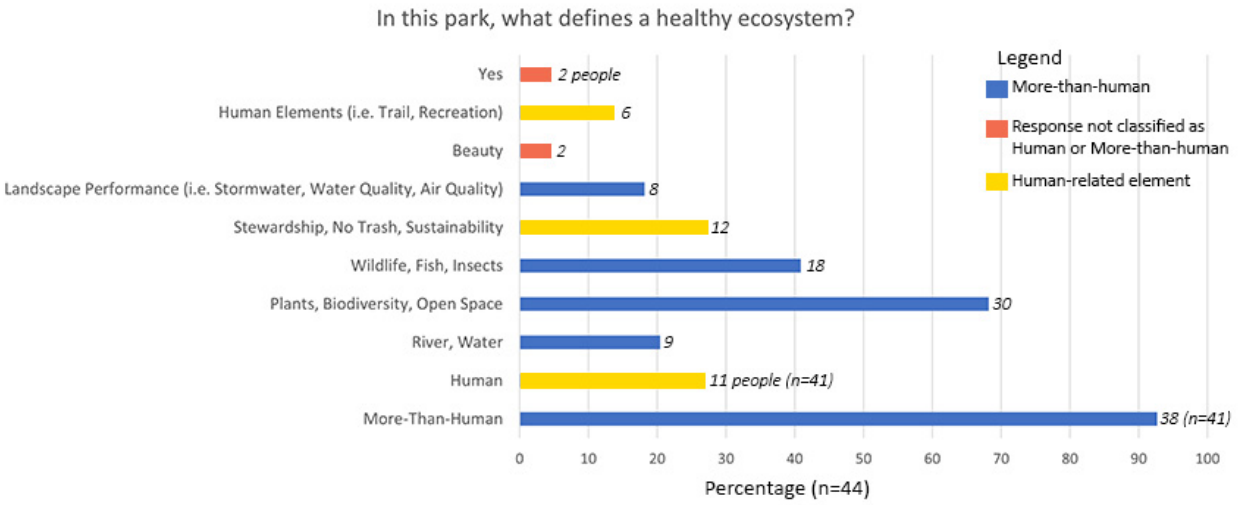
Through observations, we can see where people go on the site and how they interact with more-than-human elements. The Hank Aaron Trail[15] brings many people to the site. Thirty-two percent of bikers and 7% of pedestrians stuck to the traditional Hank Aaron Trail, while 68% of bikers and 93% of pedestrians chose a secondary trail or immersed trail, as defined in Figure 5.1, that takes them further into the park traversing hills and through the restored prairie. The popularity of the secondary trail indicates that people wanted to explore the park more, not merely pass through the site. Overall, 6% of visitors (combining pedestrians and bikers), including 17% of pedestrians, were found on off-the-beaten-path trails and had a more-than-human immersion. People were also observed to see whether they looked beyond the trails and connected with something else on the site. Thirty-two percent of people glanced at vegetation, the river, or another more-than-human element in the landscape. Additionally, 3% of people observed art, while less than 1% noted signage, shelter, or picnic tables. These points of attention suggest that the more-than-human elements are the dominant connection people create when viewing site elements beyond the trail.

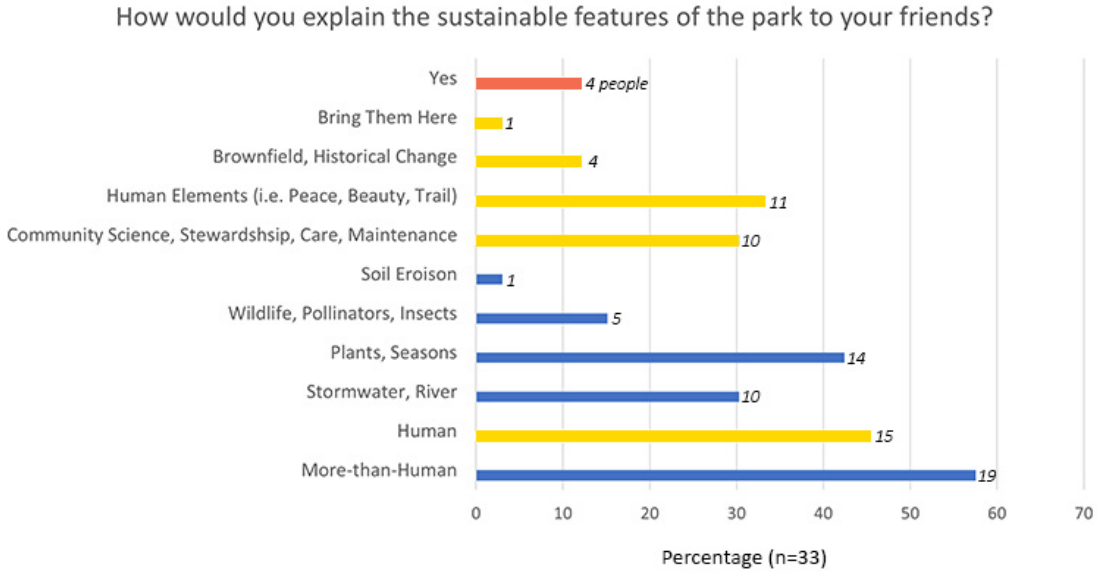
The UEC has the goal of "producing an ecologically literate child, community, city, and world" (Leinbach, 2018, p. 77). They have seen children who started out afraid of a bug go through their summer camps, school programs, and special events, but who by the end of the day become willing to look at the bug, maybe even touch it, and learn further about the land around them (Sanchez, personal communication, August 23, 2022). Those students continued to engage with the center. They have advanced to be high school leaders, summer interns, employees, and volunteers. While the UEC does not measure how much students learn, they have noticed remarkable change in the students' activities, understanding of the landscape, and excitement to share that with others. The UEC also dialogs with the school teachers that participate in the program to understand the impact they see in the classroom (Leinbach, 2018). One survey respondent noted that he bikes with his daughter to the UEC and strives to teach her about the river. As a result, she says, "Good morning 'Nomanee' River, how was your sleep?" each day as they ride by. She shows a joyful connection to the land and her own way of interacting with the more-than-human elements in the landscape.

[15] The Hank Aaron Trail is a major bike route that runs through the site from the Waukesha/Milwaukee County border to downtown and Lake Michigan. It goes past the Milwaukee Brewers' stadium, American Family Field, and is named after the professional baseball player who spent his career with the Milwaukee Braves and Brewers. American Family Field is approximately one mile from the UEC.

Figure 5.7

Ecological literacy results from surveys asking site users what a healthy ecosystem on the site looked like and how they would explain it to their friends





Place Attachment. Place attachment is defined as the "emotional bonds that form between people and their physical surroundings" (Manzo & Devine-Wright, 2012). This connection is built into UEC messaging through their motto, "We heal the land and, in return, the land heals us" (Leinbach, 2018; Veglahn, personal communication, August 17, 2022). There is a mutual relationship between the elements of the landscape. In a conversation with Jeff Veglahn, the lead steward for Three Bridges Park, he emphasized the importance of caring for the land, giving back, and being cognizant of the landscape capacity. The land provides a respite for many of the neighbors. Some referred to it as an "oasis" in

urban Milwaukee, while others shared memories of beauty related to more-than-human elements. The UEC is pioneering care and stewardship for the landscape that allows people to share their knowledge through the community science program, invest time in pulling invasive weeds, and enhance commitment to future generations through volunteering with the programs. They recognize the significance of the more-than-human elements and the importance of not dominating the landscape with human elements by having a land capacity for events held in the park (Veglahn, personal communication, August 17, 2022).

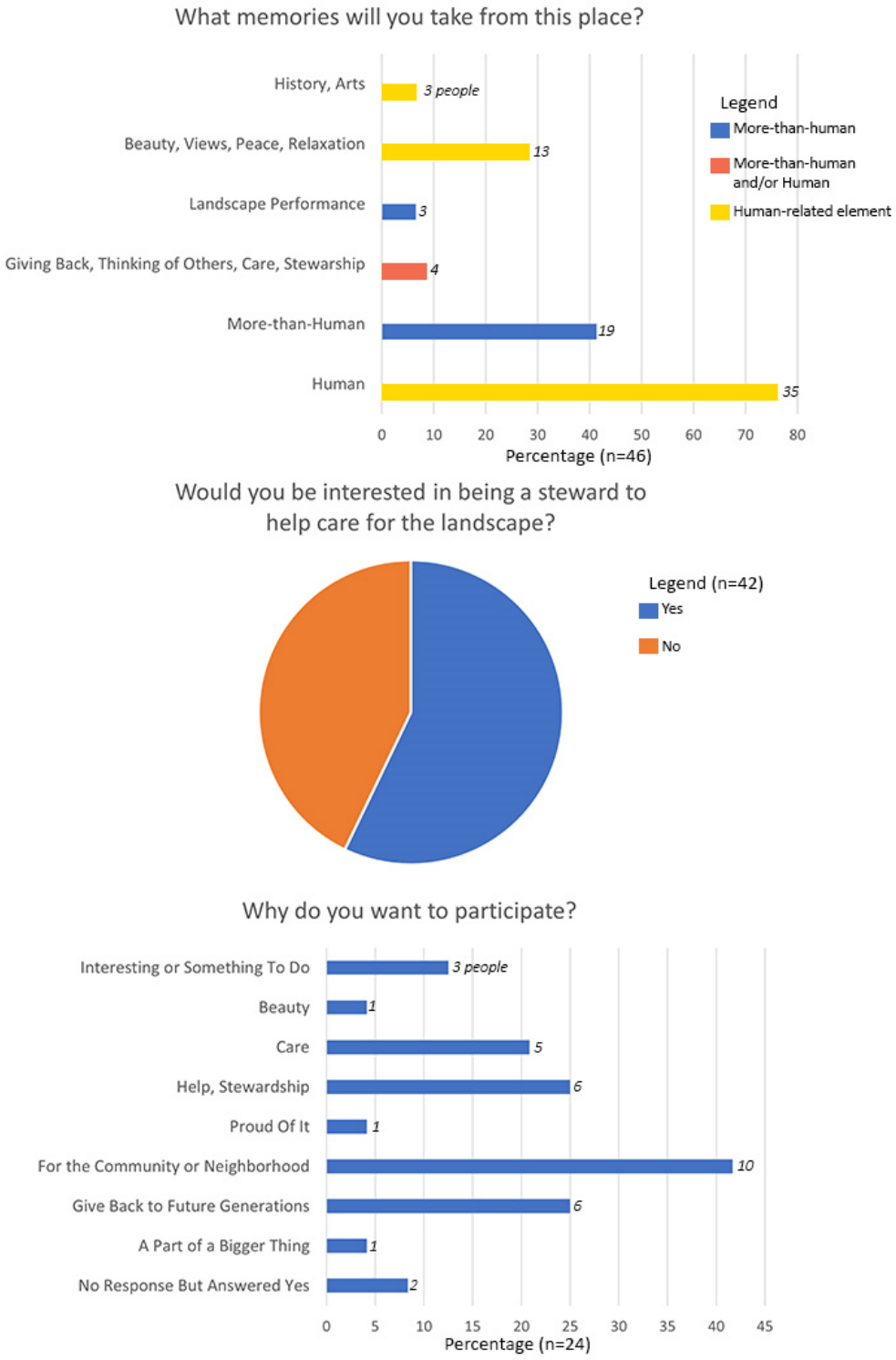
People often reflect on experiences and remember memories from a place. Clare Cooper Marcus suggests that those memories create meaning for people and expand the investment they want to put into a place (Cooper Marcus, 1992a). I asked people, "What memories will you take from this place?" Of those who responded (*n* = 46), 76% had memories relating to human elements and 41% spoke to more-than-human elements in their responses (see Figure 5.8). The greatest individual category was 28% of respondents considering beauty, views, peace, or relaxation. This shows the shift people have in this system that they do not necessarily feel in the surrounding systems. People engage with more-than-human elements, forming positive experiences.

A sense of care and stewardship shows positive relationships and interactions people are building with the system. To understand how people relate to the land, they were asked, "Would you be interested in being a steward to help care for the landscape?" Fifty-seven percent of the respondents (*n* = 42) showed interest or were already participating as a steward. Of those who answered *yes* (*n* = 24), 42% gave a reason for the community or neighborhood, 25% talked about giving back and doing good for future generations, 25% said they wanted to help, and 21% spoke of a desire to care for the land (see Figure 5.8). While one can always hope for more participation, the reasons people participated spoke to the larger system and beyond their own perspective or place in the system.

These interviews revealed human and more-than-human elements interactions and functions within the site as well as the value of strong community engagement. The sense of care and the engagement people have in the space through observations, surveys, and interviews can allow us to recognize better interactions between human and more-than-human elements, leading to a more holistic system.

Figure 5.8

Place attachment results from a site survey understanding what connections people have to the site and why they want to be an active element in improving system interactions



Conclusion: Ecological Literacy and the Role of the Urban Ecology Center

A critical element that has heightened ecological literacy and allowed that knowledge to shift to a place attachment is the UEC. This site is one of three branches in Milwaukee built with local community backing in neighborhoods that otherwise have not had safe access to parks.

> *Imagine a world where every child can get outside and explore nature near their home every day of every season of every year of their life.*
>
> *Now imagine a world where every adult can share and guide that child as a mentor in their adventure, building curiosity, understanding, and respect for the natural world.*
>
> *Image a place where folks of all ages can join together in this endeavor – at a neighborhood ecology and community center in a nearby park; a center whose purpose is to facilitate that child/adult interaction, to heal the land, to promote outdoor play, and to educate and inspire people of all ages to understand and value nature as motivation for positive change.*
>
> *In a world like that, many of our current problems would simply melt away.*
>
> -*Urban Ecology Center Vision* (Leinbach, 2018, p. 7)

The UEC is a place where programming occurs to create ecological literacy. David Orr defined the term "ecological literacy" as results of environmental education, the feeling of exploration in the environment, and the desire to learn more (Orr, 1992). Not only is formal education visible in the classes, the exploration and curiosity are the exciting pieces to see in the children. While collecting data on-site, I witnessed the children's creativity and excitement when pretending to be animals, seeing the river, and spending time outside. These classes used the murals, tunnels, bridges, park benches, and stormwater overlooks as part of their everyday activities.

All activities at the UEC include an outdoor component at Three Bridges Park or the Menomonee Valley Stormwater Park. In the event of cold, rain, snow, or other bad weather, the UEC provides jackets, rain boots, waders, hats, and gloves as needed. Many participants lack these essentials, and the nonprofit makes sure that weather conditions are not a barrier to connecting with the landscape (Leinbach, 2018; Sanchez, personal communication, August 23, 2022). It was magical to watch these children bring their families to camp on Saturdays to show their parents what they were learning. The children's energy for the landscape and their desire to share was infectious.

As a result of the UEC's ability to connect human and more-than-human elements in the system, the neighborhood has seen "reduced crime, increased academic performance, community pride, job creation, and neighborhood transformation" (Leinbach, 2018, p. 21). Evidently, encouraging relationships between humans and more-than-humans also changes human-to-human relationships and human performance within the landscape. The provision of ecological literacy creates place attachment that encourages a holistic view of the landscape. The UEC is instilling an environmental ethic in the site users and healing or restoring the relationships between all landscape system elements.

Just as the landscape includes both human and more-than-human elements, these parks would not be the same without the UEC and community, and the community would not be the same without the park. Mutual benefits and interactions in this landscape demonstrate the need for holistic thinking, ecological literacy, and an environmental ethic.

Three Bridges Park and Menomonee Valley Stormwater Park were designed to encourage landscape literacy, facilitate ecological literacy, and develop place attachment for site users. This landscape has a long history of manipulation for human gain. When the latest strategy was implemented, they considered both human and more-than-human elements in the ecorevelatory design. Designers increased interactions and improved relationships between the system elements. While the history and landscape change are best known by personal history of the place, ecological literacy is rising for both general site users, UEC participants, and a larger neighborhood community. People are recognizing, appreciating, and seeking out the more-than-human elements. The place attachment formed in this landscape is building strong, caring relationships between human and more-than-human elements. Menomonee Valley is emerging as a holistic system in which people look to care for one another and for the more-than-human elements in the landscape.

Conclusion

Sustaining the Holistic Landscape

Three sites – Sweetgrass in Seattle, Hunter's Point South in New York City, and Menomonee Valley in Milwaukee – have been examined through a framework for systems-based design evaluation. Each site has unique elements, interactions, and functions, and all are in locations that have undergone design interventions altering existing system function with explicit goals to acknowledge and amplify important site elements and to increase interactions. These sites were assessed through a landscape biography methodology considering the varying system overlaps and relationships that demonstrate how people relate to and connect with the land.

Elements. In these sites, the elements are human and more-than-human physical and tangible parts that have an operative role in sustaining the environment. The human elements include people and physical elements intended for human use, like playgrounds, sports courts, trails, artwork, and shelters. The more-than-human elements, including vegetation, water, air, and wildlife to name a few, create systems focused on the health of more-than-human elements. Each site has interventions that integrate human and more-than-human elements to the site to instigate the presence of both elemental types. For example, Sweetgrass incorporates constructed floating wetlands to benefit juvenile salmon, while artwork and banners increase human recognition and understanding. Hunter's Point South includes bioswales, marshland, and restored shoreline to benefit wildlife, insects, butterflies, stormwater, and storm surges. It also includes a playground, dog park, trails, and basketball courts to enhance the human neighborhood and surrounding city population. Menomonee Valley has restored prairie and wetland landscape that promote pollinators and wildlife and filters stormwater to improve water quality. Each site also contains trails that connect with regional bike transportation routes.

Interactions. The interactions between elements become critical for effective system function. Those interactions connect elements. For example, native plants intersect with pollinators that create habitat systems while benefiting plant growth. In other ways, humans interact with more-than-humans to show the overlap of systems – for better or worse. For example, human stewardship efforts which help remove invasive species and create room for native plants to develop are positive interactions, whereas humans removing trees without considering the impacts of the wildlife systems demonstrate negative interactions. Each of these sites have elements added in the intervention that were intended to bring human and more-than-human elements together. Sweetgrass had banners and artwork that were legible to humans and provided information about the constructed floating wetlands; they were a conduit in creating a connection between human and more-than-human elements in the system. Hunter's Point South uses trail locations and sizes to encourage element interactions. The sidewalks through more-than-human areas such as the marshes were intentionally made 4-ft wide to bring people closer to more-than-human elements. Menomonee Valley also incorporates art, something visible to humans, to promote further awareness to more-than-human elements in the system.

Function. Through interactions, the systems function and role humans play in the system evolve in response to the perceived expansion of human knowledge of other elements in the system. Depending on the interaction, different functions can occur; some are human element focused, others are more-than-human element focused. Sweetgrass' intervention fostered environmental education about the system. By having this education, increased awareness of the larger system and interactions between

human and more-than-human elements became critical to the shift in the system functioning. At Hunter's Point South, the interplay between human and more-than-human elements in the marsh area creates separation from dense urban elements and provides storm surge protection for the neighborhood. In return, humans help to steward the marshes and to mitigate the presence of invasive species. This site demonstrates how more-than-human elements benefit human elements and, in turn, how human elements care for more-than-human elements in a system. In Menomonee Valley, the interactions humans have with the restored landscape and the artwork creates ecological educational opportunities and appreciation for the complex system.

Ecofeminist theory considers how elements interact when it considers the care between elements that extends beyond the human element (Allison, 2017). This kind of interaction becomes important in recognizing how the system will function. If the interaction is human focused, then the function will be rooted in human-centric thinking and perspective. If the interaction demonstrates elements of care or mutualistic community, a holistic view of the community will include more-than-human elements. If humans are viewed from a perspective as a part of the landscape and more-than-human elements are shown care and respect, the function can shift to a holistic system approach to the land.

As each site is considered, the complexity that forms a landscape creates challenges in terms of defining the larger system being researched. Systems are defined yet nonlinear, with varying scales, components, and spatial diversity that overlap to form the layers in the landscape we experience today (Wu & David, 2002). Each of the sites have unique systems and relationships resulting in the individual functions of the landscape. Each system transitions between balanced, unbalanced, transitional, or disruptive states (Scheffer, 2009b). This transformation was in upheaval during the latest round of interventions. Hunter's Point South is a good example of a system that had been in a healthy state, but it was not healthy a holistic system before the development of the waterfront park. It was in a tolerable, borderline unhealthy state struggling with more-than-human elements being present and lacking healthy human components and interactions. As each phase of the park was installed – Gantry State Park in 1998, Hunter's Point South Phase 1 in 2013, and Hunter's Point South Phase 2 in 2018 – a system state transition occurred. Although extensive interventions were evident in creating a transition, the people and programming shifted the perspective of human elements in the system. That slow, transitional state has moved the landscape to a healthier state. Similarly, at Menomonee Valley, landscape restoration was implemented from 2006 to 2013. That restoration created a visual change in the landscape, but the transition to a healthy state occurred because of the care and community engagement that continues today. In a different circumstance, the Sweetgrass project occurred at a site that has been deemed an unhealthy state and continues to see changes in salmon populations, diminishing water quality, and degradation of more-than-human element conditions. The intervention created from the project focused on creating a critical transition in the system function to help guide the system toward a healthier state. That state and the Sweetgrass Project were temporary; a broader intervention is necessary to enable a larger shift in the health of the system.

While the elements and interventions of new elements are critical to create a visible transition towards a responsive system, the kind of interactions and functions that occur in the place result in resiliency. The longer care, stewardship, and relationships are demonstrated over time, the closer to a healthy state the system becomes. The fact that an intervention has occurred, does not mean the site will automatically shift to a healthy state. Lasting relationships are critical to health and change within the system.

Systems-based Design

When considering the importance of relationship and interaction types for a healthy system for a systems-based design approach, certain factors become critical. Traditionally, landscape design has involved consideration of which and how new elements can be added to the system, as well as how these changes influence what will change the landscape system. From a systems-based design perspective, elements are added, but the interactions and relationship types formed change the landscape system themselves. Most importantly, system states demonstrates that system resiliency does not arise from change at merely one specific moment or element. Rather, resiliency represents prolonged change and relationships that modify the system's health. Therefore, this design approach must consider long-term relationships, how care is demonstrated, and what the future of the system is to create lasting system change benefitting both human and more-than-human elements.

The roots of systems-based thinking relate to landscape ecology, feminist theory, and Indigenous knowledge. Each area of investigation has specific associations to different design approaches and actions. Ecological design builds from understanding in landscape ecology as a foundation and focuses systems-based design intervention on site flows and functions (Rottle & Yocom, 2010). Feminist design is least formalized, but centers on considering underrepresented elements (Jacobs, 2020). Indigenous planning works to build a mutualistic community by following Indigenous principles (Whyte et al., 2018). As systems-based thinking is considered through design, each of these theories can merge. Systems-based design considers the flows and function of a site, the underrepresented elements in a system, the damages and history that occurred in a system, and the mutualistic community being formed.[16]

Systems-based design still considers the elements, interactions, and functions of a system, but it is critical to consider how these relationships connect with underrepresentation and historical damages, the flows and function, and community. First, systems-based thinking demonstrates that we cannot separate the human and more-than-human elements of the system. Historically in Western culture, more-than-human elements have served as "less than" human elements. Through systems-based design, more-than-human elements must have a critical role in the system and be supported and cared for with interactions. Second, the interactions between elements create flows and functions for which we can design to reconnect or amplify system priorities. Ecological design reminds us of the lack of boundaries, the complexity of the system, and how systems and sites nest within both small- and large-scale systems. Finally, systems-based design continues the system flows and functions and considers how that relates to a mutualistic community: one that humans and more-than-humans benefit from and help each other.

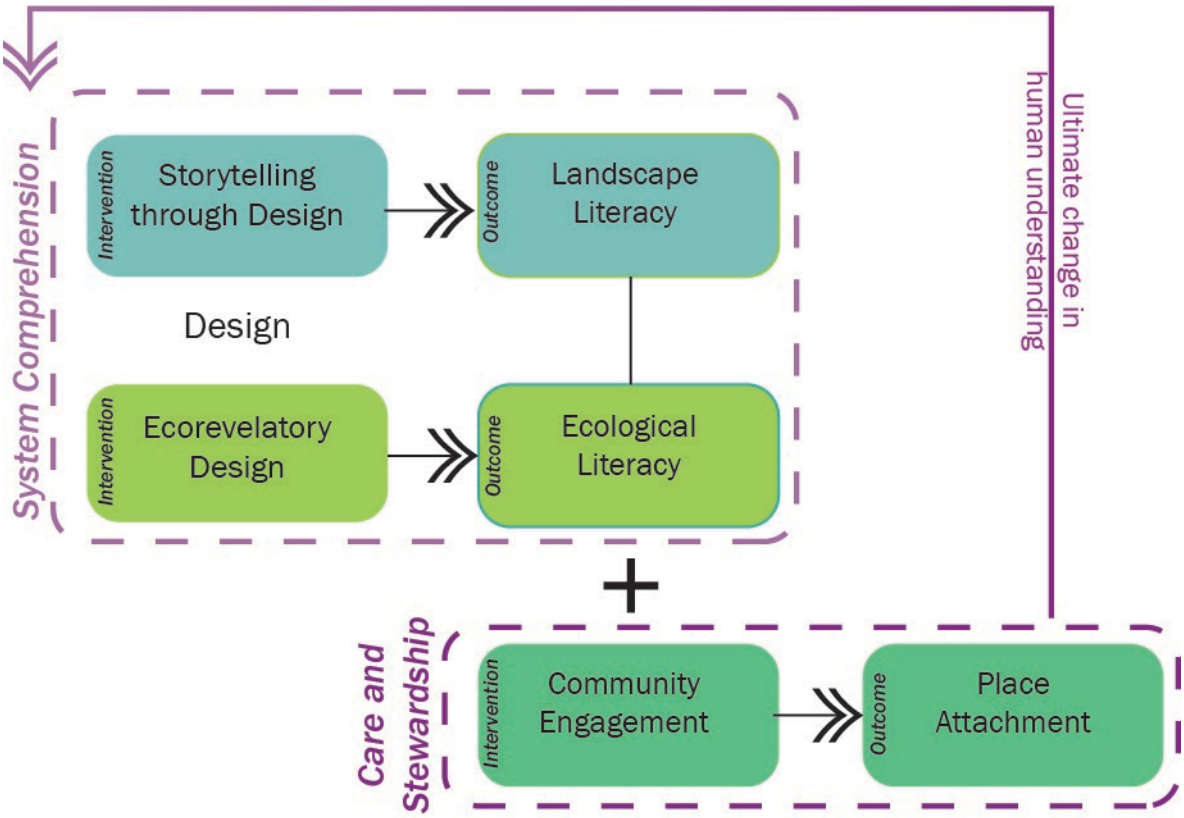
When examining how systems-based design is demonstrated, storytelling through design, ecorevelatory design, and community engagement are critical approaches that help form and define a holistic community by contributing landscape literacy, ecological literacy, and place attachment, respectively.

[16] It is important to state that incorporating the Indigenous theory and methodology is important, this research is being done from a Western perspective. Additionally, to truly understand and use Indigenous knowledge, one must be born Indigenous. This work is not meant to appropriate Indigenous knowledge, theory, or methods, but to learn from other ways of knowing and consider the larger non-hierarchical community.

This framework adjusts the system elements and the interactions that occur to pursue a change in the human understanding of the system (see Figure 6.1).

Figure 6.1

System functions and flows to create holistic understanding



Storytelling Through Design → Landscape Literacy. In storytelling through design, the elements of art, relics, or other materials are used as design elements (Heatherington, 2011; Hood & TED Talks, 2018). These elements require human interaction to tell the story and to understand the layers and history contained on the site. Hunter's Point South in New York City incorporates an industrial history of the site in the landscape design by including elements of the former Pepsi Bottling Plant sign, the piers and gantry from when it was a shipping port, railroad tracks in planters as well as in the sidewalk, a ferry stop that connects to Manhattan, and signage that explains the former sugar factory and landscape history. They focus on an industrial story emphasizing the human history of the site. SWA/Balsley, the landscape architecture firm for the project, also emphasized a narrative of sustainability and resiliency supporting the future function of the site. Site elements include native plants, bioswales, salt-tolerant marshes, and riprap shorelines. These element interactions support more-than-human elements and focus on considering habitat, stormwater, water quality, and more-than-human systems in terrestrial and aquatic environments. The marshes also relate to the historical narrative of when the marshland had been the primary ecosystem of the landscape.

Storytelling is done by intervening in the landscape with new elements or element locations, but that storytelling is not understood or recognized without the interactions that occur between the design elements and humans who are in the system. The resulting function from an interaction that humans understand is landscape literacy. Hunter's Point South demonstrates that 57% of the general site users neither made nor understood the interactions between humans and the design elements the designers intended. Those general site users surveyed who did understand spoke to the landscape's industrial and transportation history. Those who were site stewards and actively engaged in caring for the land demonstrated landscape literacy by knowing more about the land history and providing more details about the landscape. One critical difference between many of the general site users and stewards is the time they spent on the site. Therefore, the stewards develop a relationship with the more-than-human elements in the landscape.

The role of storytelling in design comes from design elements during system interventions, but the important piece to consider during design is the interactions of humans with design elements, constituting their landscape literacy. While landscape literacy is about reading and understanding the land, it is also a cultural practice that addresses histories and injustices (Spirn, 2014a). At Hunter's Point South, landscape literacy comes from knowing the Indigenous and marshland narratives that dominated the site in the 1600s. Colonization forced Indigenous peoples inland; infill of the marshland then took away homes for more-than-human elements and resulted in disarray on the landscape.

Designing with landscape literacy at the forefront means that the design team must strategically add elements to the system to create interactions that educate people about the histories and injustices. While the percentage of respondents who understood the Hunter's Point South historical narratives was small, only 10% spoke to Indigenous peoples or marshland. More (56% overall) knew about the transportation and industrial struggles in the area. This landscape intervention, Hunter's Point South, intended to foreground these histories. With time and further interactions, more people could learn to read the landscape and gain a greater appreciation of their own landscape literacy.

Ecorevelatory Design → Ecological Literacy. Ecorevelatory design began as a way to "reveal" the more-than-human elements and systems in a landscape and "make the invisible visible" (Helphand & Melnick, 1998b). Notably, ecological education is needed to understand ecorevelatory design choices (Eisenstein, 2001). Systems-based thinking continues to demonstrate the need for human elements to value more-than-human elements in the system (Hobbs & Wu, 2007). Menomonee Valley undertook this challenge on a landscape that had long been industrial factories with a designated brownfield, river with poor water quality, and very little vegetation or traditional wildlife habitat. In 2006–2013, the design intervention included strategies for brownfield mitigation, restored native prairie with pollinator and bird habitat, improved water quality and geomorphology provided better salmon habitat, and wetlands that capture, filter, and treat stormwater runoff from the industrial sites and the overhead roadway. Wenk and Associates strove to make these more-than-human elements a critical component in the landscape and strategically integrate human and more-than-human elements together in the design.

This site reveals the more-than-human elements that were not visible previously. To understand the change that it has facilitated in the system function, ecological literacy must rise from the interactions between human and more-than-human elements. Ecological literacy includes environmental education, exploration, and a sense of wonder, but it also fosters the goal of shifting human thinking from being human dominant to more-than-human dominant (Boehnert, 2012; Orr, 1992). Menomonee Valley

demonstrates more-than-human thinking when considering the ecosystem health; 86% of site users spoke to a more-than-human element in the landscape, while only 25% mentioned something human-related. This reveals how the design intervention successfully created meaningful interactions between human and more-than-human elements.

One critical resource in this shift and in formulating the interactions and relationships people have with the land was the Urban Ecology Center (UEC) adjacent the Menomonee Valley Park. The UEC facilitates these relationships, provides care for the holistic land, and ultimately supports the system flow and function. The UEC serves underprivileged communities and schools to help people learn about more-than-human elements and to see a system that transcends the merely humans (Leinbach, 2018). The other elements that the UEC provides are longevity and time. Those site users who are new to the site, did not know as much about system function, but most of the people interviewed were regular visitors who had spent time in the park and volunteered for UEC. As people spend time on the site, they gain a greater understanding of the system, whether through formal programs at UEC or on their own. Consequently, their interactions with the site and education regarding the site improve.

In design with ecorevelatory thinking, considering how the design elements can facilitate interactions is crucial, but indicating how holistic relationships can form with ecological literacy is also essential. It may be through a formal program like UEC or another informal strategy, but sustained ecological literacy is impractical without long-term strategies that exceed human interests to serve more-than-human elements. If more-than-human elements are incorporated into a site, humans must do what they can to help them thrive in the system.

Community Engagement → Place Attachment. While landscape literacy and ecological literacy are important components in understanding a system, the relationships built through them are the keys to changing the way a system is viewed. Eric Higgs furthers the importance of community engagement and the notion that it should be combined with local culture (Higgs, 2003). The Sweetgrass project demonstrated the integration of community engagement and local culture with the 33 community members involved in the design, construction, implementation, monitoring, and stewardship phases. People genuinely wanted to learn more, ask questions, and participate in the project. While community members learned from the design team, the design team members also learned from the community through their lived experiences and prior knowledge.

The relationships formed in community engagement can create place attachments for people with the landscape. How people connect with the land and their personal relationships and memories help create a bond (Cooper Marcus, 1992a; Tuan, 2013). It is vital that these relationships reveal something greater than humans and relate to more-than-human elements and a holistic system. In the Sweetgrass project, memories included floating wetlands, care for the land and water, proenvironmental behaviors, salmon, and habitats that look beyond human importance in the system. All except the salmon response had a significant increase in percentage of engaged community responses compared to general site users.[17] This growth in understanding demonstrates the role of community engagement in making memories that include holistic system thinking.

[17] The salmon was at 9% for engaged community, while the site users were at 10%. As such, the results were very close for this category.

With place attachment, the environmental, ecofeminist, and ethic of care are imperative to forming a mutualist or community care lens. Environmental or ecofeminist ethics focus on the relationships shown towards more-than-human elements in the system (Senda-Cook & Endres, 2013). The ethic of care proposed through an ecofeminist lens (Noddings, 2012) demonstrates the type of relationships essential to place attachment. Proenvironmental behavior is one way to illustrate this. In Sweetgrass, 64% of the engaged community wanted to be further involved in the project, as compared to 48% of general site users that showed interest. The engaged community showed more interest than did the site users, and they had already been involved; it reflects a sustained relationship of care. With systems-based thinking as an integral part of people's lives, they form a connection, relationships, and place attachment to the landscape.

In systems-based design, community engagement and place attachment signify ways not always incorporated with traditional design elements, such as storytelling through design and ecorevelatory design. Rather, place attachment design focuses on a caring, holistic function, and working backwards to figure out how to reach that point. What interactions or human-based systems need to be facilitated to create a place attachment in the landscape? Furthermore, community engagement must look beyond its benefits for people and consider the larger land communities' engagement, relationships, and attachments.

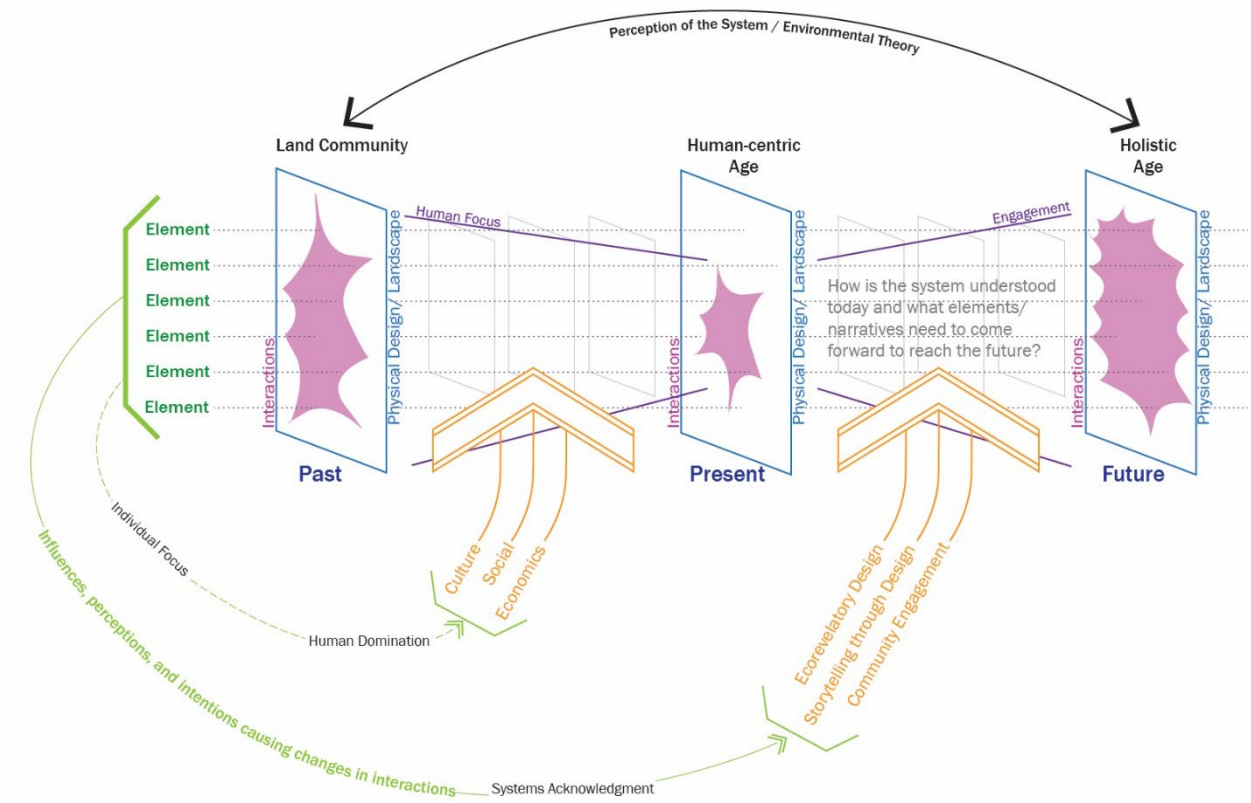
Finding a Holistic Community Approach

Historically, the land community was in a place where human and more-than-human elements were valued, and the greater function was the goal of the land system. Over time, cultural, social, and economic influences have created a much greater individualized community – one where human elements and functions dominate more-than-human elements. This relationship view has created a broken community and has fractured the landscape.

Systems-based design can help shift us toward a more holistic view that will ultimately lead to a more holistic community. If we consider not just the elements of the landscape, but the interactions, caring relationships, and long-term respect, we can start to function as a part of the landscape that has mutualistic benefits for human and more-than-human elements. By considering the role storytelling through design, ecorevelatory design, and community engagement play in contributing landscape literacy, ecological literacy, and place attachment, we ensure more-than-human elements, underserved and underrepresented elements, and past landscape narratives can be supported in the landscape's future. Systems-based design must recognize the history of the past site relationships and consider what function, relationship, and care is being implemented. See the paradigm shift illustrated in Figure 6.2.

Figure 6.2

The paradigm shift that needs to occur to rediscover a land community holistic relationship



We are all part of the complex systems that form and sustain the landscapes in which we live, work, and play, yet understanding the complexity of these systems can take many forms. Landscape ecology, feminist theory, and Indigenous knowledge each have their own ways of generating next steps, but all have similar strengths that can ground systems-based design. Each knowledge base has its form of holistic community. We must find ways to share this knowledge and to get more people involved and engaged in the system. Systems-based design is one strategy to consider how landscapes are designed and community relationships formed.

Systems-based design facilitates relationships and longevity of care for all system elements. Landscape literacy, ecological literacy, and place attachment are approaches to understand system relationships derived from storytelling through design, ecorevelatory design, and community engagement. The more we foster these relationships through systems-based design, the sooner we make possible a holistic age.

Further research can explore the evidence-based design methodology that emerges from this case-based work. We can consider a holistic community throughout the process by intentionally engaging the landscape in a similar approach. It is not about the final aesthetic appearance of the landscape, but the relationships, function, and community built in the process and maintained over time.

Holistic Landscapes

A holistic landscape seeks to place systems-based thinking and design at the forefront while bringing an intention of care and mutualism as critical components of how humans perceive the landscape system. By viewing a landscape through a holistic framework, human and more-than-human relationships are essential to understanding the landscape. Relationships can be positive and helpful, while they can also be negative or hurtful to system elements; each relationship has a component of intention that creates positive or negative interactions. Relationships within a holistic landscape are also not strictly human to more-than-human. Human to human and more-than-human to more-than-human relationships are critical interactions that form the landscape function.

Designing and viewing relationships within the landscape as holistic instills a sense of equity, intention, care, and mutualism in the landscape. The design of a holistic landscape is not about the individual elements present, but instead the function of a place that is healthy and beneficial for all elements within the system. The function is formed by the relationships and interactions within a system. Elements are used to facilitate relationships and interactions within a system. As design teams work to create holistic landscapes, it is not the aesthetics of the place that they seek, but rather the relationships and function that they aim to improve for all elements, especially underrepresented elements. This research demonstrates the importance of community engagement and how it can change the intention and care of a landscape by strengthening the relationship. It alters human understanding of other elements and a system function.

Lastly, humans are just one piece of this system. Holistic landscapes strive to remove them from a place of dominance. While humans are the ones often facilitating landscape changes, we are not the only elements in the system. Human and more-than-human elements have critical roles in a holistic system. Therefore, when understanding a holistic landscape, it is essential to recognize the relationships, or lack of relationships, between elements and seek to find ways to support all elements with new, healthy, and resilient relationships. Holistic landscapes can create opportunities to understand, repair, and sustain the system.

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Appendix

Sweetgrass Arts - Visitor Experience Survey 2021

Thank you for volunteering to participate in this survey. I am researching how visitors experience this stretch of the Burke-Gilman trail. Please answer honestly about your experience. Your response is anonymous. If you would like to add your email address at the end, you will be entered to win a $25 Starbucks gift card.

By continuing with the survey, you are agreeing to participate and consent that you are over the age of 18 years old.

How often do you come to the Burke-Gilman trail?

Daily 2-3 times a week Weekly Monthly Infrequent

In this part of the Burke-Gilman Trail, what features may be contributing to a healthy ecosystem?

_____

What art features have you noticed on the site? Do they tell you anything about the site?

_____

_____

Is there a certain art or landscape element that helped you better understand the landscape or ecosystem? _____

Have you participated in tours, stewardship, or community events of the floating wetlands? Yes No

How would you explain the floating wetlands to your friends?

_____

_____

What memories will you take from this place?

_____

Has learning about the floating wetlands made you think differently about the landscape? Yes No
If so, how? _____

Would you be interested in being a steward to help care for the landscape? Yes No
If so, why? _____

Other Comments:

Thank you for participating in this survey! Please return it to Jenn Engelke at jengelke@uw.edu

Sweetgrass Arts - Steward and Artist Survey

Thank you for volunteering to participate in this survey. I am researching how people experience this stretch of the Burke-Gilman trail. You have a unique experience having participated in creating the floating wetlands or the art. Please answer honestly about your experience. Your response is anonymous. If you would like to add your email address at the end, you will be entered to win a $25 Starbucks gift card.

By continuing with the survey, you are agreeing to participate and consent that you are over the age of 18 years old.

1. How did you participate in Sweetgrass? Choose all that apply.

   Check all that apply.

   - [ ] Artist
   - [ ] Stewardship
   - [ ] Design Implementation
   - [ ] Research team
   - [ ] Other: _____

2. If you are an artist, what is the inspiration behind your art?

3. If you are a steward or helped with the design implementation, what was your reason for being involved?

4. Is there a certain art or landscape element that helped you better understand the landscape or ecosystem?

5. How would you explain the floating wetlands to your friends?

6. What memories will you take from this place?

7. Has learning about the floating wetlands made you think differently about the landscape? Yes/No If so, how?

8. Would you be interested in being a steward to help care for the landscape? Yes/No If so, why?

9. Other comments:

10. Thank you for participating in the survey! If you would like to be entered into a drawing for a $25 Starbucks gift card, please enter your email below.

Hunters Point South Waterfront Park: Visitor Experience Survey

Thank you for volunteering to participate in this survey. I am researching how visitors experience this park. Please answer honestly about your experience. Your response is anonymous and name/contact information will not be asked as a part of this survey.

By continuing with the survey, you are agreeing to participate and consent that you are over the age of 18 years old.

How often do you come to Hunters Point South?

Daily 2-3 times a week Weekly Monthly Infrequent First Time

In this park, what features may be contributing to a healthy ecosystem?

_____

What is the history of this land? What site features (i.e. art, materials, design) helped you know that?

_____

_____

Is there a certain art or landscape element that helped you better understand the landscape or ecosystem (past or present)? _____

Have you participated in tours, stewardship, or community events at the park? Yes No

How would you explain the resilient or sustainable features of the park to your friends?

_____

_____

What memories will you take from this place?

_____

Has learning about the park's resiliency made you think differently about the landscape? Yes No
If so, how? _____

Would you be interested in being a steward to help care for the landscape? Yes No
If so, why? _____

Other Comments:

Thank you for participating in this survey! Please return it to Jenn Engelke at jengelke@uw.edu

Hunters Point South Waterfront Park: Stewardship Survey

Thank you for volunteering to participate in this survey. I am researching how stewards and visitors experience this park. Please answer honestly about your experience. Your response is anonymous and name/contact information will not be asked as a part of this survey.

By continuing with the survey, you are agreeing to participate and consent that you are over the age of 18 years old.

How often do you come to Hunters Point South?

Daily 2-3 times a week Weekly Monthly Infrequent

In this park, what features may be contributing to a healthy ecosystem?

_____

What is the history of this land? What site features (i.e. art, materials, design) helped you know that?

_____

_____

Is there a certain art or landscape element that helped you better understand the landscape or ecosystem (past or present)? _____

How would you explain the resilient or sustainable features of the park to your friends?

_____

_____

What memories will you take from this place?

_____

Has learning about the park's resiliency made you think differently about the landscape? Yes No

If so, how? _____

What community activities have you participated in?

_____

Why have you chosen to participate?

_____

_____

Other Comments:

Thank you for participating in this survey! Please return it to Jenn Engelke at jengelke@uw.edu

Menomonee Valley Community Park and Three Bridges Park: Visitor Experience Survey

Thank you for volunteering to participate in this survey. I am researching how visitors experience this park. Please answer honestly about your experience. Your response is anonymous and name/contact information will not be asked as a part of this survey.

By continuing with the survey, you are agreeing to participate and consent that you are over the age of 18 years old.

How often do you come to Menomonee Valley Community Park and/or Three Bridges Park?

Daily 2-3 times a week Weekly Monthly Infrequent First Time

In this park, what defines a healthy ecosystem?

_____

What is the history of this land? What helped you know that?

_____

Are there certain art or landscape features that helped you better understand the landscape or ecosystem (past or present)? _____

_____

Have you participated in tours, stewardship, or community events at the park? Yes No

How would you explain sustainable features of the park to your friends?

_____

_____

What memories will you take from this place?

_____

Has learning about the park's sustainability made you think differently about the landscape? Yes No
If so, how? _____

Would you be interested in being a steward to help care for the landscape? Yes No
If so, why? _____

Other Comments:

Thank you for participating in this survey! Please return it to Jenn Engelke at jengelke@uw.edu