Jun 23rd, 9:00 AM - Jun 28th, 5:00 PM

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Learning in place: Reimagining design practice as ecological literacy

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Abstract: What does it mean to practice design in a world without human beings at its center? How can designers take meaningful action in a world in crisis? In this paper, I present initial findings from an experimental month-long immersion in a place humans and more-than-humans meet—a coastal wildlife refuge in the northeastern United States. I report on my experience in the field (notes, observations, and photos), reflections on my trajectory as a designer and researcher in the refuge, my evolving understanding of what it means to design with a more-than-human lens, and how my search for meaningful action led me toward ecological literacy as an approach to practice. In doing so, I offer three contributions: four vignettes demonstrating how entangled more-than-human webs reshape an experience of place, five interconnected considerations for more-than-human design, and a model for grounding design practice in cultivating ecological literacy.

Keywords: Design practice; Ecological literacy; More-than-human design

1. Introduction

> "[W]hat we're proposing, which will no doubt ruffle some feathers, is that design needs to respond to the problem that it helped bring into being by becoming other than itself [...] In short: design must become unrecognisable to itself." (p. 10 Nocek & Fry, 2020, p. 10, emphasis in original).

In this paper, I report on my experience immersed in a place humans and more-than-humans meet—a coastal wildlife refuge in the northeastern United States. My research was based on a single question: How do we practice design in a more-than-human world? By working in the refuge, I hoped to decenter the human perspective from the worldmaking work of design, investigate how humans and nonhumans met, and use this experience to imagine new artifacts and interventions. Initially, I thought my experience might only entail a subtle shift in attention–that much of the work which I associate with design (e.g., discovery, ideation, prototyping, evaluation, iteration) would remain stable. I quickly discovered that

foregrounding the more-than-human would challenge how I conceptualize both my design practice and the idea of design itself. The more time I spent in the refuge, the more I learned about the other non-human beings who lived there. I began to understand the complex entanglements between organisms which make the refuge. In other words, I began to cultivate an *ecological literacy* (Orr, 1992). Becoming ecoliterate–spending time in the refuge, building and expanding my relationships with the more-than-human became *the work*.

In the quote above, Nocek and Fry's (2020) demand for an *unrecognizable* design rests on a challenge: How to preserve the powerful ontological world(s)-making capacity and potential of design, while simultaneously severing if from traditions and practices which push the world toward multiple concurrent interconnected crises (Light et al., 2017; Tsing et al, 2017). To avoid reproducing a collapsing present, this means no less than a complete transformation of how design is conceived of and practiced (Álvia, 2022; Escobar, 2018, 2020; Fry, 2017; Fry & Nocek 2020). What I share here is one experiment in trying to imagine design *otherwise*. In the sections that follow, I report on how my expectations and practices as a designer and researcher were continuously disrupted and reshaped by the more-than-human.

The following paper is organized as follows: First, I begin with background on the more-than-human turn in design, and the different ways thinkers have characterized design through this theoretical lens. Second, I describe my approach for exploring my own practice in relation to the more-than-human, and share a detailed description of the field site. Third, I present four vignettes, which are intended to demonstrate entangled lives which make up the refuge, as well as my own relationship with them. Finally, I offer reflections on how Orr's (1992) concept of ecological literacy created a foundation for re-imagining my design work, and propose five interrelated considerations for designers and researchers working with the more-than-human.

2. Background

All design is more-than-human design—the systems designers create impact and shape the worlds humans and non-humans share together. Accounting for these interconnections and interdependencies is increasingly important for researchers and designers from a range of disciplines interested in decentering the human in worldmaking practices. In the following subsections, I present a brief account of three interrelated threads within the more-than-human turn. First, the conditions of crises which make continued mainstream practices of design impossible. Second, how critical perspectives create openings for visions of design *otherwise*. And finally, how to reimagine design rooted in the entangled relationships between nonhumans and humans which make life on earth possible.

2.1 Design cannot continue
More-than-human design is based on an understanding of design as an ontological project–a collection of world-making practices which produce the conditions for being (Escobar, 2018; Fry, 2020; Willis, 2006; Winograd and Flores, 1987). For critics, the world design has

produced is a catastrophe–it has resulted in environmental disaster (Fry, 2020) and continuously reproduces systems of oppression (Mareis & Pain, 2021a). Mareis and Pain (2021b) describe how design, as predominantly practiced and understood, is anthropocentric, exclusionary, and reproduces a singular worldview and vision of progress which subsumes and erases all other possible ways of being. It locates design and design thinking as complicit in structural systems of oppression (Mareis & Pain, 2021b).

Mareis and Pain (2021) echo Escobar's (2013, 2018) account of predominant versions of design as inextricably linked to a singular western account of development based on constant production. A design which relies on the continuous depletion of natural resources, a singular and totalizing set of social values, and the subjugation of less powerful peoples around the world–it creates a single world without space for others (Escobar, 2018, 2020, 2021). The impact of design is so powerful, widespread, and destructive that it defutures the world (Fry & Nocek, 2020), both conceptually–making it nearly impossible to imagine other ways of being–and literally–the rate at which design produces new things and uses up resources is so intense that it renders the future world unlivable (Fry, 2020). All of these accounts situate (and implicate) design at the intersection of multiple, concurrent, and interrelated environmental, social, economic, and political crises (Agid 2020; Forlano, 2017; Jain, 2023; Tanasescu, 2022; Tsing, 2015; Tsing et al, 2017).

2.2 Design otherwise
These perspectives use the crisis of design to open space for practicing design otherwise (Ansari, 2020). Within defuturing "one is able to clear a path for futuring as the space for a redirective practice intended for repairing and making otherwise" (Escobar, 2020, p. 28). Decoupling design from systems of oppression opens "rethinking of what design fundamentally is so that we can imagine designing ontologies that care, redirect, and world otherwise" (Ansari 2020, p. 128). In asking "what can design do in conditions of crisis?" Agid (2020) positions design as a responsiveness to self and to others (Jain, 2023). As a response to crises Escobar (2021) describes design as "recommunaliz[ing] social life taking nonhumans into account" (p. 31)–an autopoietic process which relinquishes human control in a world. These framings decenter the primacy of a human perspective, and instead emphasize cultivating an ability to respond, and be responsible to the world. It is a call for humans to regain their ability to see and make otherwise, so as to make plural futures again possible (Tănăsescu, 2022). In this vein, Hunter and Thackura (2022) re-define design as creating conditions for life. Likewise (Biggs et al., 2021a; Biggs et al., 2021b) asks how designers might develop "tools or methods to help the world be more vibrantly alive" (Biggs et al., 2021b, p. 25). Designing otherwise implies a search for connection and openings for transitional projects which re-conceptualize design as a collective re-enlivening.

2.3 Design in entangled worlds
One path forward for designing otherwise is to ground design practice in relationships with the more-than-human. Accounts of care (Haraway, 2016), correspondence (Ingold, 2013),

interdependence (Ávila, 2022), and co-survival (Tsing, 2015) frame non-humans as kin. Interconnected subjects and systems, who are partners with humans (Haraway & Endy, 2019) and codependent and tangled together in constant world(s)making (Tsing, 2015; Ingold, 2013).

> [H]ow could a design practice be reconceived to reimagine human and other-than-human abilities to mutually respond in life-affirming ways? [...] The work that is necessary for us to undertake today is about fostering the human ability and capacity to respond in enlivening ways [...] responding that acknowledges ecological constraints and which in its accountability becomes able to respond in life-affirming ways (Ávila, 2022, p. 52)

Framing design as a restorative, enlivening, and life-affirming practice requires cultivating an expanded sense of responsibility to the self and others (Ávila, 2022; Coulton & Lindley, 2019; Hadfield & Haraway, 2019; Haraway & Endy, 2019; Poikolainen Rosén et al., 2022). Haraway (2016) describes "response-ability" as the ability to notice, respond to, and enliven the many relationships which texture the "myriad unfinished configurations of places, times, matters, meanings'' (p.1) of being. Ávila (2022) channels Haraway's perspective through design practices which cultivate "attunement to other living forms in concrete ways'' (p. 52) where design "must become a life-affirming, enlivening activity" (p. 149). It requires noticing the radical interdependence which makes life possible, and how the misunderstanding or destruction of that interdependence leads to crisis (Tsing et al., 2017).

These new entangled visions recognize design as situated within destruction and crisis while challenging designers to re-imagine living well on a damaged planet (Fry, 2017; Hadfield & Haraway, 2019; Tsing et al., 2017). Design transforms into a coming together–a relational thinking and being in order to "take care with the skills at hand" (Haraway & Endy, 2019). Here, skillful practice involves deep listening and noticing, unpacking relationships, asking what the others (all kinds of others) may need to flourish together (Haraway & Endy, 2019). This framing directs the work of the designer toward a situated knowing and seeing which attend to relationships and entanglements in place. This creates a foundation for imagining and enacting activities which preserve life–justice driven projects of co-survival that recompose and re-enliven the world while challenging and dismantling systems of oppression (Hadfield & Haraway, 2019; Tanasescu, 2022).

3. Approach

3.1 Field study and observation practice

I conducted a month-long field study of a wildlife refuge in the northeastern region of the United States. Specifically, I visited the same refuge each day for 31 consecutive days during the late summer. My visits included walking the trails and shore, and stopping to observe and watch in certain areas. I documented my visits with photos and videos, and I recorded notes and reflections on each visit in a notebook. I would write reflections either in the refuge as part of my visit, after I left, or both. My notes included observations about what I no-

ticed, reflections on the refuge and the wider challenge of practicing more than human design, ideas for possible projects, sketches, and more. In total, I record 40 pages of notes and reflections in small field notebooks, 45 videos, and 351 photos. I organized these photos, videos, and notes by subject in a digital whiteboard space. These data became the foundation for the four vignettes below. My fieldwork builds on previous research which use practices such as observation, journaling, vignettes, and listening to explore design and the more-than-human (Bell et al., 2024; Biggs et al., 2021a; Ofer & Alistar, 2023; Oogjes & Wakkary, 2022).

I specifically directed my observations and field visits to nonhumans. This opened up my attention to a wide range of stakeholders, from the microscope organisms in the waters of the refuge, the plants and trees which grow in it, the mammals and birds, the rocks, the sand, the wind, and more. I did not have a specific protocol for deciding what to document or not, but instead, let my attention wander over the different nonhuman beings in the refuge–birds, flowers, land mammals, crustaceans, mollusks, seaweeds, insects, wind, stones, waves, the sea–all of these actors appear both in field notes, photos, and videos.

3.2 The refuge

The refuge is a 242-acre peninsula bordered by a large saltmarsh and beach on the northeast, a river to the east and the ocean to the south and west. A single road runs into the refuge. One side boarded by rising grasslands, and the other rocky and sandy shore. The road carries you into a small parking lot next to a visitor center. From the parking lot, you can begin to see the coastal shrubland and grassland–a rare habitat made of low growing grasses, shrubs and trees. Near constant strong ocean winds and salty air prevent these fields from developing into forest. Trails run through the grasslands. As you walk through fields of native goldenrods; bayberry trees and red cedars; yarrow and tansy, you will see some of the over 200 species of birds which call the refuge home. Along the northeast edge of the refuge, the grasslands blend into 40 acres of saltmarsh which form a buffer between the river and the land. Everywhere else, the ends of the fields take you to cliffs which lead down to sandy and cobbled beaches. Along the shoreline, terns, gulls, ducks, cormorants, osprey, and humans fish for striped bass, tautog, bluefish, scup, and more.

3.3 The refuge as design interlocutor

The refuge serves as a compelling interlocutor for exploring more-than-human design practices for at least 3 reasons: First, the refuge is intended to be a place where the human and nonhuman meet. "Refuge" is an official designation assigned by the federal government. Managed by the U.S. Fish and Wildlife Service, refuges are specifically intended for "the conservation of native species dependent on its land and waters" (U.S. Fish & Wildlife Service, 2023), with the goal of "a balanced conservation that enables wildlife and people to thrive" (U.S. Fish & Wildlife Service, 2023; U.S. Department of the Interior, 2016). Birders, fishermen, and hikers visit the refuge alongside migratory birds, seeds carried by the wind, fami-

lies of deer, and more (U.S. Fish & Wildlife Service, 2006). Second, the refuge is always in dialogue with humans. As long as humans have lived near the refuge, it has been a space where humans and nature intersect. For at least 5,000 years, members of the Narragansett and Wampanoag Tribes lived on the island on which the refuge is located, establishing summer settlements and "sophisticated land management and fishing practices" (Newport Historical Society, n.d.). Due to the violence of colonization, much of the area's pre-european history is either lost or destroyed.
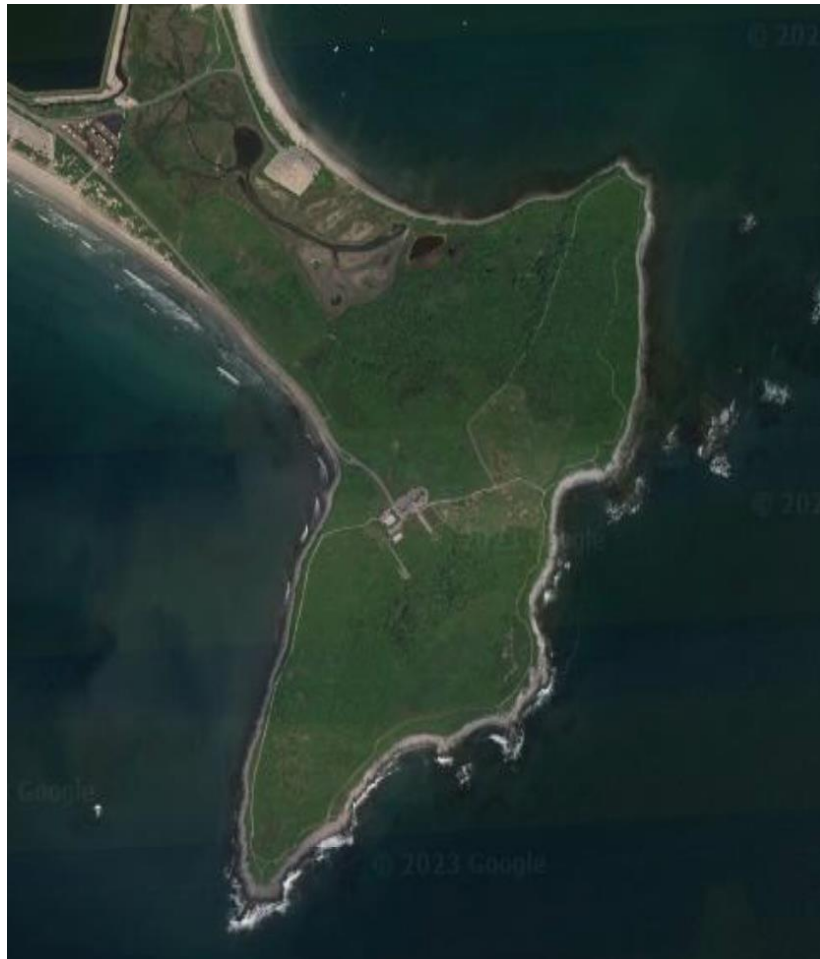

Image 1   A satellite view of the refuge (image source: Google Earth 2023).

From the mid-1600s until the 1970s the area that would become the refuge was transformed multiple times, from farmland, to military base, to municipal landfill. It was not until 1970 that some of the land came under protection, and not until 1974 that the US Navy gave the rest of the lands over to the refuge (Dunn, 2014). In the early 2000s federal and local governments began removing literal tons of construction refuse, household waste, and contaminated soil, eventually capping the land, replanting native species, and restoring the 40-acres of saltmarsh which had been used to dump trash. Now, portions of the trails are re-routed to avoid erosion from rising seas; paths are re-graveled to accommodate different accessibility needs; sections of grassland are mowed in order to control invasive plants fracturing sensitive ecosystems. Finally, the refuge is a place of borders and transitions–places

where edges meet. Coastal grasslands meet sands and rocks; the shore meets the sea; soil and sand meet hardened asphalt and concrete; conserved space meets human development. The edges create openings for life to take hold, unique entanglements between plant, animal, human, geology, microbe, mollusk, and more. Waves crashing on the shore carry flotsam and trash from the ocean, foreign algae and crabs find shelter in local tide pools. Seeds carried across continents make their way into the soil and bloom. Taken together, the area itself is an ongoing design project–human action has reshaped it for millennia, and non-human action even longer. All the life and activity in the refuge is an opportunity for rich dialogue to reimagine design otherwise.

4. Vignettes

In the following section, I present four short vignettes which are intended to demonstrate the complex entanglements which shape life in the refuge. They are not comprehensive (there are many more I would have liked to share), but instead draw on my notes and observations from my fieldwork. They represent my own (human) experience cultivating my ability to respond to and correspond with the refuge and the entities within, developing a foundation to listen and attend to how these beings speak.

4.1 Life on the edges

On the sandy beach on the north-east edge of the refuge, between the water and the salt marsh, an old aluminum can protrudes from the water. Not so long ago, human hands cut this can in half and, through some combination of intention and neglect, lost it to the sea. This addition to the intertidal ecosystem did not go unnoticed. The waters of the refuge are full of life–not only large fish and crustaceans, but microscopic animals–zooplankton. These tiny creatures are a diverse and critical part of the marine ecosystem, and include the larval stages of larger organisms. At least two kinds of larvae–blue mussels and slipper snails–noticed the can, and decided to make it their home.

Both mollusks are native to the refuge's waters. Blue mussels are a common bivalve which grow in shallow waters and intertidal zones. Likewise, slipper nails prefer bays and protected areas, and often live stacked together in breeding colonies on hard surfaces. Both produce tiny larvae, who look for safe habitat to protect them from predators. Young mussel larvae swim near the shore for up to a month before attaching to a surface where they will spend the rest of their lives (Bayne, 1964). Slipper snail larvae also float until maturing into large adults. After millennia growing on rocks and reefs, the life possibilities for these creatures have become deeply entangled with human action. While cans and other hardened debris offer potential habitats, pollution and runoff around the refuge can kill large populations of mollusks (Narragansett Bay National Estuarine Research, 2009). Unintentional care and harm mix together in this can. Removing it subtracts aluminum waste from this ecosystem, but it would also kill the young beings who have only just started growing there. The snails, the mussels, and I exist together on the edge of a constantly evolving shoreline where beings

look for spaces to thrive in the face of catastrophe (Tsing, 2015). What pathways might exist here for mutual thriving (Biggs et al., 2021b) and interdependence (Avila, 2022)?

Image 2   Young blue mussels and slipper snails growing on an old can (photo credit: the author, 2023).

4.2 Who belongs here?

The meadows in the refuge move like golden waves. As the wind comes off the ocean, unobstructed by trees and buildings, it pushes through fields of tansies. The long stalks topped with clusters of tiny bright yellow button shaped flowers sway back and forth. The sound of their rustling fills the air. In late summer, tansies are everywhere. Despite its prevalence, the tansy is relatively new to the refuge, arriving in the 1600s with European colonists (Luthin, 2015). It has thrived ever since. Before tansies, a different yellow flower would have dominated the landscape–goldenrod. While a mix of goldenrod species still grow in the refuge, the tansy dominates. It outcompetes goldenrod, putting pressure on the wide range of species which rely on the flower for habitat. The tansy's presence then implies absence of others, and its ability to flourish has come at the cost of other plants who had long called the refuge home–plants which co-evolved with other insects, birds, mammals, and microorganisms (Root & Cappuccino, 1992).

Image 3   A field of tansy (photo credit: the author, 2023).

In the region, the tansy is a contentious flower. Some states identify it as an invasive species, while others consider it naturalized (New Hampshire Comprehensive Invasive Plant List: January 2023, 2023). This decision is a political one, it relies on government agencies to make an assessment of the flower's impact, and incorporate it into laws and agency programs. With this designation comes funding and resources, both for removing the tansy, and for cultivating other flowers to take its place. In an effort to restore the coastal meadows of the refuge, contractors cut down large swathes of tansy in hopes that goldenrod (and other residents) will take root.

Image 4   Goldenrod (photo credit: the author, 2023).

This decision, choosing to create conditions which favors one species over another, is a human one. While these actions attempt a kind of repair, it also contains a judgment–that one

species is worthy and belongs in a space, while another does not. The relationships between tansy, goldenrod, humans, and other species invites designers to reflect on the kinds of conditions for life which systems create, the possible futures therein, and how to respond responsibly within collapsing conditions (Light et al., 2017).

4.3 A shared space

The trail is loud today. Somewhere, at the base of the shallow cliffs on the rocks, four Great Black-backed Gulls gathered around a fish have much to say to one another. The gulls here are ambitious opportunists. They have learned to raid beachgoers cooler, chase smaller gulls off of fish they have caught, and harass Osprey in hopes the larger bird might drop its catch. This scene is different. These four do not jockey for position, or fight each other off. Three of these gulls are juveniles. Instead of the distinct slate-gray back and white chest, they are a mottled brown, gray, and white. The mature gull watches as the other three pick at the fish on the shore.

Image 5   Gulls on the rocks (image credit: the author, 2023).

This scene is not unlike many that I have encountered in my visits. Like the gulls, humans fish off the rocks and cliffs of the refuge, leaving behind piles of trash, burned out fire pits, and

tangles of finishing lines. The birds watch these anglers carefully, waiting for an opportunity to snatch loose bait or a fresh catch and wary of possible danger. During the summer, it is not unusual to find whole families fishing together. This often means adults casting and tending lines while young children scrambling along the rocks, exploring and playing. Just as juvenile gulls chatter over their fish, human children delighting in their play on the rocks of the refuge. Both gulls and human visitors are entangled together in the refuge (Haraway, 2016), using it as a place to nourish their kin. These enmeshed threads suggest opportunities for mutuality and care, openings for humans and non-humans to co-construct and share possible futures.

4.4 Invisible worlds

There are hidden worlds in the refuge, and by the end of the summer, I have become fixated on plankton–the microscopic ocean creatures who form the bottom of the food chain. The waters of the refuge are full of zooplankton and phytoplankton. Phytoplankton are microscopic marine algae which live off of sunlight and float near the top of the water. They take in mineral nutrients to survive and they themselves serve as food for others like shrimp and snails and jellyfish. Zooplankton are microscopic animals such as krill, snails, and worms, as well as the larvae of other invertebrates and fish. These tiny creatures form the foundation for all the marine life around the refuge. They are also an alarm; changes in temperature, salinity, or acidity affect populations of plankton, these changes in population ripple through the marine ecosystem. Water without plankton is dying water. There will be no fish. With no fish, the shorebirds disappear. Without shorebirds, the human fishers and birders vanish as well. When the sea and shore degrades and dies, so does life on land. I often watched fisherman cast their lines and wondered what they thought about the tiny creatures which keep the sea full of fish, which kept both their families, as well as families of terns, and cormorants, osprey, gulls and ducks fed all summer.

The refuge waters are healthy, and I am eager to try and meet some of these creatures. For me though, they are invisible. Unseen, and without the right tools, unseeable with my human eyes. At the end of the month, I build a basic plankton net, using plans for a children's science class I find online (Amaral, 1995). I borrow a kayak and try to use my nets to trawl the calmer waters on the northeast side of the refuge. The water in the nets is cloudy, a good sign that it is full of life. Later, under the microscope, I struggle. I see bits of plastic, salt, and algae. But, at first, I find no plankton. The device I am using is basic–less refined than a professional microscope. It shakes and wobbles. After searching through slides, I finally spot tiny shapes dancing through the water. I cannot magnify it enough to see or learn who they are. Seeing them however, was a surprising comfort, a hopeful reminder of the invisible life which connects some much life around the refuge. The plankton are a reminder that the refuge is a world of many worlds. They offer a prompt for imagining both ways of mutually enlivening existing worlds and of expanding opportunities for possible worlds (Escobar, 2017).

Image 6,7 (left) A DIY plankton net; (right) A sample collected with the plankton net (image credits: the author, 2023).

4.5 Closing thoughts

Taken together, these vignettes are intended to demonstrate the entangled relations within the refuge and highlight my own evolving relationships with nonhumans. Immersing myself in the entangled life of the refuge, my work became about knowing in place. To cultivate and reflect on my own relationship in place, to seek to better understand the human and more-than-human relations which create the place as I encounter it, became my design practice.

5. Design practice and ecological literacy

On my initial visits to the refuge, I was awed by the fields of tansies. I am still impressed, but I am also now sensitive to some of what their presence means. Similarly, early in my field-work, I was captivated by all the life in a single tide pool. Now though, I see the tidal world with more nuance. Growing alongside the Rockweed and Knotted Wrack seaweeds are invasive Deadman's Fingers (RI Coastal Resources Management Council, n.d.). Likewise, at the start of the month, I could only name a few trees and flowers as I walked through the refuge. Now, I know the names of many that I encounter, native or nonnative. My relationship with the refuge as a whole, and the beings within it transformed as I actively worked to deepen my understanding of the place itself.

Image 8   A tide pool taken over by Dead Man's Fingers (image credit: the author, 2023).

To describe this coming to know a place, and to capture the ways this immersive work has changed, and continues to change my practice, I adopt David Orr's (1992) concept of *ecological literacy*–a sensitivity to and understanding of the natural systems and more-than-human beings which make life on earth possible based in capacities to "observe nature with insights, a merger of landscape and mindscape" (Orr, 1992, p. 86). Cultivating knowledge and relationships with the places occupy and share with others is essential because:

> People who do not know the ground on which they stand miss one of the elements of good thinking which is the capacity to distinguish between health and disease in natural systems and their relation to health and disease in human ones. (Orr, 1992, p. 86)

Orr's (1992) conception of ecological literacy is rooted in the same concerns and critiques of many of the design scholars described above (see Section 2.1)–a deep recognition of a world facing multiple interrelated catastrophic crises which cannot be addresses by the same forces that "helped create the problems" (Orr, 1992, p. 83). To practice more-than-human centered design, to be response-able to the world (Harway, 2016) means direct experience in the field and in place, learning to notice and hear the more-than-human, and finding awe and wonder in the seemingly mundane. The more-than-human world speaks (Abram, 1997), and ecological literacy provides language and thinking designers might adapt for noticing, listening, and attending to these voices. In the following section, I describe five interconnected directions for practices for developing ecological literacy as a more-than-human practice.
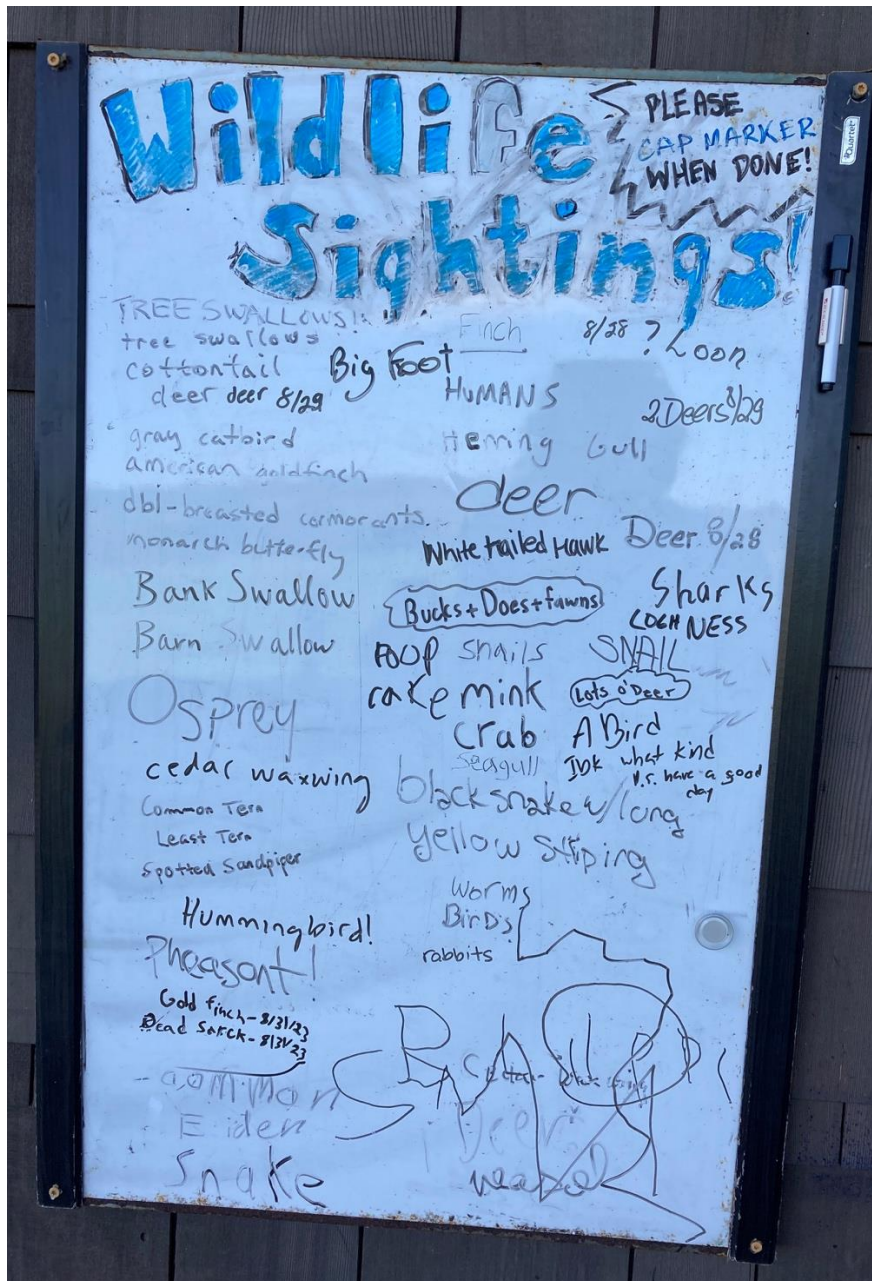
Image 9 A sign in the refuge for visitors to record wildlife sightings (image credit: the author, 2023).

5.1 Awe-full relationships

Ecological literacy as a foundation for design practice starts with building relationships–beginning with a sense of kinship with life itself, in the many different forms it might take (Orr, 1992). Kinship is a sensitivity to the more-than-human "driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world" (p. 86) where "[n]ourishment of that affinity is the beginning point for the sense of kinship with life" (p. 86-87). Kinship is a foundation deepened with specific content knowledge: "at least a basic comprehension of ecology, human ecology, and the concepts of sustainability" (Stone & Barlow, 2005, p. XI). It is at the nexus of a kinship based in "wonder" and "delight", and a deeper understanding of ecological systems and sustainability that we develop the "wherewithal to

solve problems" (Stone & Barlow, 2005, p. XI). Ecological literacy as design practice is not simply "comprehension of how the world works"–design which restores (Hunter & Thackura, 202) and re-enlivens (Biggs et al., 2021b) the world demands thick relationships rooted in awe (Haraway & Endy, 2019).

5.2 Listening in place

Immersing myself in the refuge, I became a student of place. The refuge, its land, plants, animals, and waters became active instructors in cultivating "the habit of careful, close observation, and with it the ability to connect cause and effect" (Orr, 2005, p. 104). Becoming a student of place means learning to listen to, and to enter into dialogue with nonhumans, while avoiding language such as "resources, manage, engineer, or produce" (Orr, 1992, p. 91), which risk positioning the more-than-human as receiver of human action, rather than interlocutor. Learning to attend to nonhumans "trains the intellect to observe the land carefully and to distinguish between health and its opposite" (p. 91). Discerning this difference is central to more-than-human design practices, as it enables practices of response-ability (Haraway, 2016) which create conditions for life (Hunter & Thackeray, 2022). Place is "the most immediate of a series of layers leading to the entire region as a system of small places" (Stone & Barlow, 2005, p. 131), and understanding the language can create opportunities to respond to a wider world.

5.3 Ways of listening

In the refuge, I walked and watched, I wrote field notes and reflections. I sketched images of and maps. I took photographs and recorded videos. I learned to collect water samples, and to observe them under a microscope. These are all different tools and techniques for listening–and represent only a few of many possibilities for listening. Ecological literacy suggests becoming facile in practices and techniques of observation and noticing from a wide range of disciplines. For example, designers and researchers might draw on a wide spectrum including scientific instruments such as hydrophones, sophisticated microscopes and digital sensors. They also might employ more artistic practices of focused attention, contact microphones, and sketching. Further, in becoming ecoliterate, researchers and designers can blend the tools and techniques from disciplines like ecology with existing skills and art practices to create new modes of listening and being *with* non-humans (Bell et al, 2024; Biggs et al., 2021; Ofer & Alistar, 2023; Oogjes & Wakkary, 2022).

5.4 Slower work

The refuge resists any pace but its own. I had assumed that I could quickly learn its plants and animals, and easily see connections which might lead to interesting design ideas. Initially, it was easy to imagine design ideas. Early on, I would record these ideas in my notes, and while some of these projects may have been interesting, I was thinking at the wrong speed. I was not taking the time to understand the relationships and entangled lives which live together in place. To make design "unrecognizable" (Nocek & Fry, 2020, p. 10) requires a slowing down of pace. Good conversation with the more-than-human is "unhurried" (Orr,

1992, p. 91). In slowing down, I attempted to allow myself to become further grounded in place. I began to come to know the different elements of the refuge much more intimately. Over the course of my fieldwork boundaries of the refuge began to dissolve, and my thinking around generative work began to widen.

5.5 Other outputs

My broadened perspective challenged me to imagine other kinds of design research outputs. My relationship with the refuge evolved in parallel with my understanding of design–how it might be reconceived of and practiced. Within this new understanding, my own expectations of the *kinds* of outputs for a design project shifted. Designing with the more-than-human became the wider project of "living and acting well in the world" (Orr, 1992), inviting and requiring other kinds of design actions. Consider Hadfield and Haraway's (2019) reflections on pacific island tree snails. What began as a scientific study, grew into a global network of activists, generations of scholars from local communities, community action, and political advocacy seeking justice for the entangled snail and human lives.

6. Conclusion

This work is the start of engaging with the more-than-human to imagine design *otherwise*. Rather than cycles of discovery, prototyping, and testing, in the refuge, my work became to know the place and learn to live and act well therein. One direction for future work is to imagine and enact collective enlivening activities. Recall the fishing families in the Shared space vignette. What designer actions might they inspire? I am left imagining how to cultivate expansive relationships between the families (human and nonhuman) who spend so much of their summer in the refuge. The human and gull families are networks of relations, how might we strengthen these connections so that together they can "carry a shared vision to fruition" (Barlow & Stone, p. 2). Their shared experiences invite actions centered in response-ability that can cultivate wonder and joy so we might experience the world beyond ourselves as kin.

Image 10 A view of the shoreline (image credit: the author, 2023).

refuge–and by extension each other. Without them, this work could not have been possible, and I, quite literally, would not be the person I am today.

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