

Disturbance Emergence | Regenerative Stewardship of Urban Prairies

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Committee

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Abstract

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Anna Hatcher

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Landscape Architecture

Amidst a warming climate, urban public landscapes often reflect and reinforce land-management practices that contribute to ecological degradation, including turf-dominated planting regimes, fossil-fuel-dependent maintenance, and ecologically simplified systems reliant on constant intervention. These conventional approaches not only drive emissions and biodiversity loss, but also perpetuate fragmented relationships between humans, more-than-humans, and the land itself. This thesis argues for a fundamental rethinking of how urban public landscapes are designed, stewarded, and perceived.

Grounded in ecological planting design, disturbance ecology, and regenerative stewardship, this research investigates urban prairiescapes as a framework for cultivating more ecologically and socially regenerative public landscapes within Seattle's urban realm. Adapted to disturbance, drought, and nutrient-poor soils, prairie ecosystems are uniquely capable of supporting biodiversity, improving soil health, strengthening climate resilience, and fostering reciprocal relationships between people and ecological systems. While ecological planting design has increasingly been applied within urban landscapes, the integration of regenerative stewardship practices such as grazing and prescribed fire remains largely unexplored in highly visible public urban contexts, particularly as a strategy for supporting biodiversity, ecological resilience, and public engagement.

Using the Washington Park Arboretum's Montlake Peninsula as a case study, this thesis investigates how regenerative stewardship can inform the design and stewardship of urban prairiescapes to restore and sustain ecological and social function. Methods include literature review, interviews and consultations with practitioners and researchers, precedent analysis, and spatial and qualitative site analysis. Through these methods, the research examines how ecological planting design can support functional biodiversity and shape public perception; how disturbance regimes such as grazing, burning, mowing, and rest influence habitat heterogeneity, ecological resilience, and opportunities for cultural ritual and community engagement; and how regenerative stewardship frameworks can cultivate adaptive, participatory, and reciprocal relationships between humans and ecological systems.

Findings from this research suggest that ecologically functional landscapes can operate successfully within urban public contexts while reducing long-term maintenance demands, increasing biodiversity, strengthening climate resilience, and creating new opportunities for public engagement with ecological processes. The project proposes a speculative framework for regenerative urban prairiescapes that integrates heterogeneous planting communities, patch-burn grazing strategies, and adaptive stewardship systems supported through community partnerships and long-term ecological stewardship.

Ultimately, this thesis positions prairiescapes not only as an ecological strategy, but as a cultural and relational framework for reimagining how public landscapes are co-created, stewarded, and cared for in the face of climate change.

Themes: Prairiescapes, ecological planting design, disturbance ecology, regenerative stewardship, climate adaptation, biodiversity, landscape architecture.



DISTURBANCE EMERGENCE

REGENERATIVE STEWARDSHIP OF URBAN PRAIRIES

By Anna Hatcher

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I have so many people to thank for supporting me throughout this project.

Thank you to **Celina Balderas Guzmán** and **Ken Yocom** for serving on my committee and for offering continual guidance, support, and insight throughout this process. Thank you to **Lynne Manzo** for guiding the initial phases of this project, teaching me about research methods, offering thoughtful feedback that helped shape the foundation of this work, and for going out of her way to offer immense support while studying abroad. Thank you to **Julie Parrett** for leading the thesis support studio with such care, offering valuable feedback, and organizing our presentation reviews with so much intention and generosity. Thank you to **Catherine De Almeida** for supporting my thesis development and for being a walking encyclopedia of resources.

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I want to thank all of the incredible **University of Washington instructors** who have taught, challenged, and supported me throughout my education and helped prepare me to undertake and complete this project. I want to thank my **family** for their unconditional love and support throughout my education. Thank you to my **friends** for offering feedback, encouragement, hugs, and moments of joy that carried me through this process. Thank you to my sweet pets **Luna, Zuko, and Miso** for their comfort through the excitement, celebrations, trials, and tribulations. Thank you to my lovely **hens** for inspiring my curiosity about regenerative practices and reciprocal relationships with the land.

Thank you to my **Swiss host family** for inspiring in me a love for regenerative practices and ecological planting design that has profoundly shaped the trajectory of my life and career. I want to thank my **ancestors**, who have stewarded prairie landscapes since time immemorial, and whose relationship with the land has surely influenced my love for prairies and reciprocal care for the Earth. Thank you, **Mother Earth**, for continually teaching me what is most important and for guiding my spirit toward stewardship and care.

Finally, I want to thank **Prairies** for reminding me that sometimes in life, disturbance is necessary for a more beautiful and resilient life to emerge. Sometimes, we need to burn things to the ground, and better things are to come.

LAND + INDIGENOUS ACKNOWLEDGEMENT

The University of Washington and the Montlake Peninsula site lie within the unceded lands and waters of the first peoples of Seattle. This thesis acknowledges and honors the Suquamish, Duwamish, Muckleshoot, and Tulalip peoples as the original stewards of this land since time immemorial and recognizes the ongoing Indigenous relationships to place that continue today.

While I cannot speak on behalf of Indigenous communities, it is critical that Indigenous voices are in the forefront of these conversations surrounding land stewardship, ecology, and restoration. Due to the scope and constraints of this research, Indigenous perspectives are not represented in the ways they deserve to be, and this work should not be understood as speaking for Indigenous communities. Rather, this research is grounded in deep respect for the stewardship practices that have shaped and sustained these landscapes over generations.

This thesis also acknowledges that settler colonialism, alongside institutions including the University of Washington itself, has deeply disrupted and scarred relationships between people, land, water, and ecology. In honoring reciprocal methods of care and stewardship, this thesis seeks to celebrate practices that foster enduring relationships between humans, more-than-humans, and the landscape. I would also like to honor with gratitude the land itself and the many Indigenous peoples who have cared for, lived with, and continue to sustain this place.

PREFACE



Figure 0.1 : Prairie plants near my Montana home, photograph by author, 2016.

I grew up surrounded by Montana grasslands and wheat fields that now stand in place of the bygone prairies—a wide-open valley with long, cold winters, where I learned to love the dried colors of the Earth.

To this day, one of my favorite smells is burning grass. Whether from my dad burning the lawn's thatch or nearby farmers burning their fields, the scent of smoke filling the valley was a sign that spring was near. One of my favorite natural phenomena is watching the wind dance through tall grasses—the way they swell and ripple in waves. I have heartfelt memories of being entirely captivated by this natural display— a visual symphony of Earth and Air playing in harmony.

I grew to love grasslands and prairie landscapes. Maybe it was because of the physical surroundings of my upbringing, or perhaps an ancestral familiarity and appreciation. My ancestors, Theresa Kills in Lodge and her parents, Sarvis Berry and Lone Speech, were members of the Piegan Blackfeet tribe and people of the Great Plains. Although these ancestors came seven generations before me, I like to think their intimate connection with grasslands has been passed down despite the oppression and erasure of Indigenous values within the broader culture and within our own family history.

When I was nineteen, studying chemical engineering and unraveling over what to do with my life, a literature professor told our class to go for a walk with nowhere in mind—just walk. I found myself drawn toward the glowing plant growth center at Montana State University, illuminated with purple grow lights. Like a moth gravitating

toward light, I walked through the doors and was greeted by plants and the sound of a trickling waterfall. Relief from the stresses of my life immediately washed over me.

In that moment, I realized that nothing in the world mattered more than nature. Nature is everything. Yet we have been, in many ways, so cruel to nature—extracting, degrading, polluting, and replacing the natural world. Walking through those greenhouses, I realized I wanted my life's efforts to go toward mending the relationships between humans and nature. This thesis, in many ways, is an ode to just that: how we might design our world to rekindle reciprocal relationships that allow life to coexist more peacefully and beautifully together.

As I continued through my education and professional experiences, much like grasslands themselves, my understanding of nature—and humanity's relationship to it—became increasingly fragmented and shaped by conflicting ideals. In an undergraduate entomology course, we were asked to sweep insects from tall grasses, and I began to understand how rich, complex, and alive the world among the grasses truly is. In other classes, I learned to graft, cultivate, and propagate ornamental plants bred primarily to serve human desires. Through work experience, I was taught to yank, pull, cut, spray, mow, bend, and break ornamental landscapes, where it often felt like a tug-of-war with nature rather than a collaboration with it.

I have witnessed how deeply we have scarred the Earth. As a developed society, we expend immense resources on landscapes that prioritize aesthetics over ecological function, reshaping our understanding of beauty itself. In the process, we have erased the beauty that was already here and the ecological identities that once defined a place. As autumn comes to an end each year, I find myself gathering prairie plants into small bouquets for the people I love, preserving some trace of what once was.

This unique set of life experiences has led me to this work. I find immense beauty, joy, and solace in prairies.

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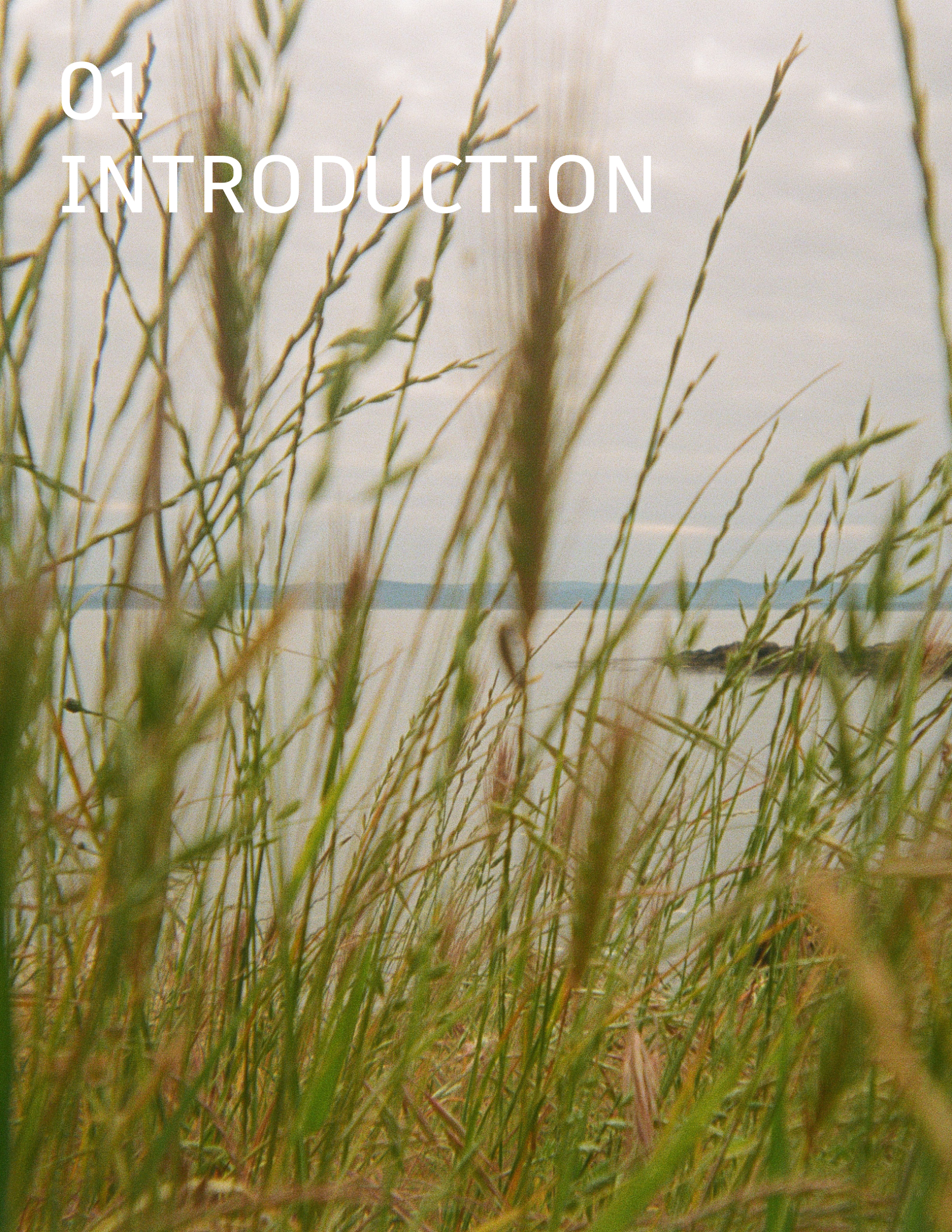
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A photograph of tall grass in the foreground, slightly out of focus, with a lake and mountains in the background. The text '01' is overlaid in the top left corner.

01

INTRODUCTION

GROUNDING THE PROJECT

THEORETICAL SCOPE

This project is grounded in three primary topics, all of which are intertwined and connected with one another: Ecological Planting Design, Disturbance Ecology, and Regenerative Stewardship.

REGENERATIVE
STEWARDSHIP

ECOLOGICAL
PLANTING DESIGN

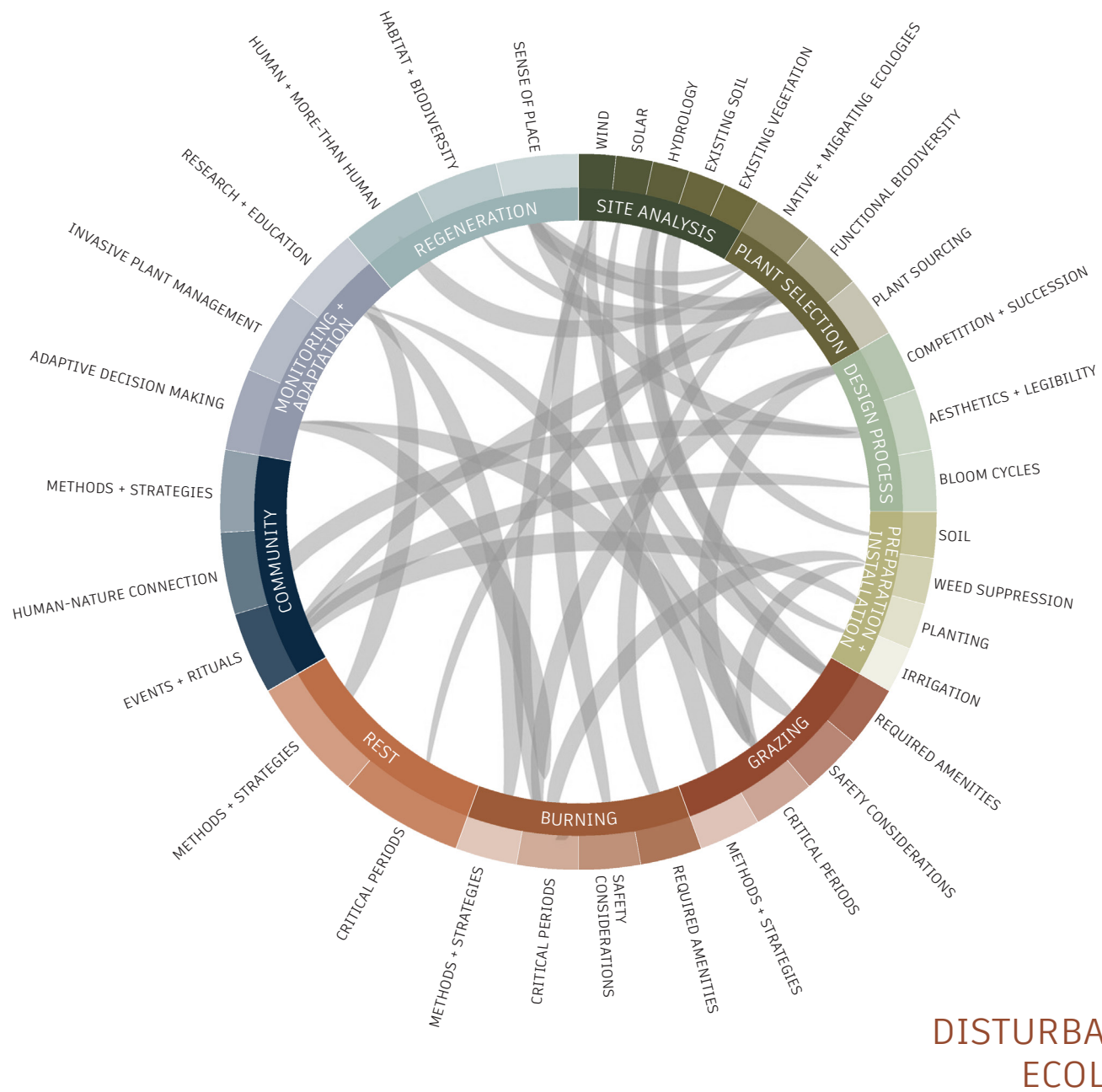


Figure 1.1 : Concept Framework of project themes and their relation to one another, by author, 2026

ECOLOGICAL PLANTING DESIGN

A design approach that mimics naturally occurring plant communities to support greater ecological function.

I use mimic rather than replicate intentionally. While replication is often the goal, the complexity of natural systems develops over timescales far beyond what we can facilitate in designed or restored landscapes. We can make an honest and informed effort, but within the span of a human lifetime, designed landscapes will not achieve the same depth of ecological relationships as undisturbed ecosystems.

DISTURBANCE ECOLOGY

How disturbances such as fire, grazing, and human activity alter resource availability and physical structure for a more biodiverse and resilient system to emerge.

We often idealize restoring ecosystems to a “balanced” state, assuming that balance reflects a stable, unwavering moment in time. In reality, balance is better understood as resilience—an ecosystem’s capacity to persist through change. Disturbance is an essential component of that balance. As animals graze and fires move through the landscape, these processes create conditions for new life to emerge, often with greater resilience.

REGENERATIVE STEWARDSHIP

The practice of managing land and resources to improve soils, plants, human, and more-than-human well-being, creating a net-positive, more sustainable system.

The essence of regenerative stewardship is to rethink how we create, implement, and care for landscapes through a more holistic approach—one that considers more facets of life than just human benefit, and seeks not only to mitigate harm, but to actively regenerate the systems of life in which we are embedded.

APPLIED SCOPE



Figure 1.2 : 2011 Schematic Design of Montlake Peninsula designed by Berger Partnership
(Seattle Department of Planning and Development, 2011)

This project builds upon and compliments the ongoing work of Berger Partnership, the landscape architecture firm leading the prairie design at the Montlake Peninsula. In development for over two decades and anticipated to move into construction by 2031, the project provides a foundation for this research.

This thesis extends the firm's work through continued research and design exploration, with the intention of informing aspects of the built project. Given the project's advanced stage, this thesis does not propose a wholly new design. Instead, it seeks to enhance the existing framework by developing a systems-based approach to how the landscape can be created, implemented, and stewarded.

CRITICAL POSITION



Figure 1.3 : Primary problems this project addresses, by author, 2026

(Image sources: Lawn Mower Tractor Working in the Town Park, 2018; de Kok-Mercado, 2022; VacationSketcher, n.d.;)

I focus on the prairie landscape typology for its convergence of ecological urgency, cultural significance, climatic resilience, and capacity to reframe contemporary public landscape stewardship.

In many Western contexts, land management systems are rooted in control, uniformity, and resource-intensive intervention, shaped by long histories of power, order, and exclusion (Schmidt, 2023). These approaches have produced public landscapes that appear orderly yet are ecologically simplified, economically and environmentally costly, and lacking a meaningful sense of place. In contrast, prairie landscapes offer a low-input, ecologically diverse system that is drought- and heat-adapted, restoring ecological complexity while reestablishing a stronger sense of regional place.

Prairies are cultural landscapes, shaped and sustained through millennia of human stewardship (Noland & Carver, 2011). Their open, low-growing structure supports spatial legibility, clear sightlines, and both perceived and actual safety, while enabling visual and social connectivity in urban contexts. As a regionally native typology, prairies create opportunities for gathering, education, and engagement, fostering public understanding of local ecologies and reinforcing a collective ethic of care. Washington prairie ecosystems support more than 300 species of plants, insects, birds, mammals, reptiles, and amphibians (Payton, 2023), demonstrating an extraordinary capacity to sustain biodiversity and ecological interdependence within relatively low-input systems.

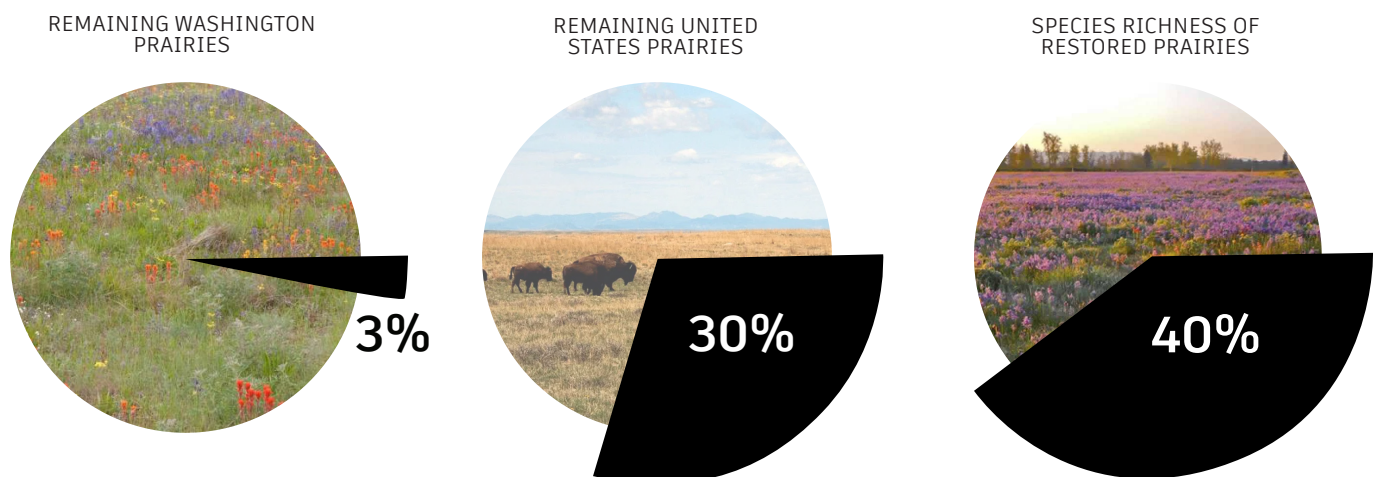


Figure 1.4 : Local and national prairie statistics, by author, 2026 (Image Sources: Vogt, 2023; Brown, 2012; Martin, n.d.)

As one of the most endangered ecosystems in the United States and Washington (Marinelli, 2019), prairies are on the brink of extinction due to agricultural expansion, urban development, land privatization, and the suppression of Indigenous land management practices—particularly fire—resulting in widespread woody encroachment. Their loss reflects the same extractive systems that shape contemporary public landscapes. Reintegrating prairie systems into urban contexts therefore functions as both ecological preservation and cultural repair, restoring landscapes that have been deliberately erased while reasserting reciprocal human–land relationships.

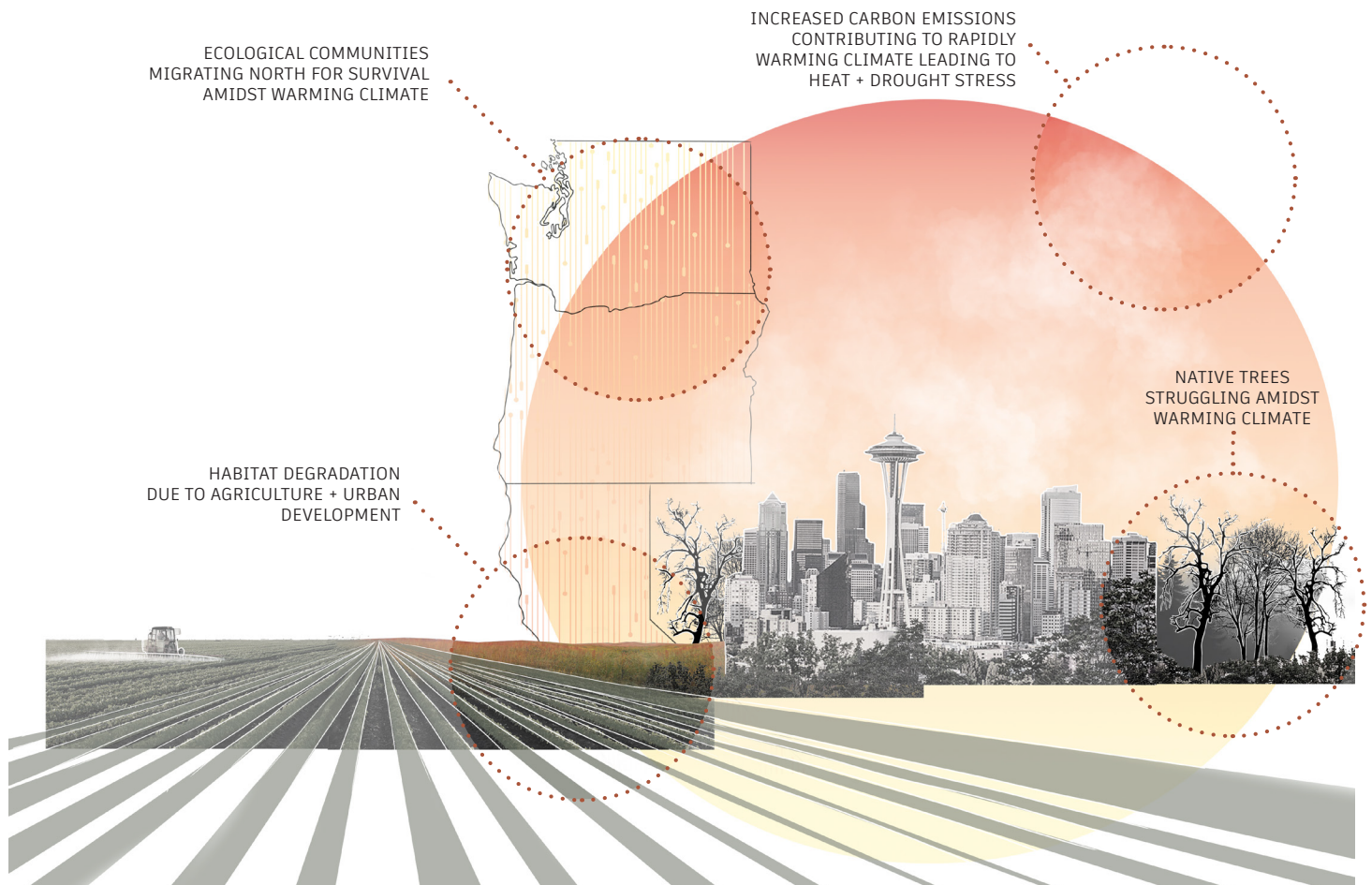


Figure 1.5 : Changing climate conditions and habitat degradation increasingly shifting local ecologies, by author, 2026

At the same time, prairie ecosystems are increasingly relevant under projected climate conditions in the Pacific Northwest. Although Seattle has not historically supported prairie systems, adjacent South Puget Sound prairies indicate their regional presence, and shifting climatic conditions (University of Maryland Extension, 2024) are expanding their range northward. Urban heat island effects and engineered hydrology already produce hotter, drier microclimates that increasingly resemble prairie environments. As forested systems face increasing stress from prolonged summer droughts (Gilles, 2023), prairie species—adapted to heat, water scarcity, and nutrient-poor soils—offer a resilient alternative capable of maintaining ecological function with reduced inputs. Deep-rooted prairie systems additionally sequester carbon within stable underground soil reservoirs, reducing the likelihood of atmospheric release compared to aboveground carbon storage in forested systems while contributing to long-term climate mitigation and soil regeneration (Vogt, 2023).

Finally, prairies offer a model for regenerative stewardship. Coevolved with fire and grazing, prairie systems depend on cyclical disturbance to maintain biodiversity, cycle nutrients, and regenerate plant communities (Vogt, 2023). Reinterpreting these processes within urban landscapes opens new possibilities for stewardship practices that are regenerative rather than extractive—shifting away from emissions-intensive, resource-dependent regimes toward systems that work with ecological processes.

Within a context of accelerating ecological degradation, climate instability, and unsustainable public landscape maintenance practices, prairie systems offer a framework for rethinking the relationship between humans, more-than-humans, land, and life—grounded in reciprocity, resilience, and long-term care.

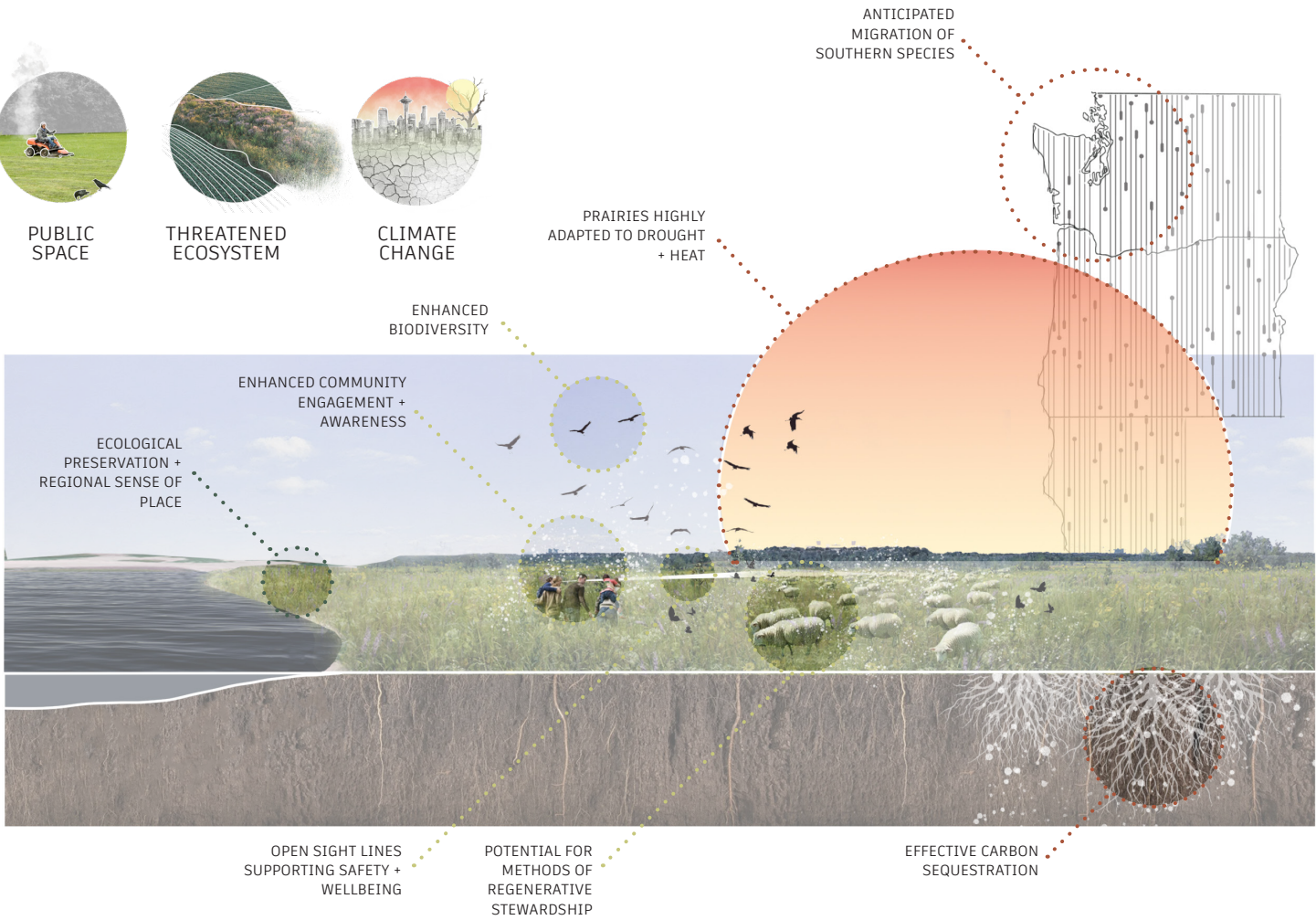


Figure 1.6 : How this project addresses aforementioned problems, by author, 2026

WHAT IS A PRAIRIE?

A PRAIRIE IS A **STEWARDED CULTURAL LANDSCAPE**
THAT RELIES ON DISTURBANCE TO THRIVE

BURNING
SUPPRESSES WOODY
ENCROACHMENT

PROMOTES HABITAT IDEAL
FOR LARGE GRAZING
ANIMALS



THE DELIBERATE ERASURE OF INDIGENOUS PEOPLES AND SUPPRESSION OF FIRE
HAS SEVERELY IMPACTED NORTH AMERICAN PRAIRIES

Figure 1.7 : Interactions between prairies, humans, and more-than-humans, by author, 2026
(Image credit: Curtis, 1908)

Prairies are a unique landscape typology in that they are stewarded cultural landscapes that rely on disturbance to thrive. For thousands of years, Indigenous peoples of North America have intentionally used fire as a land management practice to suppress encroaching woody vegetation. This practice of cultural burning provided multiple benefits, including maintaining open sightlines for travel and protection, cultivating high-value food sources, and attracting large grazing animals. These grazing animals were not only a valuable food source themselves, but their grazing behavior also stimulated the growth of new shoots while improving air and water access to young seedlings (Jones, 2025).

When French colonial settlers arrived in North America, they encountered landscapes lush with grasses. Lacking a word for this landscape, they used their word for meadow, la prairie (Vogt, 2023). While the word prairie is derived from meadow, the two terms are often used interchangeably. For the purposes of this project, however, I would like to distinguish between them. These definitions are not universally agreed upon, and there is considerable overlap in both terminology and species composition. Based on my research, I define these terms as follows:

GRASSLANDS

A broad category that includes prairies. Grasslands are expansive areas dominated by graminoids (grasses and sedges) with fewer forbs, and less than 5% tree coverage. They may exhibit lower biodiversity when a few grass species predominate. Grasslands typically occur in lowlands and are a global classification. In North America, the term is sometimes used interchangeably with prairie.

PRAIRIE

A type of grassland typically composed of roughly 70% graminoids and 30% forbs, with less than 5% tree or woody plant coverage. Prairies are primarily maintained by fire, which promotes herbaceous growth, suppresses woody encroachment, and supports high plant species diversity. They often contain a higher proportion of warm-season grasses and are characteristic of the temperate grasslands of North America. Prairies commonly occur in lowlands and valley areas within higher-altitude landscapes. Prairies can be further classified into tallgrass (found in wetter eastern regions), mixed-grass, and shortgrass prairies (found in more arid western regions), as well as wet, mesic, and dry types. These distinctions are primarily determined by climate and rainfall.

MEADOW

Landscapes dominated by roughly 70% forbs or non-flowering plants (i.e., ferns) and 30% graminoids, often surrounded by forest. Meadows may be considered smaller in area than prairies or grasslands and may include more cool-season grasses. They are typically found in wetter soils or transitional areas that may eventually succeed to forest, occurring near water or in upland climates. Tree coverage is generally less than 10%.

OAK SAVANNAH

Landscapes featuring fire-resilient oak trees sparsely distributed (10–30% tree coverage) over an understory of grasses and forbs. In this region, the represented oaks are the native oak species Garry Oak (*Quercus garryana*). (Gallagher, 2024; Sullivan & Brittingham, 2024; Natural Resources Conservation Service, 2008; U.S National Park Service, 2024)

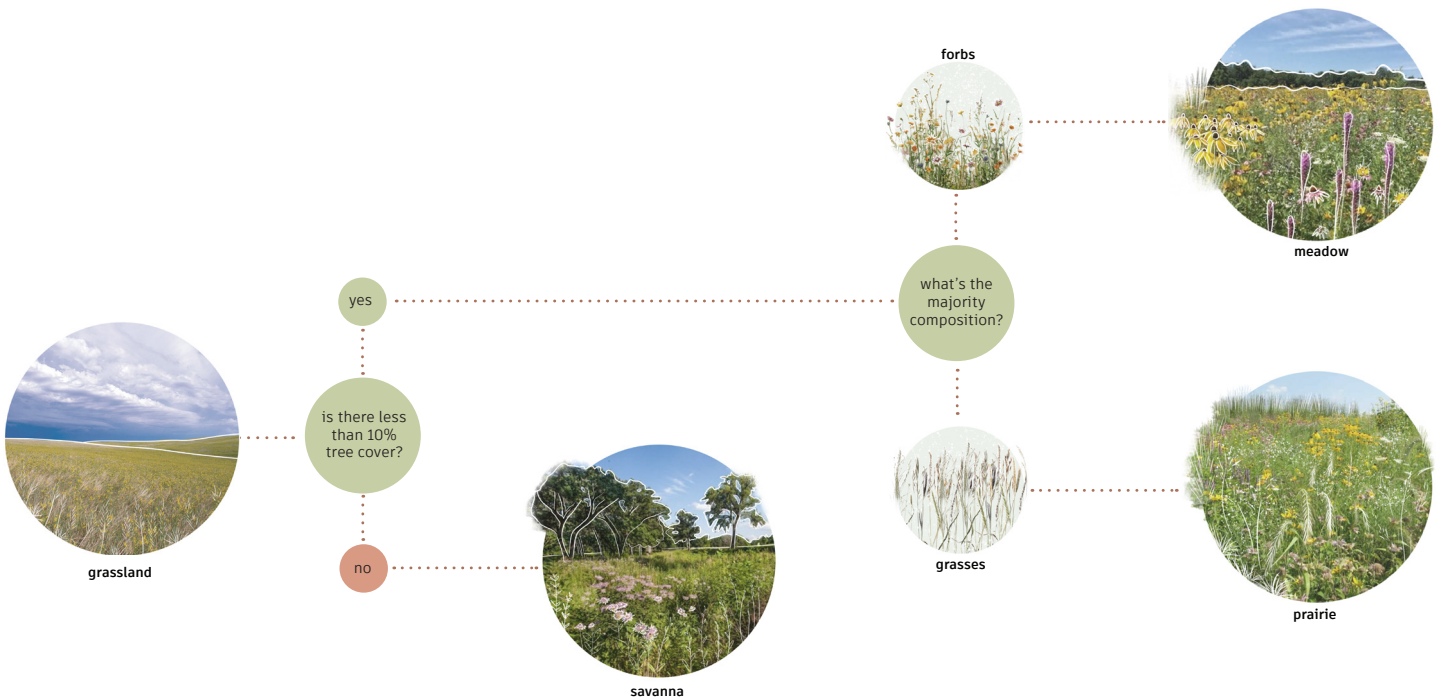


Figure 1.8 : Distinction between grassland, savanna, meadow, and prairie, by author, 2026, (Image Credits: Buffalo Gap National Grassland, n.d.; National Park Service, n.d.; U.S. Fish and Wildlife Service, 2017; Pheasant Branch Conservancy, 2001)

ERASURE OF NORTH AMERICAN PRAIRIES

Before Europeans colonized North America, grasslands covered approximately one billion acres of the United States, roughly 50% of the landmass of the 48 contiguous states. Due to agricultural expansion, urban development, deliberate erasure of indigenous peoples, and subsequent suppression of fire, prairies are considered the largest, most threatened, and least protected of the four terrestrial biomes. (Marinelli, 2019).

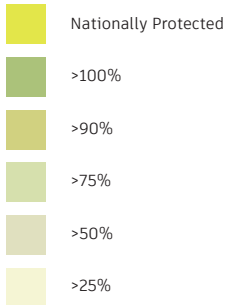
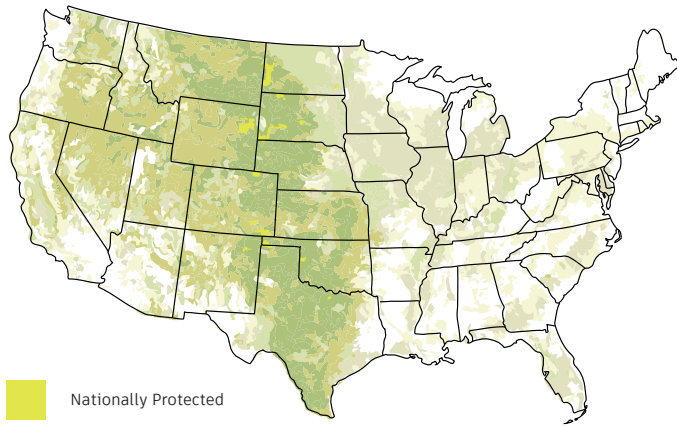
Prairie landscapes are inextricably linked to intentional human land management strategies and natural disturbance regimes. While prairies have self-managed in response to naturally occurring disturbances, they are considered cultural landscapes that require human intervention for their persistence. Cultural burning, therefore, sustained interconnected food systems: edible plants, the herbivores that depended on them, and the human communities who relied on both. As a result, prairie landscapes emerge as a distinct cultural landscape formed not only by ecological processes but by generations of sustained human stewardship (Jones, 2025).

Without recurring fire and grazing, prairies become overrun with encroaching woody and grass species, enabled to grow and outcompete less competitive forb species, reducing overall biodiversity. Given the dependence of prairie landscapes on human stewardship, the deliberate erasure of Indigenous peoples during settler colonialism led to the disappearance of prairies themselves. Under most U.S. state laws, prescribed burning was effectively banned outside of state control. This was an act that deliberately dismantled Indigenous food systems and economies rooted in land-based resource gathering (Jones, 2025).

Triggered by the Homestead Act of 1862, people quickly expanded west with the promise of land. With colonial settlement, much of the North American lands that had once been managed through shared, relational systems were subdivided, privatized, marked by fences and property boundaries, converted to croplands, and overgrazed by domestic livestock contained within the perimeters of barbed-wire fencing. The native fauna were driven to the periphery and replaced by domestic livestock, contributing to settler economies while displacing natural ecosystems and indigenous land stewardship. Hundreds of millions of acres of grasslands were converted to cultivated fields to support the growing populations, all the while, the indigenous stewards of the grasslands were forcibly removed from the land (Hage & Marcotty, 2022).

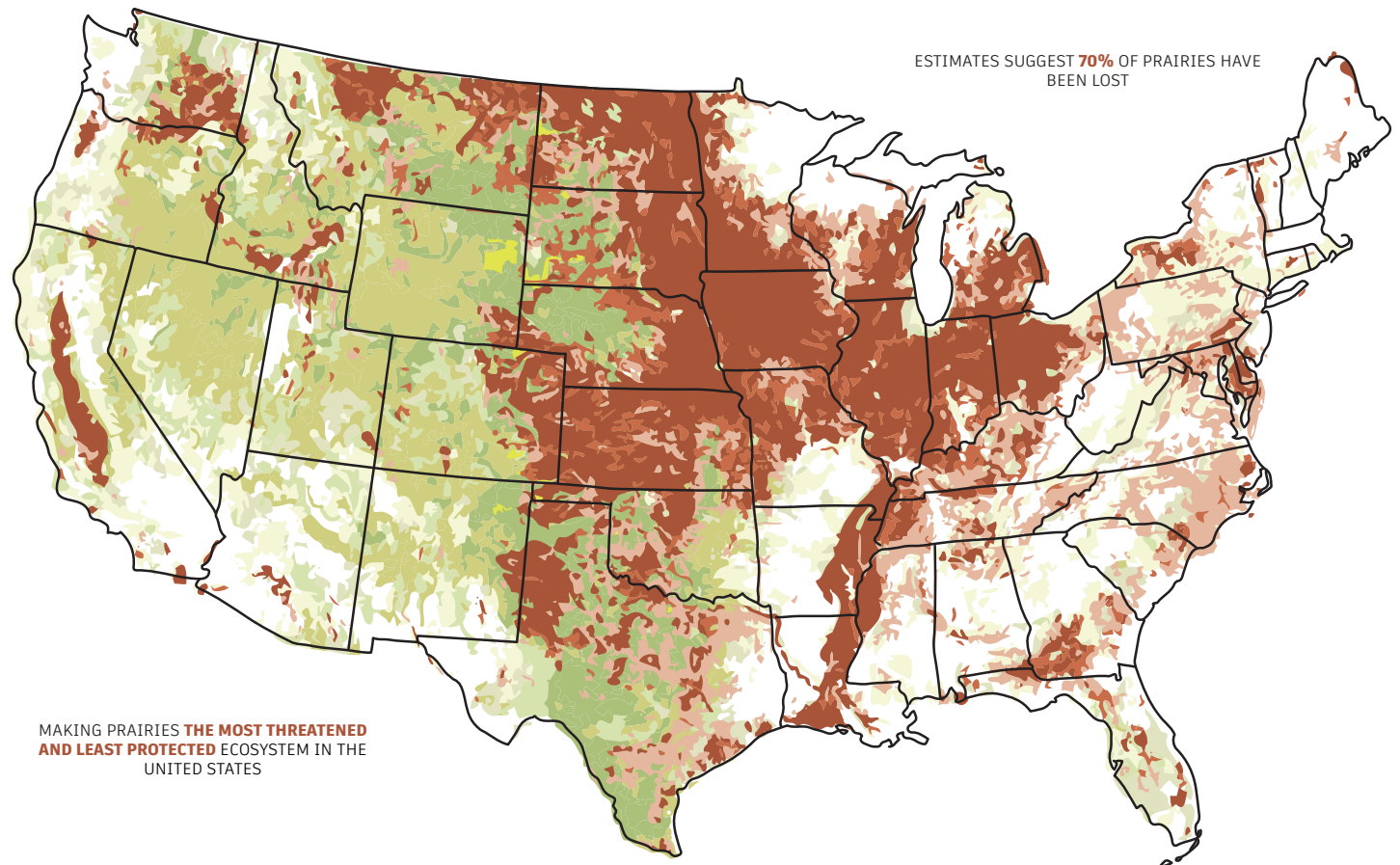
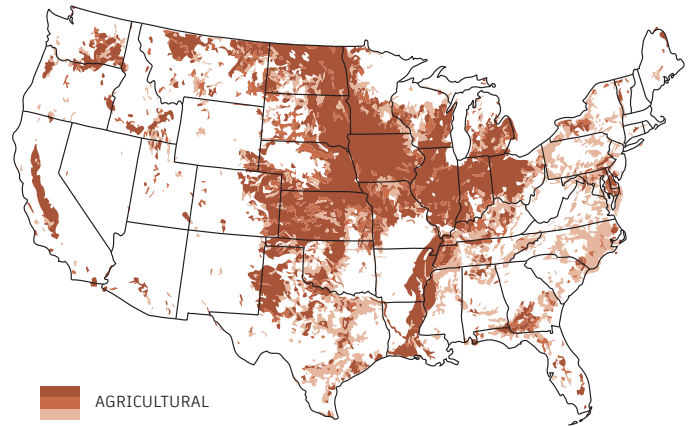
John Deere's invention of the commercial plow created a further boom of farmland expansion as families were now granted capacity for plowing exponentially larger fields (Hage & Marcotty, 2022). More than 99% of the tallgrass prairie has been lost, making it the most altered ecosystem in North America. Overall, more than 70% of the United States' prairies have been destroyed largely due to agricultural expansion and urban development. A majority of what remains lies in the hands of private ownership (Postlethwait, 2024). In a 1987 essay, geographers Deborah and Franke Popper described settling the plains as "the largest, longest-running agricultural and environmental miscalculation in American History" (Hage & Marcotty, 2022).

HISTORIC GRASSLANDS



GRASSLANDS COVERED 50% OF THE UNITED STATES PRE-SETTLEMENT

AGRICULTURAL LANDS



MAKING PRAIRIES **THE MOST THREATENED AND LEAST PROTECTED** ECOSYSTEM IN THE UNITED STATES

ESTIMATES SUGGEST **70%** OF PRAIRIES HAVE BEEN LOST

Figure 1.9 : Historic grasslands of the United States compared to current agricultural lands, by author, 2026,
(Data sources: USDA, n.d.; U.S. Fish & Wildlife Service, n.d., Central Grasslands Conservation; Esri, n.d.; Rangeland Analysis Platform, n.d.)

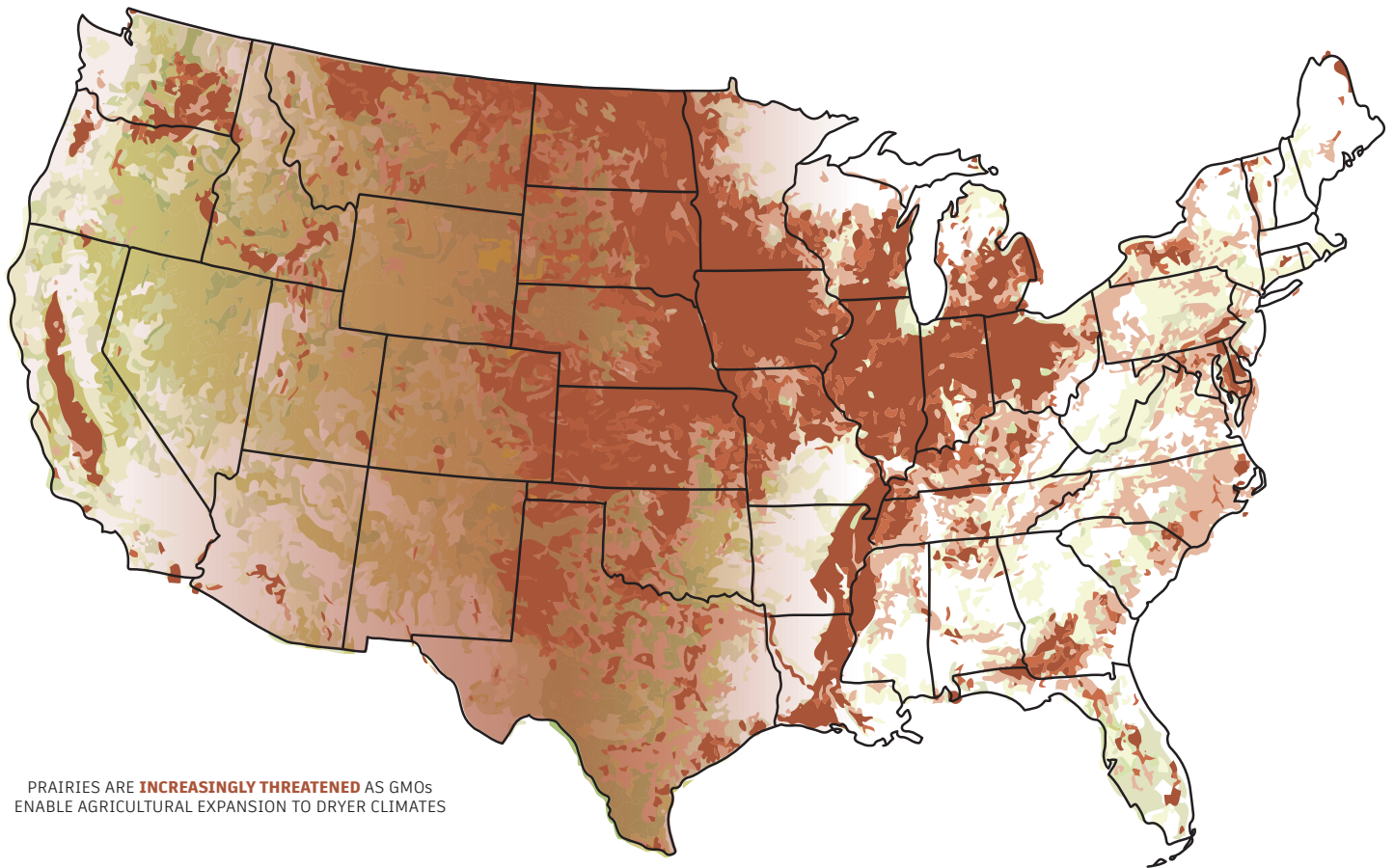
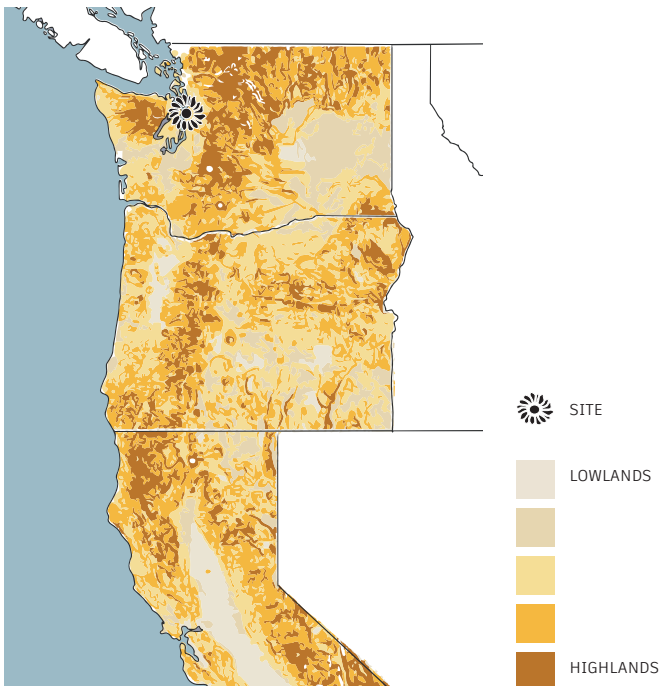


Figure 1.10 : Prairies threatened due to genetically modified organisms enabling agricultural expansion to dryer climates, by author, 2026 (Data sources: USDA, n.d.; U.S. Fish & Wildlife Service, n.d., Central Grasslands Conservation; Esri, n.d.; Rangeland Analysis Platform, n.d.)

TOPOGRAPHY



AGRICULTURE + GRASSLANDS

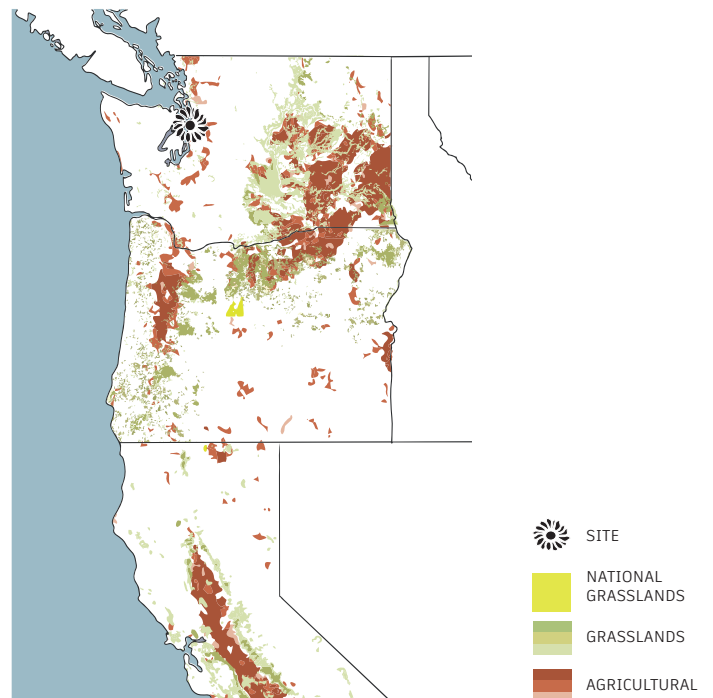


Figure 1.11 : Regional prairies in proximity to agricultural lands, by author, 2026
(Data Sources: Washington Department of Fish and Wildlife, 2025; U.S. Department of Agriculture, n.d.; U.S. Geological Survey, 2022; Oregon Department of Fish and Wildlife, n.d.; Schroll, 2023)

In looking closer at topography, current grasslands, and protected grasslands at a regional scale, we can see that grasslands typically exist as fragmented remnant landscapes surrounding agricultural lands, with very few grasslands nationally protected, and a majority in the hands of private ownership.

WASHINGTON PRAIRIES

Of the estimated 180,000 acres of Washington prairie, only 3% remain (Washington Department of Fish & Wildlife, n.d.).

The prairies of the Puget Sound Lowland region originated approximately 15,000 years ago following the retreat of the Vashon ice sheet, estimated to be 1,500 feet thick near present-day Tacoma. When the glacier retreated, it carved the terrain, leaving gravelly soils. These soils are classified as having low water-holding capacity and being excessively well-drained. Contrary to the nutrient-rich deep soils of the Great Plains, western Washington prairies are classified as having shallower and gravelly soils and thus being more nutrient-poor compared to Midwest prairie landscapes. Many of these prairie landscapes were stewarded through cultural burning practices of the region's indigenous peoples. This practice helped to support diverse flora and fauna, including deer, elk, birds, and insects (Noland & Carver, 2011).).

What once spanned approximately 180,000 acres in this region has now been reduced to approximately 5,400 acres and continues to face threats, including urban and agricultural development, invasive weeds, overgrazing, and woody encroachment resulting from fire suppression. Most of the core prairie soils are concentrated between Tacoma and Vancouver, Washington, with other prairies scattered throughout the San Juan Islands and Whidbey Island. Only a small fragment of the prairies that remain are formally protected (Washington Department of Fish and Wildlife, n.d.).

Joint Base Lewis-McChord alone contains approximately 90% of the remaining South Sound prairies, encompassing roughly 17,000 acres. In an interview with restoration specialist Cory Gardner, he noted that ecologists working on-site are required to wear bomb-proof vests while conducting fieldwork, and visitor accounts of the adjacent Mima Mounds frequently describe the constant sound of artillery from JBLM. Gardner explained that, while other landscapes such as estuaries often receive priority funding, prairie protection in Washington is largely supported through military initiatives—ironically as a response to environmental degradation caused by those same activities (Gardner, personal communication, 2026).

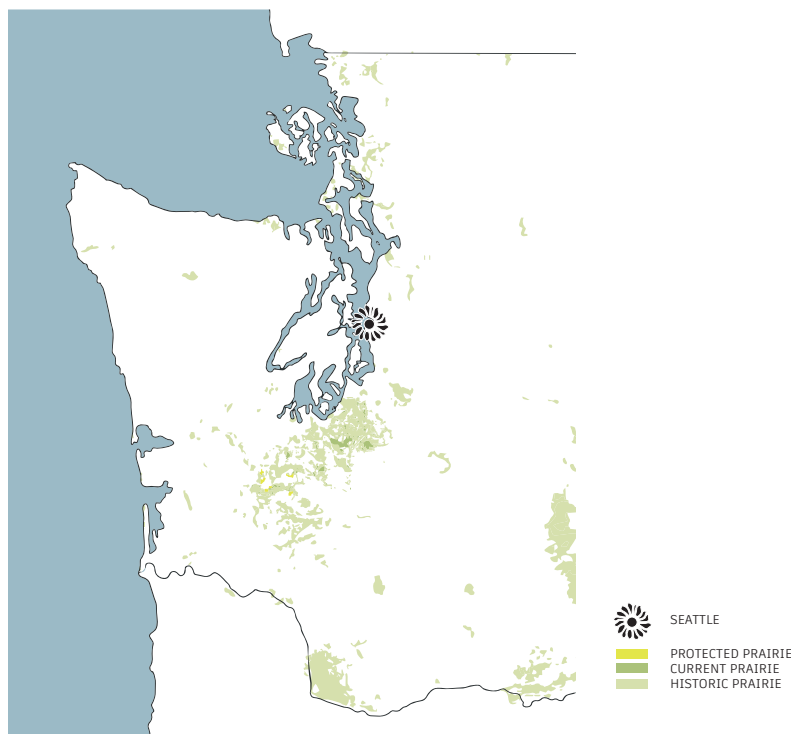


Figure 1.12: Historic, current, and protected prairies of Washington, by author, 2026

(Data Sources: U.S. Geological Survey, n.d.; Noland & Carver, 2011; U.S. Fish & Wildlife Service, n.d., Conservation of prairies in Western Washington)

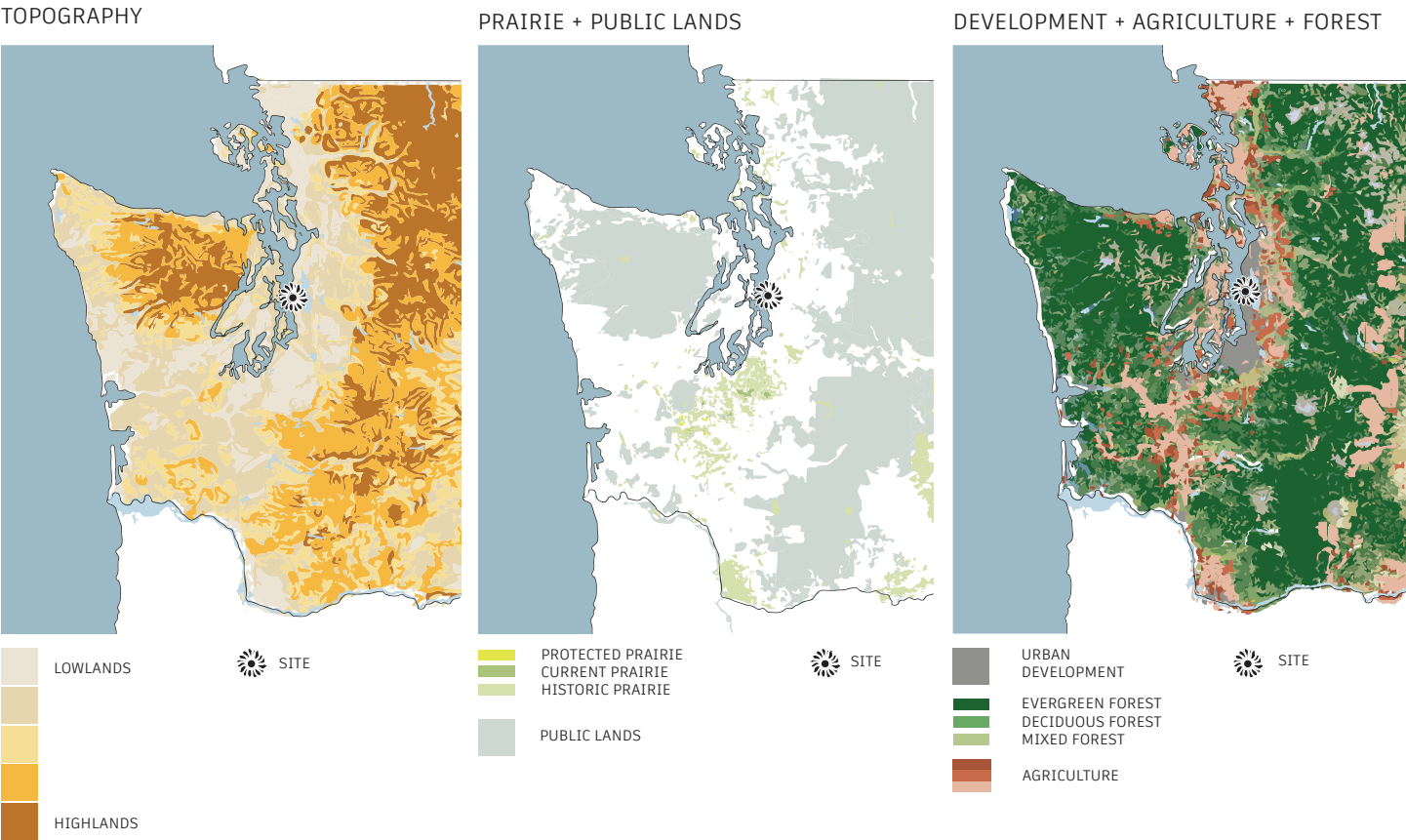


Figure 1.13 : Remnant Prairies and Agricultural and Urban Encroachment, by author, 2026 (Data Sources: U.S. Geological Survey, n.d.; Noland & Carver, 2011; U.S. Fish & Wildlife Service, n.d.; Conservation of prairies in Western Washington; Washington State Recreation and Conservation Office, n.d.)

Protected Prairie Areas	County	Ownership
Mima Mounds Natural Area Preserve	Thurston	WA Dept. of Natural Resources
Rocky Prairie Natural Area Preserve	Thurston	WA Dept. of Natural Resources
Lacamas Prairie Natural Area	Clark	WA Dept. of Natural Resources
Black River Mima Prairie-Glacial Heritage Preserve	Thurston	Thurston County
Scatter Creek Wildlife Area	Thurston	WA Dept. of Fish and Wildlife
West Rocky Prairie Wildlife Area	Thurston	WA Dept. of Fish and Wildlife
13th Division Prairie Research Natural Area	Thurston	US Army - Ft. Lewis
Weir Prairie Research Natural Area	Thurston	US Army - Ft. Lewis
Tenalquot Prairie Preserve	Thurston	Center for Natural Lands Management
Clover Creek Reserve	Pierce County	Forterra Land Trust
Yellow Island	San Juan	The Nature Conservancy
Camp Young Hill	San Juan	National Park Service
Smith Prairie	Island	Pacific Rim Institute

Figure 1.14 : Protected prairies of the Puget Sound (Cascadia Prairie-Oak Partnership, 2002; Noland & Carver, 2011)

A VERY BRIEF AND SELECTIVE TIMELINE OF HUMAN - LANDSCAPE ENTANGLEMENT

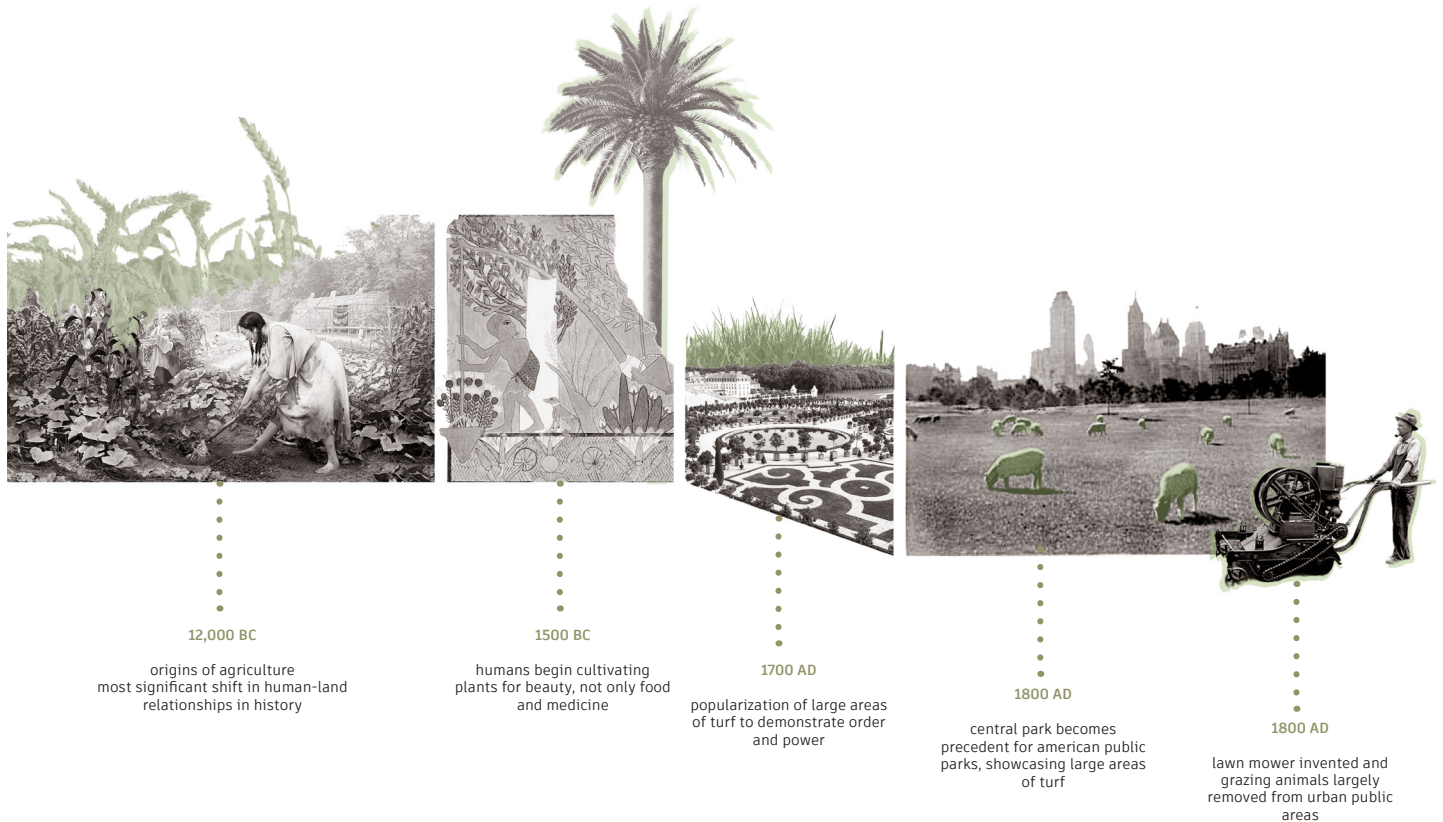


Figure 1.15 : Evolution to turf as standard for public commons, by author, 2026 (Image Credits: Antique Historical Photographs, n.d.; Fairfax, 2023; Garfield, 2018; University of Manchester, 2019; Zaiken, n.d.)

In many Western contexts, land management has evolved into systems rooted in control, uniformity, and resource-intensive intervention, shaped by long histories of power, order, and exclusion. These systems have produced landscapes that appear orderly, yet are ecologically diminished and environmentally and economically costly.

With the emergence of agriculture approximately 12,000 years ago, humans shifted from hunter-gatherer lifestyles to agricultural settlements, marking the most significant shift in human-land relationships in Earth's history. Fertile grasslands were among the most preferred areas for agricultural expansion. Landscapes that once supported diverse communities of species were gradually transformed into plots sustaining only a select few desirable crops. People became less nomadic, human populations flourished, settlements expanded, and land use increasingly favored agricultural production at the expense of diverse, functional ecosystems (Hage & Marcotty, 2022).

Some of the first examples of humans cultivating plants beyond the necessities of food and medicine appear in paintings of ancient Egyptian gardens from as early as 1500 BCE. Across Egypt, Persia, and Rome, gardens were typically organized into geometric, orderly layouts and enclosed to exclude animals.

With the adoption of irrigation technologies and the expansion of botanical trade, gardens increasingly embodied human power over nature—carefully constructed horticultural paradises set within otherwise arid landscapes. The cultivation of gardens for pleasure and aesthetic enjoyment became an exclusive privilege of the wealthy elite, turning gardens into symbols of status and power (Daines, 2008).

The Baroque period of the 17th and 18th centuries saw the popularization of the lawn, particularly on French and English estates. Large, open swaths of meticulously maintained grass became increasingly rigid in form,

functioning as deliberate displays of order, wealth, and power. This costly and labor-intensive landscape practice showcased that the landowner could afford to maintain land for beauty and pleasure alone. A notable example is the gardens of Versailles, where plantings are highly controlled and exist as a function of aesthetics, status, and political control (Schmidt, 2023).

European colonization of North America introduced European ideals of green space, significantly reshaping land management and land use across the Americas. As American cities grew, planners began designing public green spaces to bring order amidst the rising chaos. The first example of this is Central Park in New York, designed by Frederick Law Olmsted. Central Park was designed to feature wooded areas, bodies of water, and large swaths of lawn. One section was designed to be pastoral, incorporating sheep to enhance aesthetic appeal and meet practical management needs. As demand for sport and other recreational activities grew, and the lawn mower became more widely adopted, the sheep were eventually removed in 1934 (Central Park Conservancy, n.d.). Central Park, considered the first designed park in the United States, set a precedent and standard for public parks, with



Figure 1.16 : Common problems of modern public space, by author, 2026
(Image Sources: Halley Park in Betleigh, Victoria, Australia, 2026)

Today, many urban landscapes are dominated by turf and non-native plantings that are routinely mowed, fertilized, irrigated, and stripped of organic matter, resulting in highly dependent systems that perpetuate carbon emissions, pollution, and ecological simplification. Within this context, landscape maintenance has become a driver of environmental harm rather than a practice of care.

PROJECT GOALS

The primary project goals of this thesis are to :

- Cultivate reciprocal relationships between humans, more-than-humans, plants, land, and life
- Amplify functional biodiversity through both planting and stewardship strategies
- Strengthen ecological resilience in the face of climate change

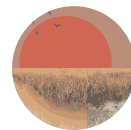
These goals are interdependent rather than isolated. Increased functional biodiversity supports greater ecological resilience under changing climatic conditions, while more resilient systems, in turn, create the conditions for reciprocal relationships between humans and more-than-humans to emerge and persist over time.



**CULTIVATE RECIPROCAL
RELATIONSHIPS**
between humans,
more-than-humans, plants,
land, and life.



**AMPLIFY FUNCTIONAL
BIODIVERSITY**
through both planting
and stewardship
strategies.



**STRENGTHEN
ECOLOGICAL RESILIENCE**
in the face of climate
change.

Figure 1.17 : Project Goals, by author, 2026

RESEARCH QUESTIONS

OVERARCHING RESEARCH QUESTION

How can regenerative stewardship inform the design of urban prairiescapes to restore and sustain ecological and social function?

DESIGN

What design elements are needed to support regenerative stewardship while maximizing ecological processes, safety, and accessibility in urban public landscapes?

ECOLOGY

What ecological processes and regenerative stewardship strategies are necessary to create and sustain functional ecologies in urban prairiescapes?

SOCIAL + CULTURAL

How can regenerative prairiescapes strengthen community connection, public engagement, and collective care through meaningful points of interaction between people and landscape?

METHODS

To address these research questions, this thesis applies a combination of methods, including literature and research reviews, interviews and consultations, and spatial and qualitative analysis, to inform the design of a regenerative framework for this landscape.

Together, these methods support the development of a framework for implementing and stewarding prairie landscapes in an urban context while addressing ecological, social, and design considerations.

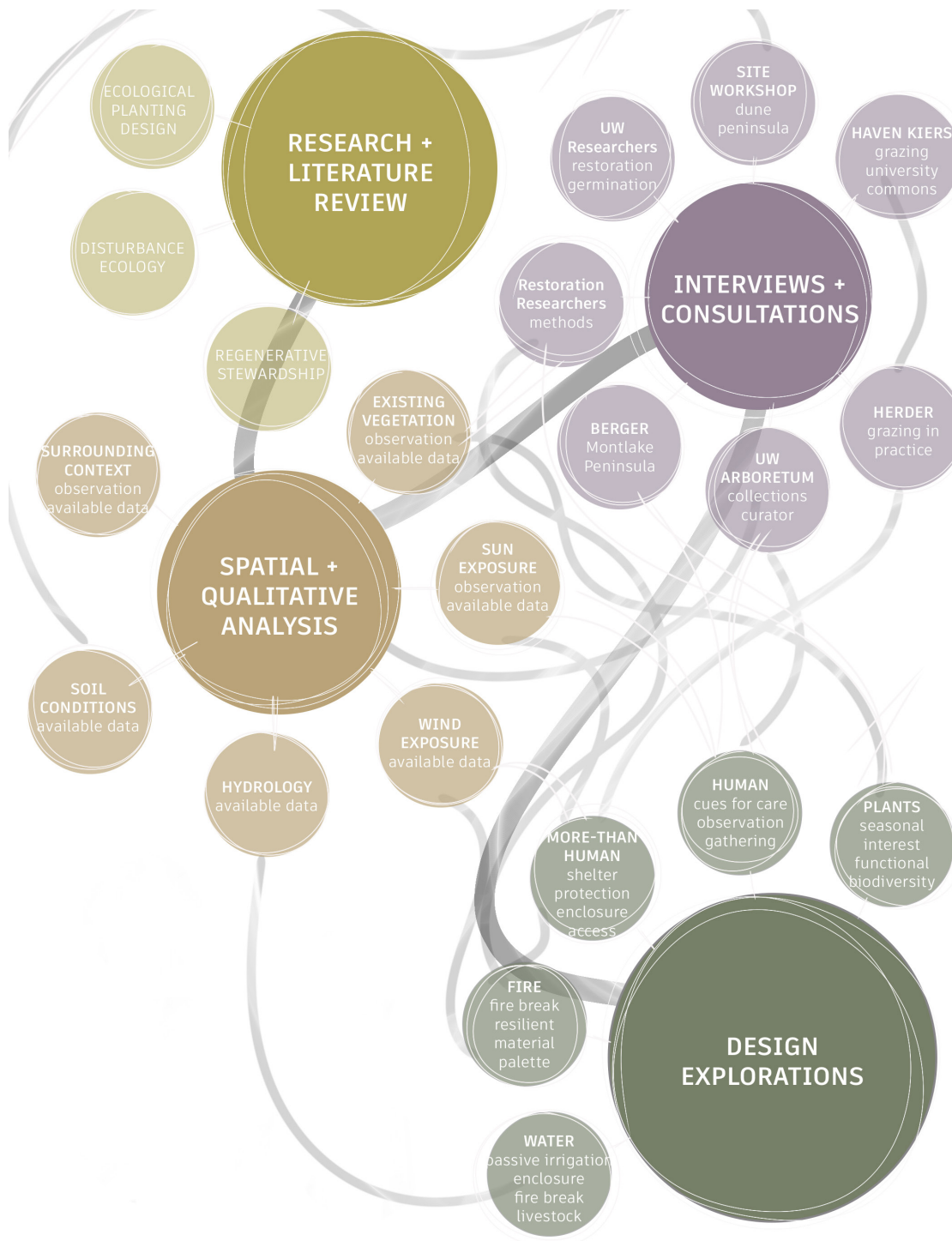


Figure 1.18 : Project methods supporting overall project outcome, by author, 2026

I. RESEARCH + LITERATURE REVIEW

The literature review explores the science and theory of ecological planting design, disturbance ecology, and regenerative stewardship. This analysis informs both the design exploration and the ecological and social impacts.

II. INTERVIEWS AND CONSULTATION

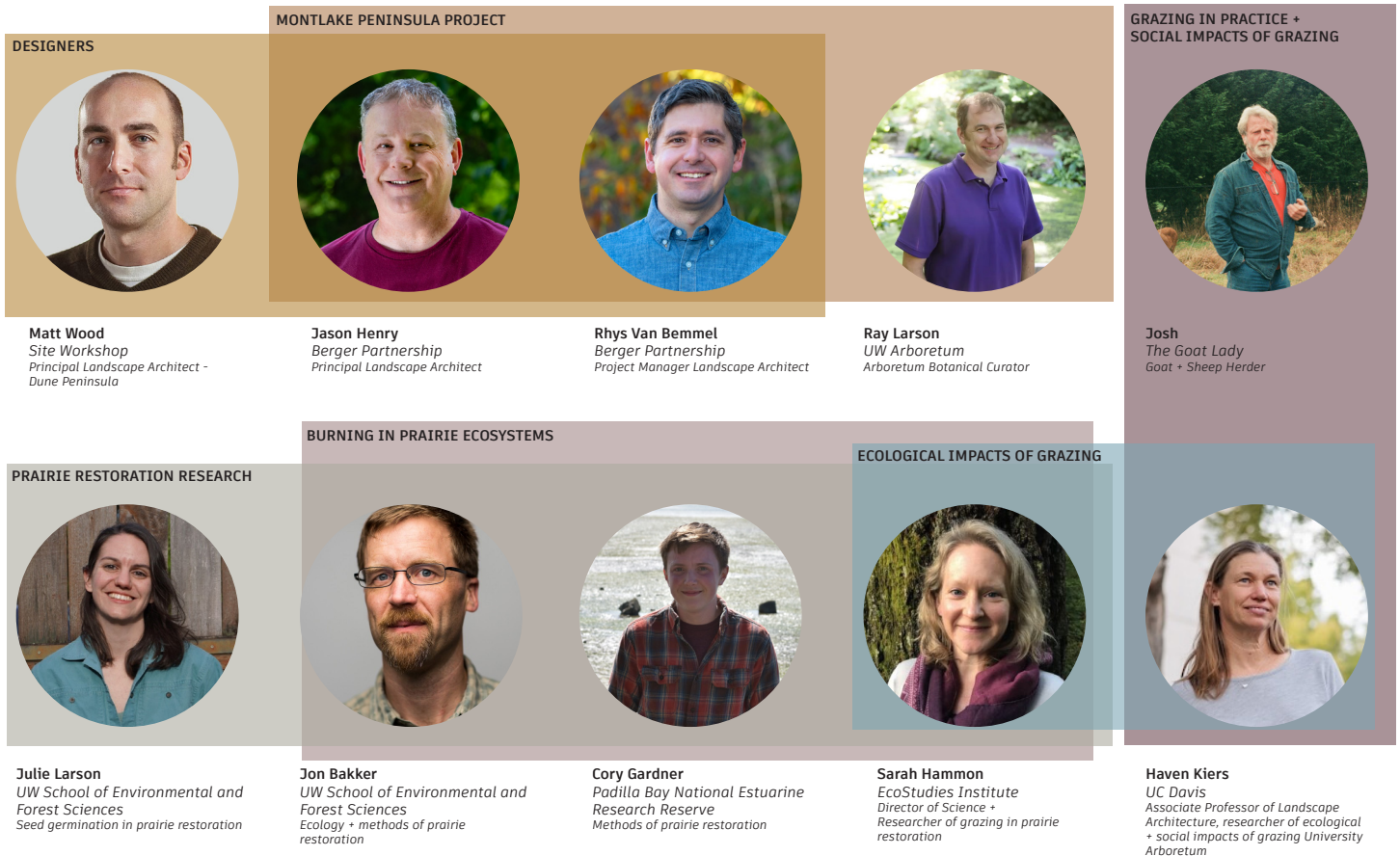


Figure 1.19 : Contributing interviews + consultations of this project.

Interviews and consultations support the literature review and design analysis within a local context. I engaged with practitioners, including:

Haven Kiers, an associate professor of landscape architecture at UC Davis researching the ecological and social benefits of sheep grazing on the UC Davis campus.

Matt Wood, a principal at local landscape architecture firm, Site Workshop, who participated in the design of Dune Peninsula, a local prairie landscape in Tacoma, Washington.

Jason Henry and Rhys van Bommel, a principal and project manager respectively, of Berger Partnership, the local landscape architecture firm who is currently tasked with designing the Arboretum's Montlake Peninsula.

Josh Farmer, the owner and operator of The Goat Lady, a local sheep and goat herder who rents his flock out to manage predominately invasive species and vegetation around infrastructure.

Cory Gardner, prairie restoration specialist at Padilla Bay National Estuarine Research Reserve who is conducting staged-scale restoration research of local prairies.

Sarah Hamman, the director of science with Ecostudies Institute who is carrying out research on rotational burning and grazing of lands to promote biodiversity.

Ray Larson, the associate director and curator of living collections at the Washington Park Arboretum

Julie Larson, an assistant professor of the University of Washington specializing in restoration ecology, regeneration ecology, and management of dryland and rangeland ecosystems

Jonathan Bakker, a professor of the University of Washington, specializing in restoration and management of terrestrial ecosystems, with experience in prairie restoration

These consultations provide practical insight into implementation, stewardship, and site-specific ecological and social considerations. Greater details of each interview can be found in the appendices.

III. SPATIAL AND QUALITATIVE ANALYSIS

Using publicly available data and field observations, I explore mapping techniques at multiple scales. At a larger regional and state scale, I assess historic and current prairie landscapes in relation to current agricultural lands and encroaching forests. At the site scale, I assess the context within the arboretum, relation to the surrounding urban context, as well as the qualitative features of the site, including environmental and human systems analysis.

At the regional and state scale, this research:

- Maps relevant ecoregions to define the geographic and ecological boundaries of vegetation types included in the study
- Maps and analyzes historic prairie extent using archival vegetation maps and soil surveys
- Compares historic prairie distributions with current land-use patterns to assess prairie loss and fragmentation
- Assesses trends in agricultural expansion, forest encroachment, and the spatial configuration of remnant prairie patches

At the site scale including the arboretum and immediate surroundings:

- Documents and classifies site conditions using available data sets, maps, and field observations
- Characterizes environmental systems such as topography, hydrology, soils, vegetation, and microclimates
- Evaluates human systems such as access, circulation, and land use

This spatial and qualitative analysis informs the narrative of how prairie landscapes have been transformed over time in the greater regional context and guides both the design and ecological strategies for the site.

IV. DESIGN EXPLORATION

Drawing on insights from the literature review, interviews, and spatial analysis, I propose a speculative design approach for the Washington Park Arboretum Montlake Peninsula. In this context, design is understood as an evolving social and ecological process, where the form and visibility of these systems shape public perception, understanding, and acceptance.

This exploration addresses multiple ecological, social, and functional layers, including:

Site Preparation Strategies

Consideration of existing site challenges and approaches for addressing soil compaction, existing gravel conditions, and weed pressure.

Phased Implementation Strategies

Staged planting and establishment approaches intended to improve long-term success, alongside experimental plot variations designed to inform adaptive stewardship strategies and site-specific management methods.

Vegetation Compositions

Plant communities designed to amplify functional biodiversity, support grazing and disturbance regimes, strengthen landscape resilience, and enhance seasonal and aesthetic experience.

Disturbance-Informed Systems

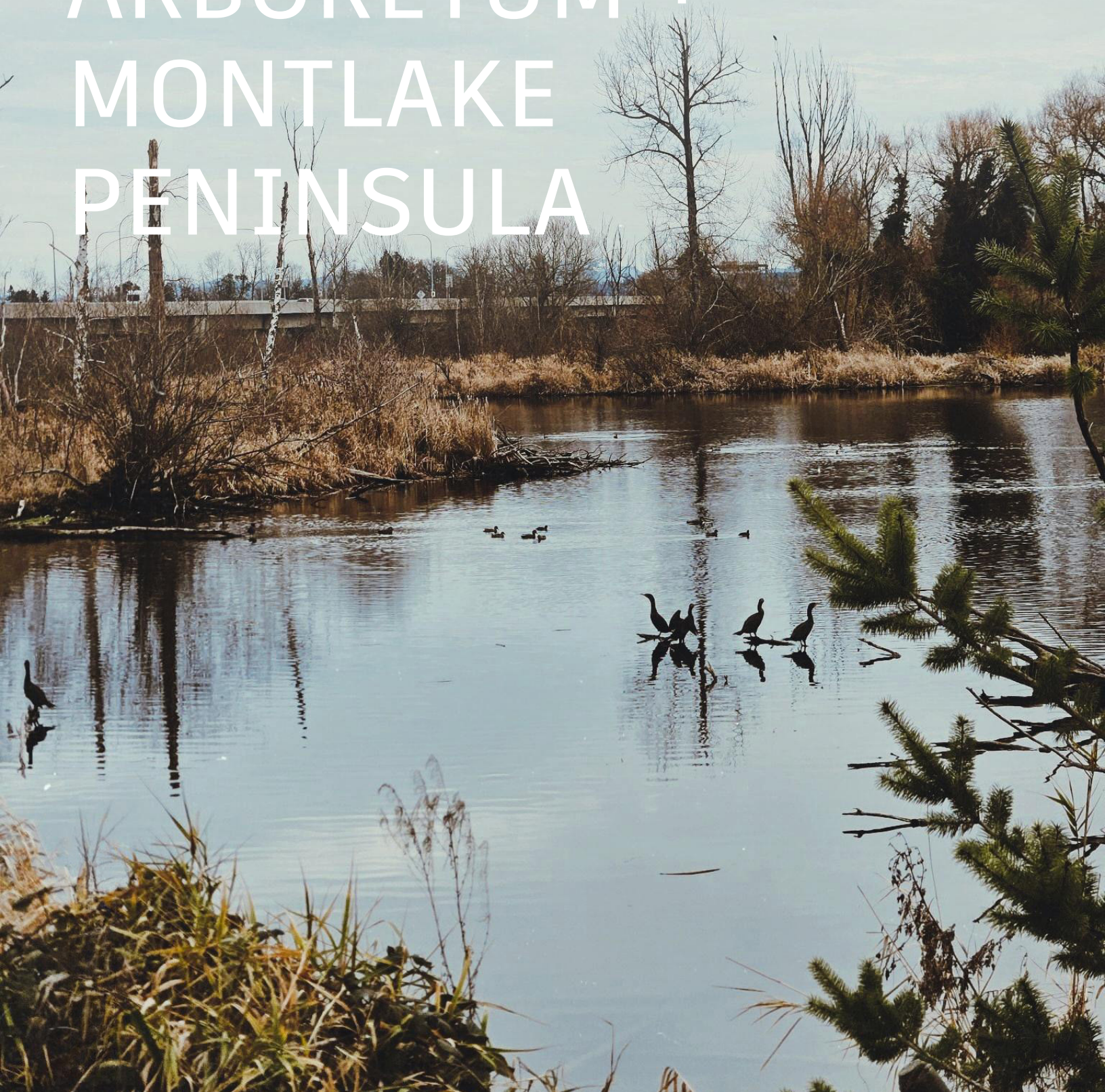
Strategies emphasizing pattern, repetition, and the aesthetic legibility of disturbance cycles, including fencing systems supporting human–grazer interactions, firebreaks, fire-resilient material palettes, shelter and water infrastructure for grazers, and circulation and access considerations.

Community Stewardship Frameworks

Approaches for collective landscape creation and long-term stewardship, including community-based seed harvesting opportunities, educational engagement, adaptive management strategies, and identification of potential stewardship partners and collaborators.

02

WASHINGTON PARK ARBORETUM + MONTLAKE PENINSULA



ABOUT THE ARBORETUM + SITE



Figure 2.1 : Seattle Public Parks, by author, 2026

(Data source: Map of Seattle Parks with Natural Areas and Greenbelts, 2016)

The site of study is the Montlake Peninsula of the Washington Park Arboretum and Seattle Botanic Garden. The Arboretum is a 230-acre public green space containing diverse living collections of ornamental and botanical species, representing more than 4,400 species. The Arboretum is owned by Seattle Parks and Recreation, with botanical collections stewarded in partnership with the University of Washington.

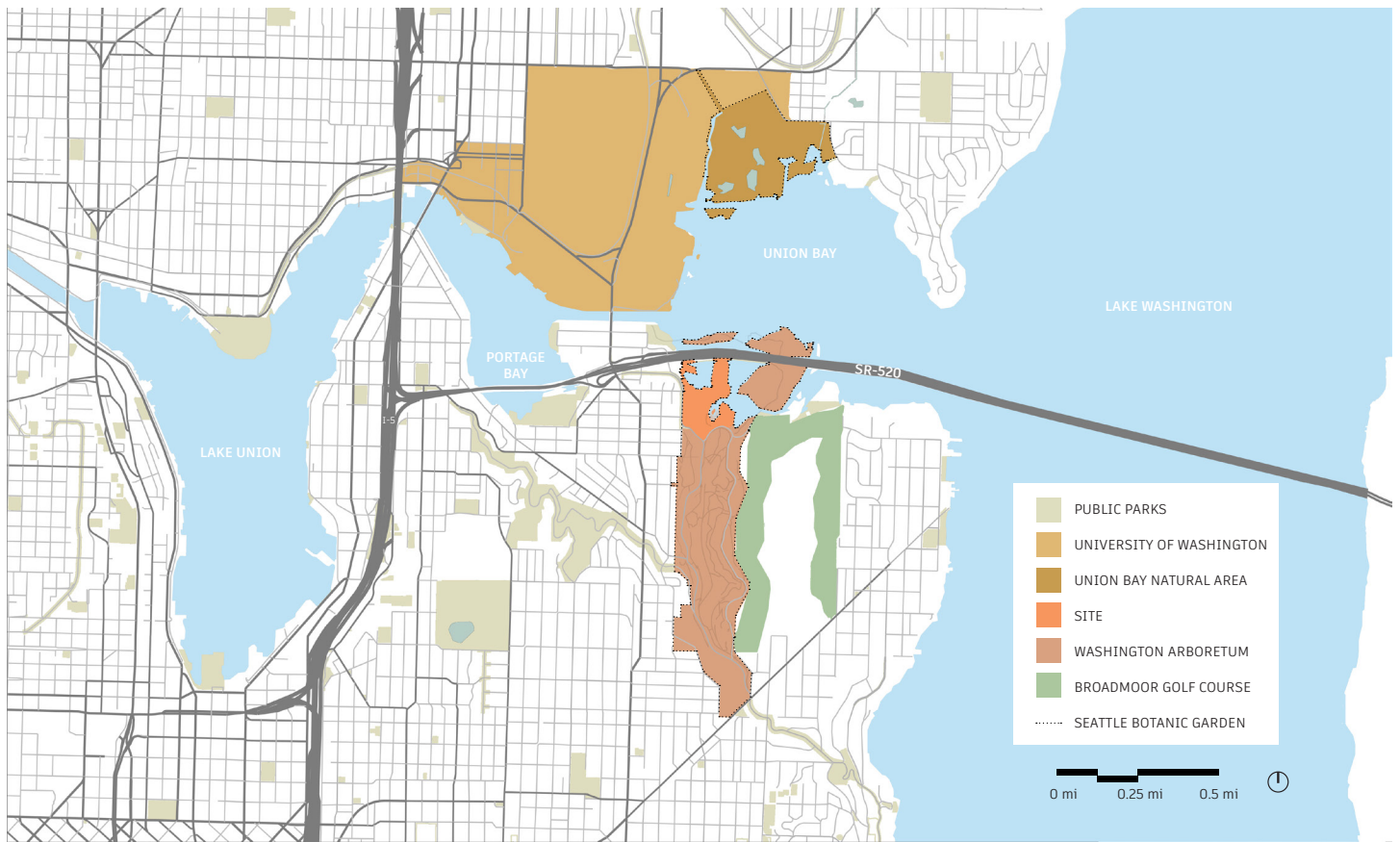


Figure 2.2 : Public land use adjacent to site, by author, 2026
 (Data Sources: OpenStreetMap, n.d.; Seattle Information Technology Department, n.d.)

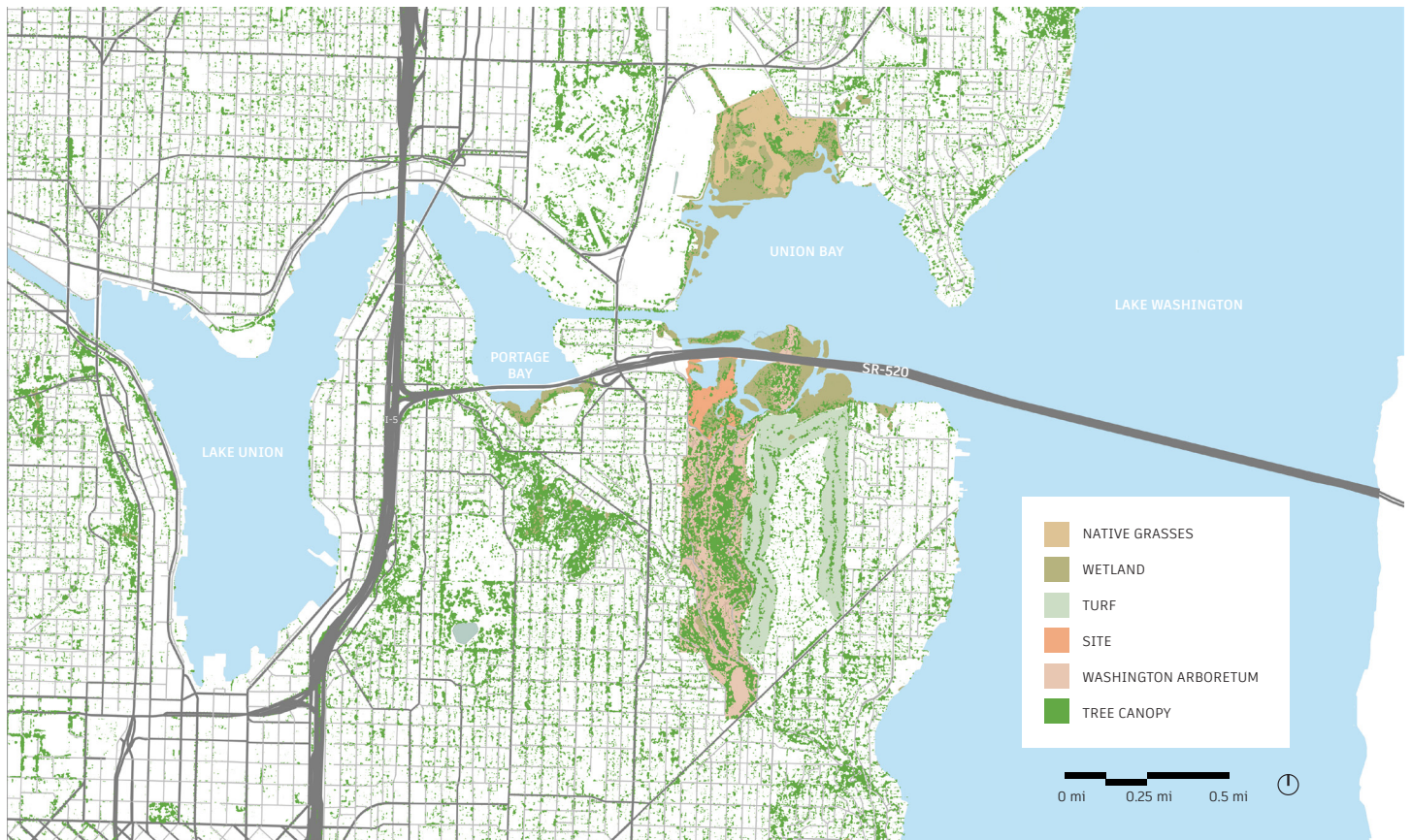


Figure 2.3 : Vegetation and ecological zones adjacent to site, by author, 2026
 (Data Sources: OpenStreetMap, n.d.; Seattle Information Technology Department, n.d.; University of Washington Botanic Gardens, n.d.)



Figure 2.4 : Aerial view of the site (Google, 2025)

The specific area addressed in this project is currently under the jurisdiction of the Washington State Department of Transportation, with plans underway for transfer to Seattle Parks as the approximately 25-acre parcel is reintegrated into the Arboretum. Of the site's 25 acres, approximately 10 acres consist of wetlands, while the remaining 15 acres are planned as prairie landscape by the local landscape architecture firm, Berger Partnership.

At the time of this thesis, the project is still in early design phases, with Berger Partnership currently engaged in site analysis and conceptual design. Detailed planting plans have not yet been developed, and approaches such as grazing and prescribed fire have not been formally integrated into long-term stewardship planning.

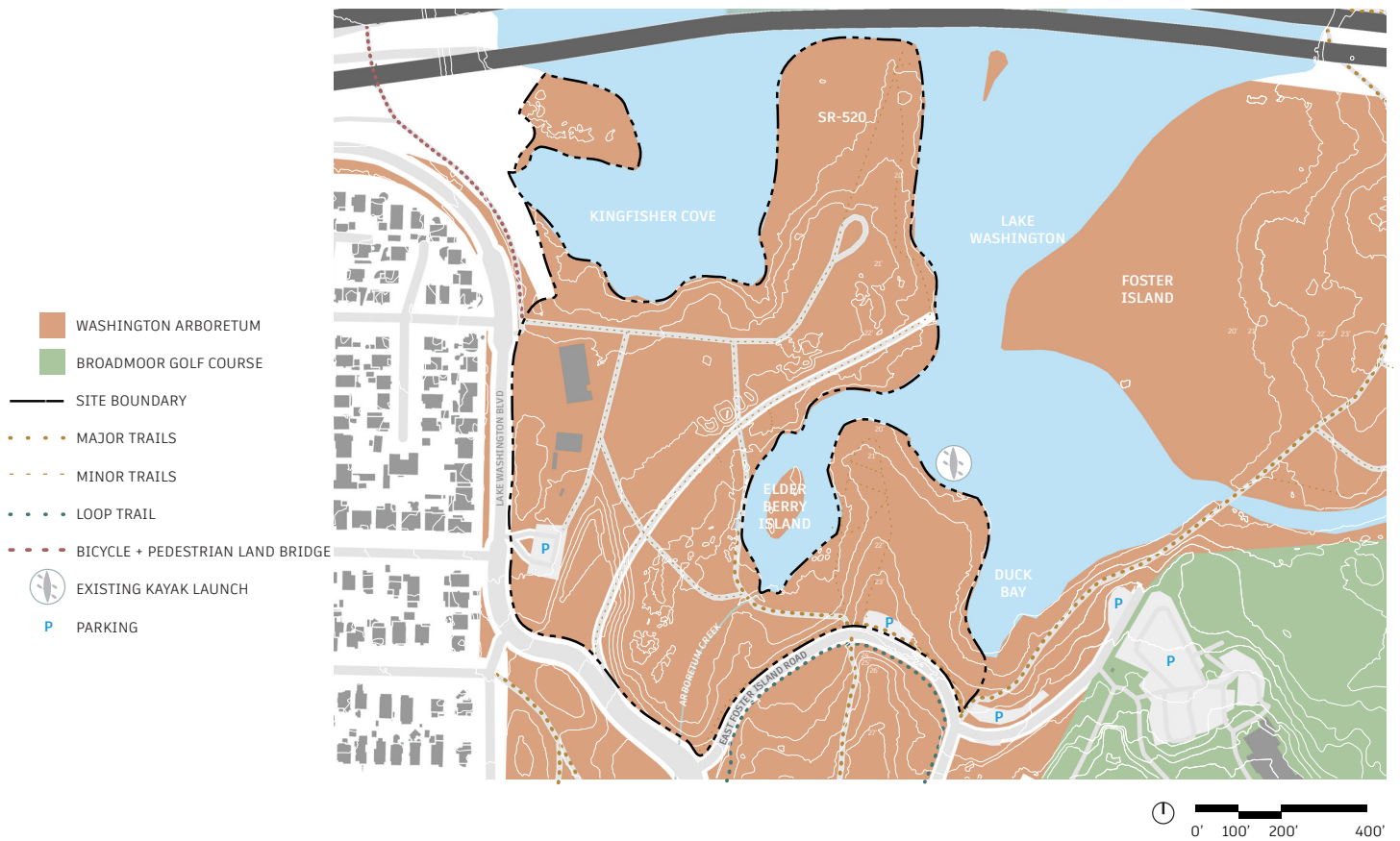


Figure 2.5 : Trails and access of site, by author, 2026 (Data Sources: OpenStreetMap, n.d.; Seattle Information Technology Department, n.d.)



Figure 2.6 : Vegetation and ecological zones of site, by author, 2026 (Data Sources: OpenStreetMap, n.d.; Seattle Information Technology Department, n.d.)



Figure 2.7 : 2011 Schematic Design of Montlake Peninsula designed by Berger Partnership (Seattle Department of Planning and Development, 2011)



Figure 2.8 : 2022 Schematic Design of Montlake Peninsula designed by Berger Partnership (Arboretum Foundation, 2022)

ARBORETUMS OF THE FUTURE



Figure 2.9 : Arboretum Ethos, by author, 2026

Arboretums have long served as sites of botanical research, plant collection, and public education, historically centered around the cultivation and display of rare, exotic, and aesthetically significant plant species. As living collections, they have provided opportunities to study plant taxonomy, horticulture, and cultivation practices while fostering public appreciation for plants and landscapes.

Today, in response to climate change and accelerating ecological instability, the role of arboretums is evolving beyond ornamental collection and preservation. Increasingly, arboretums are becoming active sites of climate adaptation research, ecological experimentation, conservation, and adaptive management. With highly trained staff, established research infrastructure, proximity to universities and scientific institutions, and strong public engagement networks, arboretums are uniquely positioned to test and monitor new approaches to landscape design and stewardship in the face of changing environmental conditions. Their capacity to support long-term observation, citizen science initiatives, volunteer stewardship, and adaptive management allows for more intensive ecological monitoring than is often possible within conventional public landscapes (Primack, Ellwood, Gallinat, & Miller-Rushing, 2021).

As both a public landscape and a living research collection embedded within a broader institution of education, research, and community engagement, the Washington Park Arboretum offers a unique context for applied experimentation in urban ecological design. The Arboretum's dual role as both research site and public landscape positions it as an ideal testing ground for alternative stewardship regimes and regenerative landscape management practices. Within this context, the Arboretum becomes not only a designed public landscape, but an active site of ecological inquiry, experimentation, and long-term stewardship research, offering a framework for what urban prairie landscapes, and arboreta more broadly, might become in response to climate change.

The timing of this project is particularly significant. With construction still several years away, there remains a critical window in which ecological and management frameworks can meaningfully inform future implementation decisions before they become fixed. This proposal integrates research, citizen science, monitoring, and adaptive management into the landscape lifecycle—an approach that may be particularly feasible and institutionally supported within an arboretum setting.

SITE HISTORY

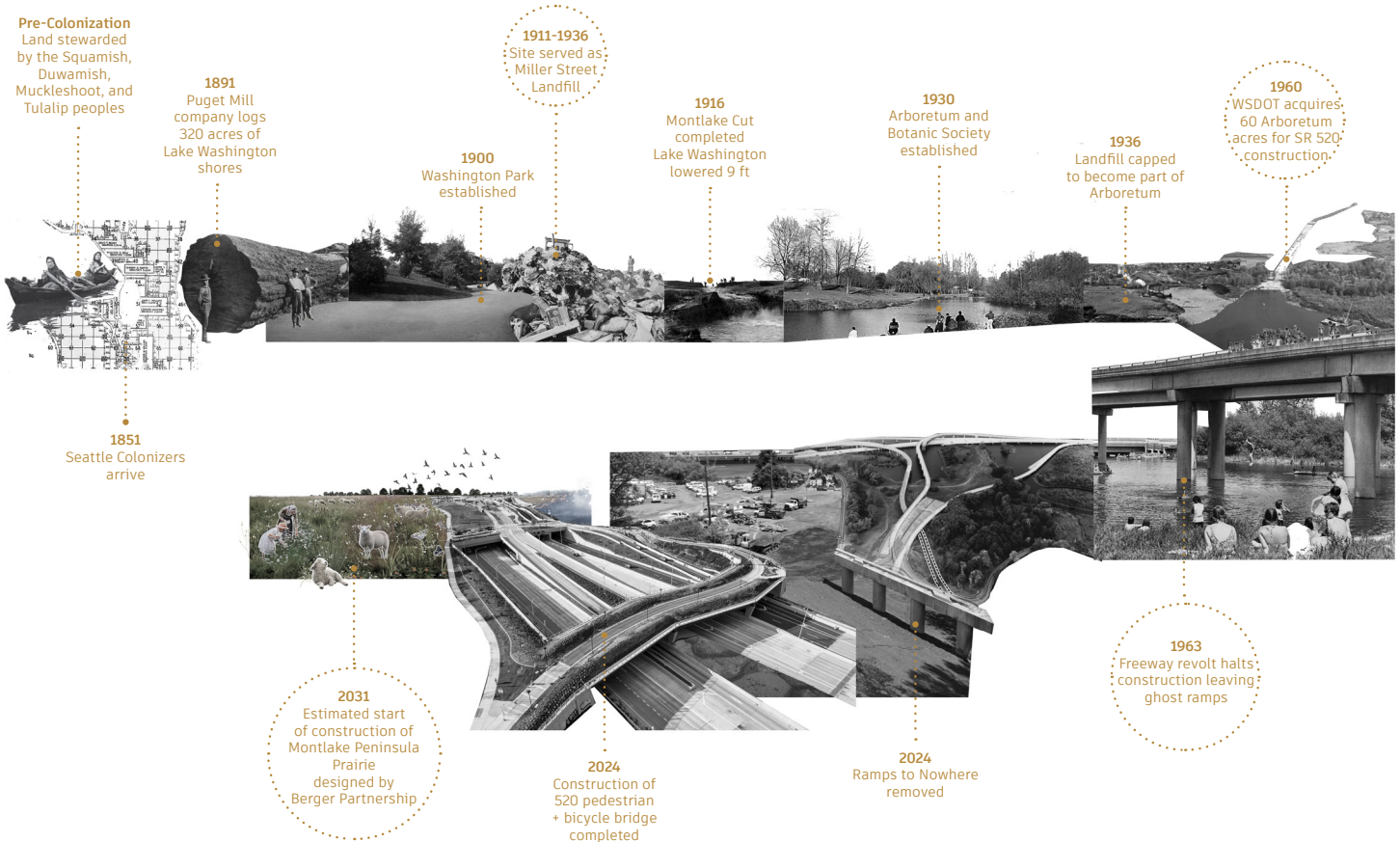


Figure 2.10 : Washington Arboretum + Montlake Peninsula History, by author, 2026

(**Data Source:** Karen Kiest Landscape Architects & BOLA Architecture + Planning, 2003; **Image Credits:** Dorpat, n.d.; Warmer, 1850; MOHAI, n.d.; Seattle Municipal Archives, 1904; Baker, 2025; McDonald, 1913; University of Washington Botanic Gardens, 2017; Seattle Municipal Archives, 1962, *Dredging of lagoon*; Seattle Municipal Archives, 1962, WSDOT Peninsula; Haller, 1975; McKim, n.d.; Wagner, n.d.; Washington State Department of Transportation, n.d.)

The Arboretum lies within the traditional territory of the Coast Salish peoples, including the Suquamish, Duwamish, Muckleshoot, and Tulalip tribes. While the site itself is not historically documented as prairie, it has long been shaped through Coast Salish stewardship practices, including cultural burning, which supported hunting, gathering, and the stewardship of the forested landscape.

This thesis acknowledges and honors the Suquamish, Duwamish, Muckleshoot, and Tulalip peoples as the original stewards of this land and recognizes the ongoing Indigenous relationships to place. While I cannot speak on behalf of Indigenous communities, this research is grounded in deep respect for the stewardship practices that have shaped and sustained these landscapes since time immemorial.

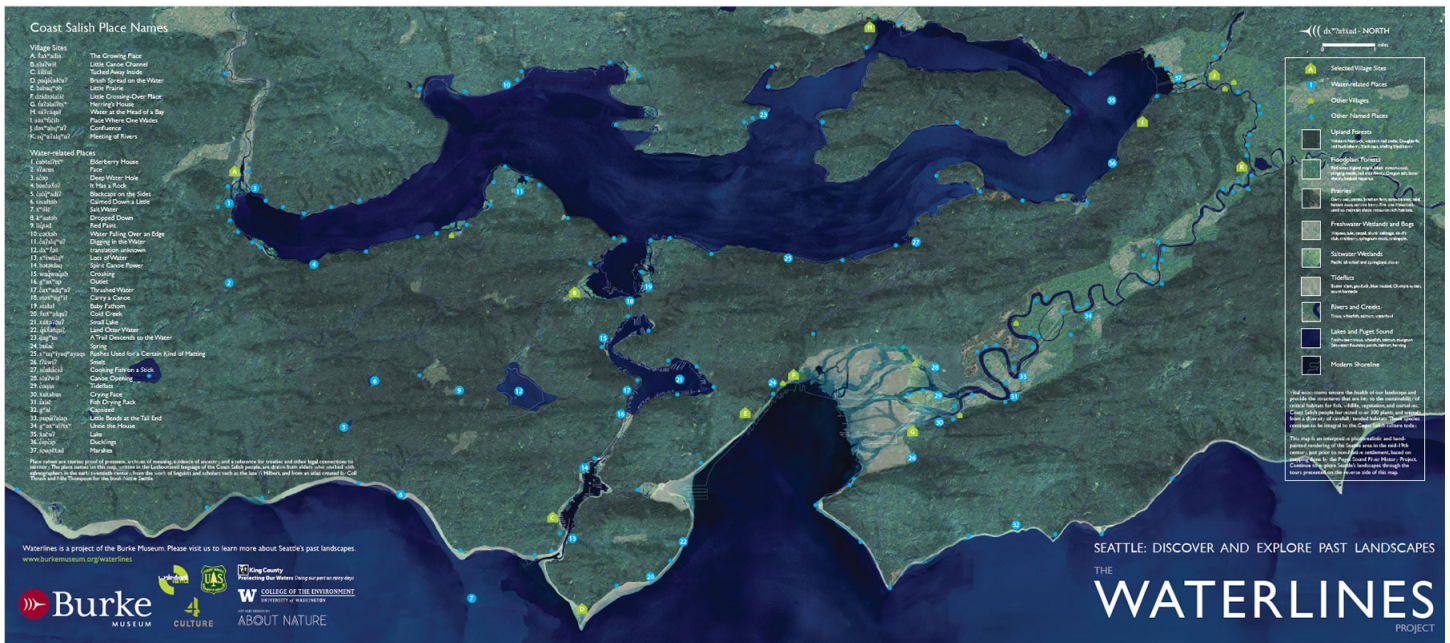


Figure 2.11 : The Waterlines Map Illustrating Pre-Colonial Seattle (Burke Museum of Natural History and Culture, 2014)

Pre Colonization	Lands of the Suquamish, Duwamish, Muckleshoot, and Tulalip tribes.
1851	Seattle settlers arrive.
1853	The US Army Corps of Engineers proposes a canal between Lake Washington and Lake Union.
1861	University of Washington established.
1871	Washington Canal Company acquires the rights to the canal and the federal government assumes ownership. This later aided efforts to build the SR 520 floating bridge.
1889	Washington admitted to the Union as the 42nd state.
1890	The city establishes a park fund from bonds, appropriations, gifts, licenses and penalties.
1891	Puget Mill Company logs 320 acres of shores of Lake Washington in anticipation of development.
1896	Puget Mill Company exchanges 62 acres of land to City of Seattle which later becomes Washington Park.
1900 - 1904	A series of purchases establishes Washington Park– one of the city’s first parks.
1903	Olmsted Brothers commissioned to conduct a thorough survey and provide comprehensive plan for Seattle Parks.
1907	Olmsted brothers produce plan to extend Washington Boulevard to AYP exposition grounds.
1911 - 1916	Montlake ship canal construction begins.

1910	Construction of the watergate to control water levels in Lake Washington begins.
1911-1936	The Montlake Peninsula served as Miller Street Landfill. Excavations indicate debris is 2-10 ft deep.
1916	Montlake ship canal construction concludes. Lake Washington lowers 9 ft exposing more land on islands and peninsula for Washington Park.
1917	City of Seattle purchases Foster Island (<i>Stitici</i>), the Duwamish Burial Ground, and adds land to Washington Park.
1924	UW president Henry Suzzalo enters into agreement with the Seattle board of park commissioners to reserve Washington Park for the UW Arboretum and Botanical Garden.
1930	Arboretum and Botanic Society formed.
1934	More land acquired. Washington Park is now 175 acres.
1935	Olmsted brothers commissioned to provide general plans for Arboretum.
1936	Miller Street Landfill closes and is capped shortly after to become part of the Arboretum collections.
1953-1960	Montlake Peninsula was part of a rose garden collection and memorial area to Hugo A. Winkenwerder, a dean of the UW School of Forestry and director of Arboretum.
1953	Foster Island declared a bird sanctuary.
1960	Montlake Peninsula becomes property of WSDOT for the construction of Highway 520.
1960 - 1963	Construction of SR 520 floating bridge results in 60 acres lost to arboretum land. \$500,000 trust established. Lagoons and peninsula landform changed with the dumping of materials following construction
1963	Ramps to Nowhere Freeway Revolt. Construction halts leaving ghostly ramps at point of site.
2024	Final remnants of ramps to nowhere removed.
2024	Construction of 520 pedestrian and bicycle overpass completed.
2031	Estimated start of construction for Montlake Peninsula Prairie, designed by Berger Partnership.

(Karen Kiest Landscape Architects, & BOLA Architecture + Planning, 2003)



03

ECOLOGICAL PLANTING DESIGN

*A design approach that mimics
naturally occurring plant communities
to support greater ecological function.*

INTRODUCTION

“There might be as many as thirty million species of insects ... rapidly disappearing. The current extinction rate is four hundred times that of the recent geologic past and climbing. It is an odd irony that the places we call empty should retain some memory of diversity of life, while the places we have filled up grow emptier and emptier.”

– Paul Gruchow

Ecological planting design operates within the context of accelerating habitat loss and climate change, where functioning ecosystems are increasingly replaced by development, resource extraction, and agricultural systems. The landscapes that replace functional systems are often resource-intensive requiring high-inputs while lacking resilience to increasing drought, heat, and other climate-driven stressors. These conditions form an exceptionally complex web of interacting crises and climate stressors, and meaningful change will require addressing them from multiple angles. For landscape architects, I believe this work begins with ecological planting design.

Ecological planting design offers an opportunity to rethink how landscapes are structured and experienced, moving beyond landscapes that function primarily as aesthetic artifacts, sustained through intensive resource inputs, toward plant communities that perform ecological function while requiring fewer ongoing inputs and expressing a regional sense of place.

Biodiversity plays a critical role in this shift. More diverse systems are better able to absorb disturbance and maintain function over time, while simplified systems are more vulnerable to failure under environmental stress. However, biodiversity cannot be rapidly manufactured. A study of over 3,000 restored ecosystems spanning 150 years found that these systems supported approximately 30% less biodiversity and 40% less ecological function than undisturbed habitats (Vogt, 2023).

Within this context, ecological planting design does not seek to, nor is it capable of, replicating historic ecosystems, but rather to emulate ecological function under contemporary and future conditions. It engages native and regionally adapted plant communities, as well as novel assemblages shaped by shifting climates, to create landscapes capable of adapting to uncertain futures.

Ultimately, ecological planting design provides a framework for creating landscapes that are ecologically functional, resilient, low-input, and expressive of place within changing environmental conditions.

PRECEDENT | 17TH STREET CORNER PLAZA

Location: Denver, Colorado

Designer: Terremoto

Year: 2022

Acreage: 0.4 acres

This precedent demonstrates a landscape designed specifically to support native bird species. Rooted in extensive research on local ecologies, it presents a highly naturalistic landscape within a dense urban fabric. It also illustrates alternative management practices for maintaining public landscapes without the use of motorized tools.



Figure 3.1 : 17th Street Corner Plaza designed by Terremotto, Denver, Colorado (VonLehe, 2022)

The 17th Street Corner Plaza is a privately owned but publicly accessible native garden in downtown Denver, created by transforming a former parking lot. Designed by Terremoto, the project emphasizes place-based design, with most materials sourced within 100 miles and planting communities modeled on the region's foothills and shortgrass prairies. The design team collaborated closely with local ecologists and spent extensive time studying surrounding Colorado landscapes to ensure the garden reflected local ecological patterns (Green, 2025).

A central aim of the project was to design for the bird species historically reliant on these prairies but largely absent from the urban core, using habitat-driven planting to invite their return. While the project has not yet been evaluated through the Landscape Performance Series, its intentions are grounded in ecological observation and regenerative practice. The plaza is maintained entirely by hand, without motorized tools, demonstrating a commitment to low-impact, craft-based stewardship that supports the garden's ecological structure and function (Green, 2025).

NATIVE PLANT COMMUNITIES

Like the definition of a prairie, “native” is a debated and complex concept. For the purposes of this work, a native plant is defined as one that has occurred within an ecoregion since the retreat of glaciers approximately 10,000 years ago, which shaped the soils and landscapes we recognize today. While this is often interpreted at the state level, it is more accurately understood within the context of an ecoregion.

LEVEL II ECOREGIONS



LEVEL III ECOREGIONS

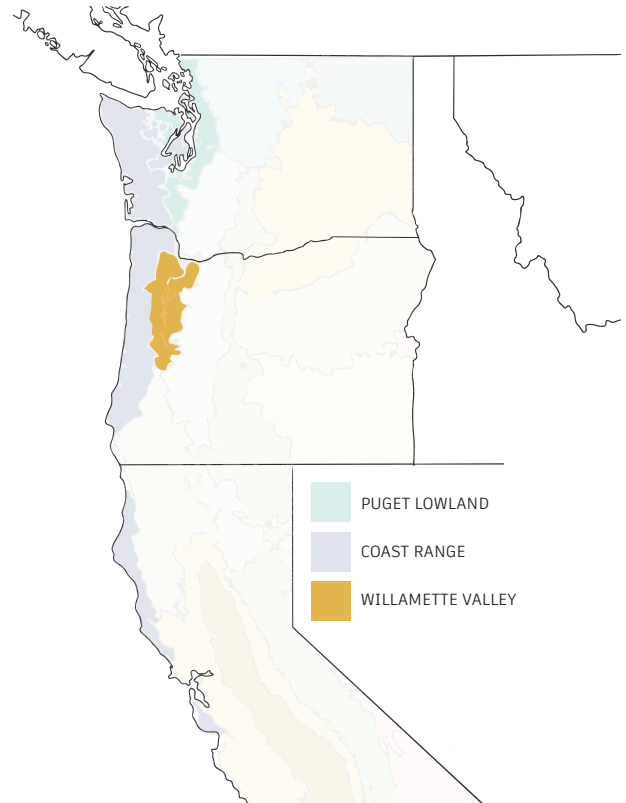


Figure 3.2 : Level II and III Ecoregions, by author, 2026 (Data Source: U.S. Environmental Protection Agency, 2010)

An ecoregion is a spatially defined area characterized by distinct assemblages of plant and animal communities and shared environmental conditions, shaped by climate, geology, soils, and vegetation (U.S. Environmental Protection Agency, n.d.). This project focuses on the Marine West Coast Forest, and more specifically, the Puget Lowland, Coast Range, and Willamette Valley.

Native plant communities form the baseline ecological relationships within these regions. Having coevolved with local climate and soil conditions, they are well adapted and resilient, typically requiring fewer inputs such as water and fertilizer. Over millennia, these communities have also developed reciprocal relationships with local fauna, supporting habitat and food webs. In contrast, non-native species often lack these established ecological connections and provide limited support for local wildlife.

SPECIES MIGRATION + NOVEL PLANT COMMUNITIES

Although prairie ecosystems have not historically been documented in the Seattle region, their geographic proximity to South Puget Sound prairies, combined with projected warming trends and increasingly dry urban microclimates, suggests that prairie systems may become more ecologically relevant in the future.

Native plant ranges are shifting in real time in response to rapidly changing climate conditions. As temperatures rise, many species are migrating northward as a strategy for survival (University of Maryland Extension, 2024). While some species are able to adapt through succession or genetic plasticity, particularly fast-reproducing prairie species, others are experiencing stress and decline. Western red cedar, for example, is showing widespread dieback under warmer and drier conditions (Gilles, 2023). These shifts indicate that plant communities are not static, and that species historically associated with a region may not persist under future climatic conditions.

Urban environments intensify these dynamics. Cities generate distinct microclimates characterized by elevated temperatures, altered hydrology, and increased disturbance regimes. These conditions diverge from surrounding reference ecosystems and increasingly support plant assemblages that do not align with historical vegetation patterns. As a result, urban landscapes are becoming sites of ecological novelty, where new plant communities emerge in response to both climatic and human-driven change.

Within this context, the goal of restoring urban landscapes to a pre-colonial or historical condition becomes increasingly unattainable. As Thomas Rainer and Claudia West (2013) argue, it is necessary to move beyond “the romanticized ideation of pristine nature and embrace *new nature* which is largely designed and managed by humans.” Rather than replicating historical plant communities, ecological planting design must respond to ongoing ecological transformation and accept landscape change as a foundational condition.

In addition to supporting biodiversity and habitat function, plant communities may also be selected to accommodate grazing stewardship as a complementary ecological and maintenance strategy within urban landscapes. In this way, planting design can support both ecological adaptation and evolving forms of stewardship in a warming climate.

Given these conditions, this research proposes a planting framework that integrates three interrelated community types: **native communities**, which support coevolved ecological relationships; **novel communities**, which emerge from urbanization, climate disruption, and shifting disturbance regimes; and **emerging communities**, which anticipate future species distributions under continued climate change. Together, these categories allow planting design to move beyond strict nativity and better reflect the ecological realities of a rapidly changing world.

CSR THEORY, COEFFICIENT OF CONSERVATISM, + FLORISTIC QUALITY INDEX

Now that native, novel, and emerging plant communities have been established as part of this research, it is important to understand how individual species interact within these systems. English ecologist Philip Grime developed CSR theory, which categorizes plants along a spectrum of competitive (C), stress-tolerant (S), and ruderal (R) strategies. Rather than fixed categories, these strategies exist within a triangular relationship in which plants exhibit varying combinations of competition, stress tolerance, and disturbance adaptation. This framework is important for understanding disturbance ecology and the ways plant communities shift in response to environmental stress and disturbance (Grime, 1977).

Competitive species are adapted to environments with abundant resources and relatively low levels of disturbance or stress. In landscapes with ample water, nutrients, and minimal disturbance, competitive species often dominate and displace ruderal or stress-tolerant species through rapid growth and resource capture. Recall that, due to the absence of disturbance, particularly fire, trees and shrubs—considered competitive species—have encroached upon Washington prairie ecosystems, gradually displacing prairie species and transforming these landscapes entirely.

Ruderal species, by contrast, are adapted to disturbance. In landscapes experiencing herbivory, fire, mowing, plowing, soil erosion, or pathogen pressures, ruderal species are often the first to colonize newly disturbed ground. These species are typically fast growing, quick to reproduce, and tolerant of repeated disturbance. Although not always the case, many short-lived annual species are considered ruderal due to their rapid

colonization strategies. Some perennial species may also exhibit ruderal tendencies; for example, fireweed (*Chamerion angustifolium*) is commonly among the first species to emerge following wildfire disturbance.

Many prairie species have additionally evolved germination strategies linked directly to disturbance processes. Certain seeds require fire, heat, smoke, scarification, or acid exposure through animal digestion to break dormancy and initiate germination. Because prairie ecosystems co-evolved with Indigenous stewardship practices over millennia, including cultural burning and grazing, many prairie species are highly adapted to cyclical disturbance regimes.

Finally, stress-tolerant species are adapted to environments with limited resources or physically demanding conditions, such as drought, nutrient-poor or compacted soils, limited sunlight, extreme temperatures, or shallow substrates. These species are generally slower growing, slower to establish, and invest energy into persistence and survival rather than rapid expansion (Grime, 1977).

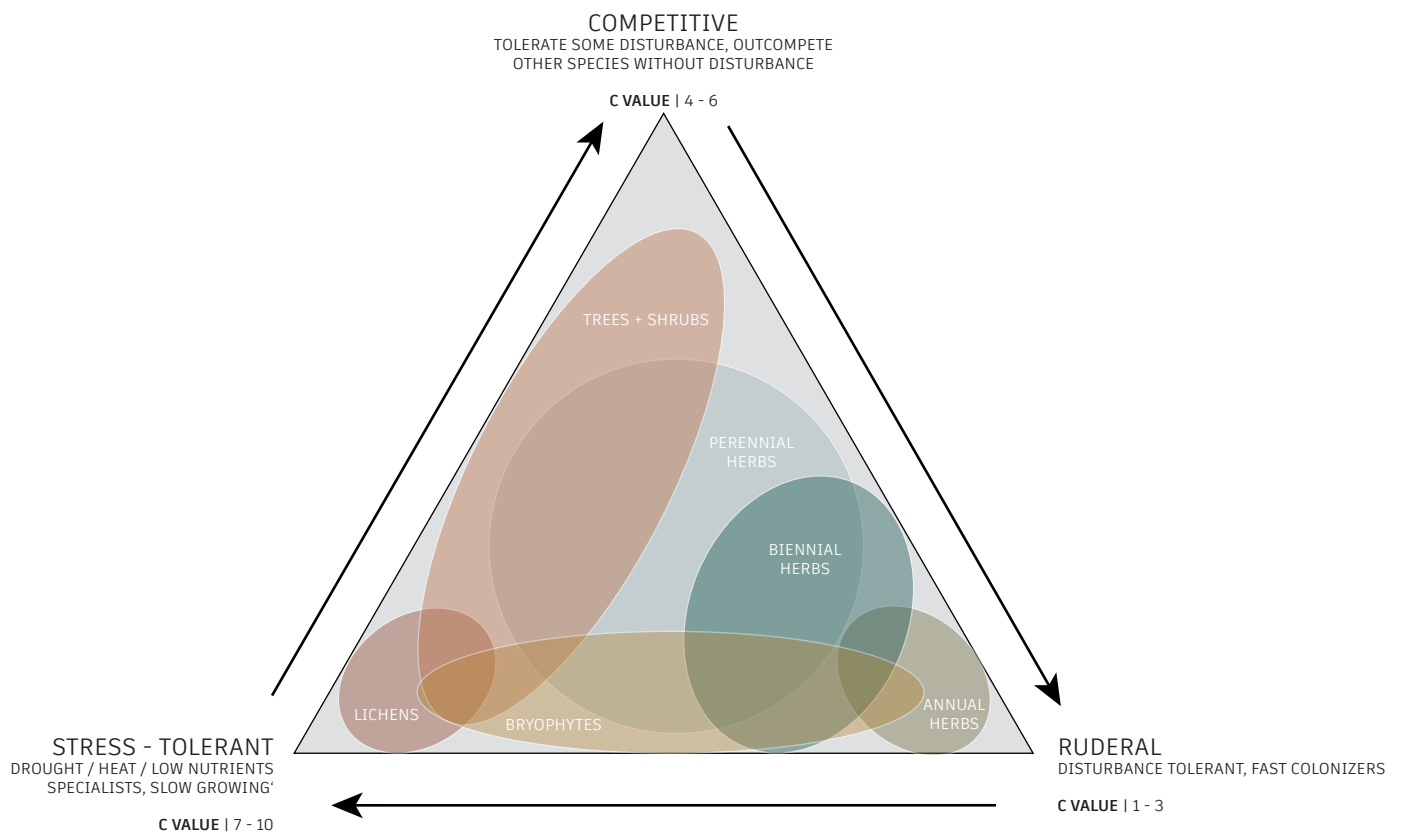


Figure 3.3 : CSR Model, by author, 2026 (Data Source: Virens Studio, 2024)

In addition to CSR theory, this research considers the Coefficient of Conservatism (C-value), a metric assigned to native plant species by regional ecologists. C-values represent a species' fidelity to particular habitat conditions and its tolerance to disturbance on a scale from 0–10. This metric contributes to a broader ecological assessment known as the Floristic Quality Index (FQI), which evaluates the ecological integrity of an ecosystem and helps inform conservation and restoration priorities (Washington State Department of Natural Resources, n.d.).

Under this system, non-native species are assigned a value of 0 based on the assumption that they do not meaningfully contribute to regional ecological integrity. This assumption can be challenged, as some non-native species provide important ecological functions or food resources for local fauna. For example, Himalayan blackberry (*Rubus armeniacus*) is widely utilized by birds and pollinators despite its invasive status. However, within conventional floristic assessment frameworks, non-native species remain categorized as 0.

Species assigned C-values between 1–3 are generally tolerant of disturbance and occur across a broad range of environmental conditions. These species are often considered ecological generalists and may exhibit “weedy” growth characteristics. Species with C-values between 4–6 occupy a moderate range of habitat conditions and may display stronger competitive abilities. Finally, species assigned values between 7–10 are typically associated with relatively intact ecosystems and are often more specialized to specific environmental conditions and ecological relationships (Washington State Department of Natural Resources, n.d.).

Although CSR theory and Coefficient of Conservatism are not directly translatable systems, this research draws provisional relationships between the two frameworks due to the limited availability of CSR classifications for many regional species. In this study, species with C-values between 1–3 are generally interpreted as more ruderal, species with values between 4–6 as more competitive, and species with values between 7–10 as more stress-tolerant. These relationships are not absolute, but they provide a useful framework for interpreting planting dynamics and ecological function within designed prairie systems.

An important assumption within floristic quality assessment is that high-quality ecosystems are often dominated by species with higher C-values. Because these species are generally slower growing and less disturbance-tolerant, they may allow greater niche differentiation and coexistence among plant communities. In contrast, highly competitive or ruderal species can rapidly dominate a site, reducing ecological diversity over time through competitive exclusion (Washington State Department of Natural Resources, n.d.).

Finally, C-values are used in an equation to assess the overall Floristic Quality Index (FQI) of an ecosystem.

$$FQI = \bar{C} \times \sqrt{N}$$

Where:

$\bar{C}$ = mean coefficient of Conservatism (C-Value) of all native species present

N = total number of native species in the site

General FQI ranges are interpreted as follows:

FQI Score	Interpretation
1 - 19	Low Quality
20 - 35	High Quality
36 +	Exceptional

Figure 3.4 : Ecological quality as a result of Floristic Quality Index (Washington State Department of Natural Resources, n.d.)

In assessing the FQI of the selected species for this research, 85 native plant species were evaluated, resulting in an average C-value of 4.28. Therefore, the proposed planting community achieves an FQI of approximately 39.46, indicating an exceptionally high floristic quality and a strong representation of ecologically conservative native species.

$$FQI = 4.28 \times \sqrt{85} = 39.46$$

PLANT SELECTION + COMMUNITY ASSEMBLAGE

Plant communities within this project prioritize functional systems, ecological diversity, and the occupation of diverse ecological niches in response to disturbance, rather than solely aesthetic composition. These communities are designed to evolve through succession and disturbance, transitioning between native, novel, and emerging conditions as environmental pressures and disturbance regimes shift.

This project incorporates native Washington prairie species to support regional ecologies and biodiversity, while also drawing from California coastal prairie communities to anticipate emerging climatic conditions. At the same time, the project acknowledges and responds to the novel urban environments within which these landscapes are situated. These plant communities are organized in part through C-values, which help inform interpretations of how species may respond to disturbance regimes and environmental conditions.

The proposed plant communities include Washington dry prairie assemblages, Washington annual communities composed of more ruderal species, Washington wet prairie communities adapted to wetter conditions along the lake shoreline, California coastal prairie communities, and pasture species intended to support grazing regimes, which will be discussed further in Section 4: Disturbance Ecology.

Finally, this project considers common urban and prairie antagonists that are likely to contribute to the novel plant communities of the site. As discussed previously, some of these species still provide ecological resources for local fauna communities. While it is unrealistic to completely eradicate these species from the site, it is important to understand how they function, reproduce, and spread, including their flowering and seed production cycles, in order to more effectively steward a balanced and ecologically resilient system.

WASHINGTON DRY PRAIRIE

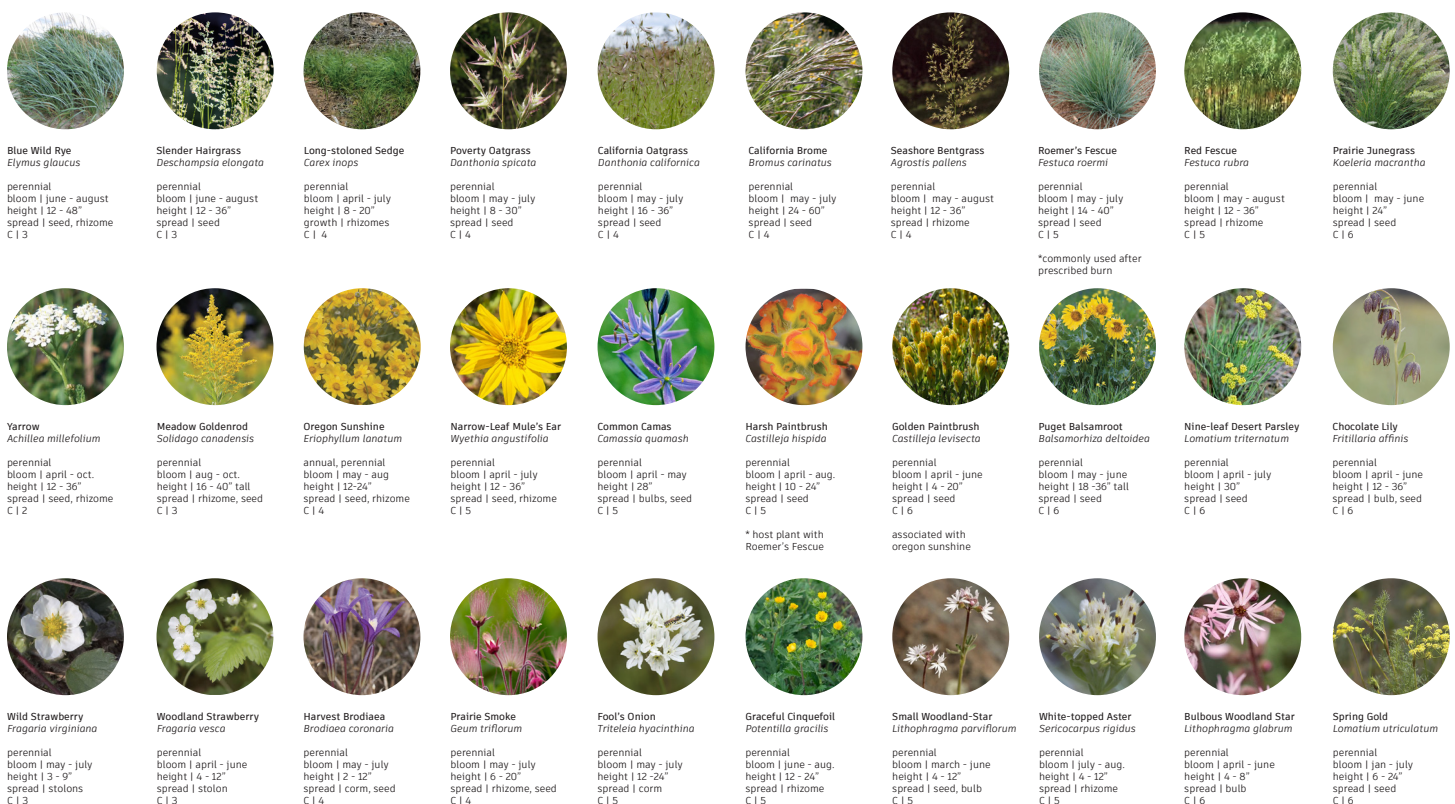


Figure 3.5 : Washington dry prairie plant palette

WASHINGTON ANNUALS



Figure 3.6 : Washington annuals plant palette

WASHINGTON WET PRAIRIE

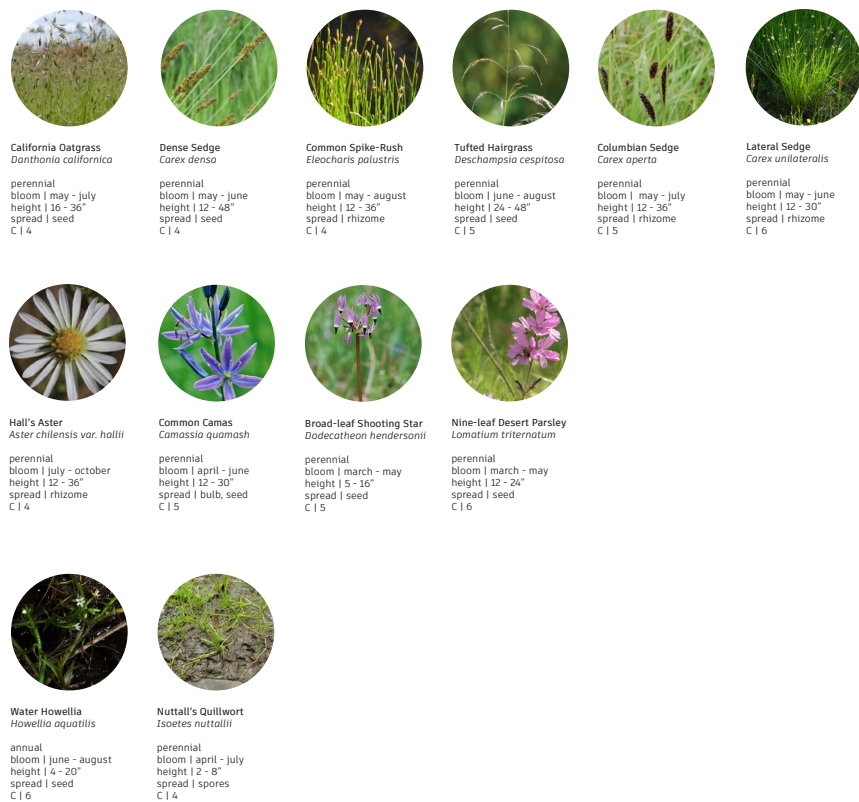


Figure 3.7 : Washington wet prairie plant palette

CALIFORNIA COASTAL PRAIRIE

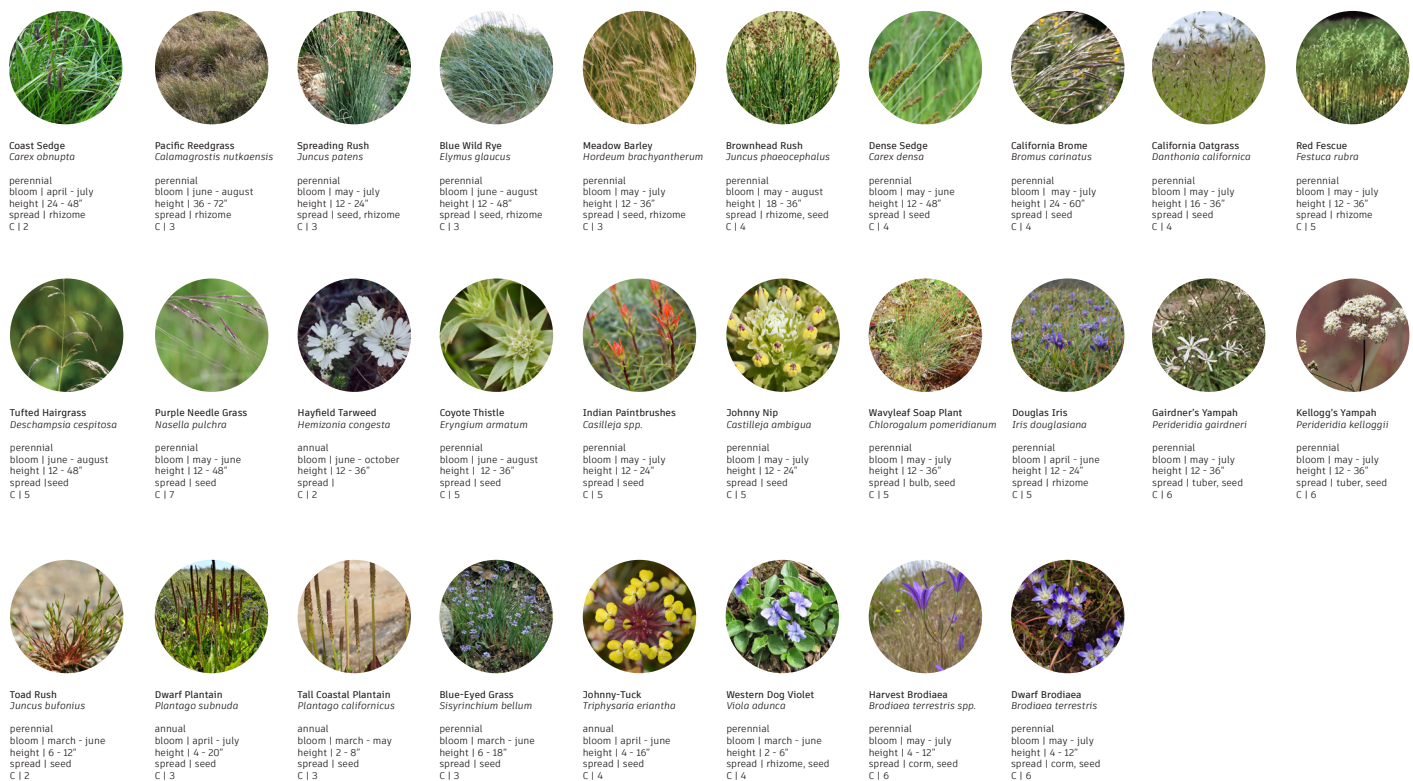


Figure 3.8 : California Coastal prairie plant palette (Schroll, 2023)

PASTURE PLANTS

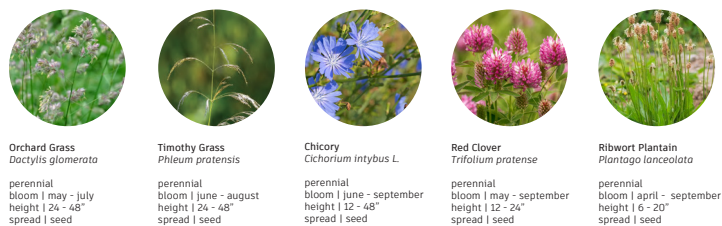


Figure 3.9 : Supplemental pasture plant palette to support grazers

COMMON URBAN + PRAIRIE ANTAGONISTS

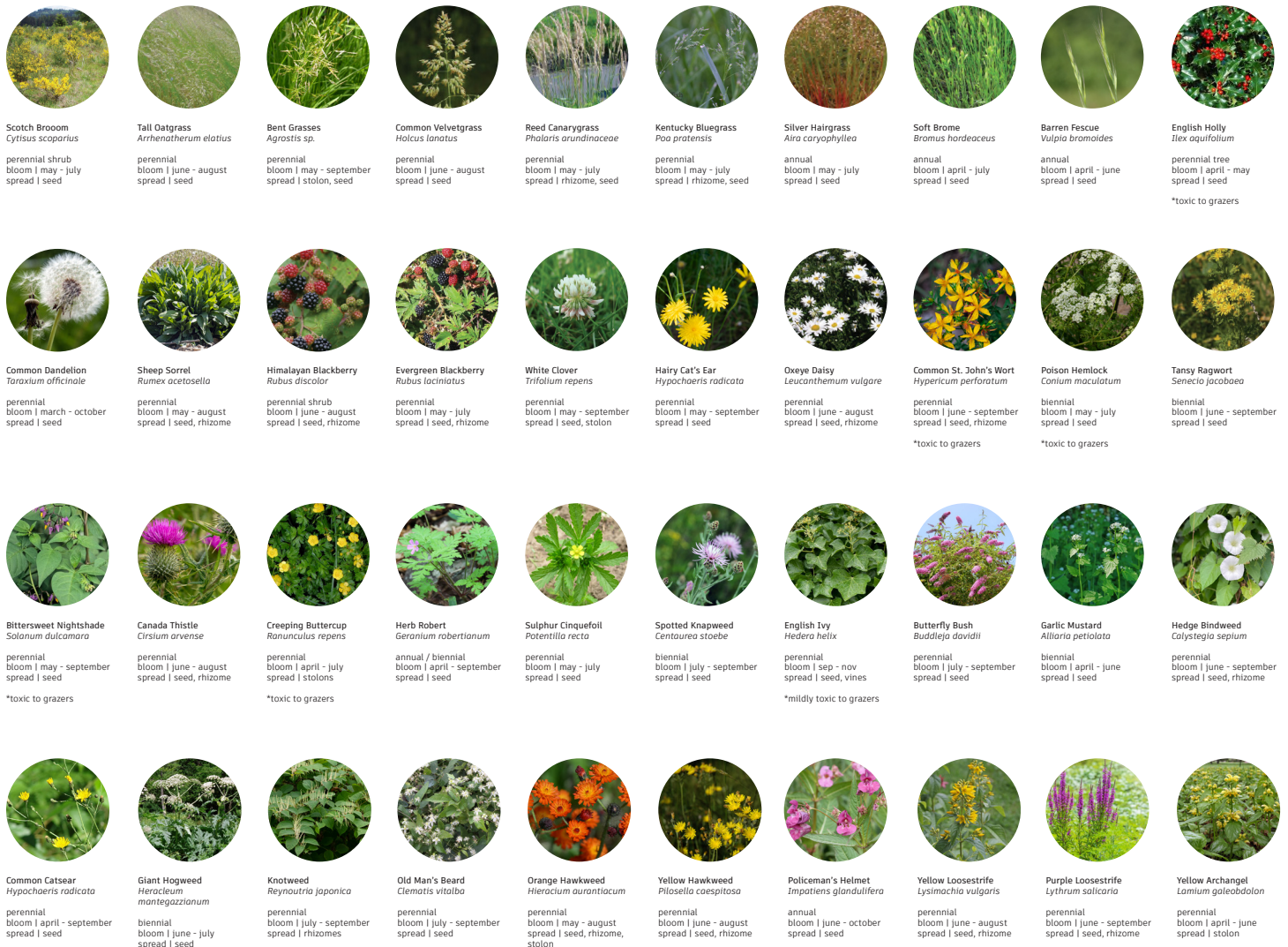


Figure 3.10 : Common Urban + Prairie Antagonists

FUNCTIONAL BIODIVERSITY OF PLANT COMMUNITIES

Altogether, these plant communities are intended to support functional biodiversity, whereby species occupy distinct ecological niches to form systems that are resilient, adaptive, and largely self-sustaining. The greater the functional biodiversity within a plant community, the greater its capacity to withstand disturbance, environmental stress, and disease. By occupying diverse niches, these communities reduce the likelihood of systemic collapse, allowing ecological functions and relationships to persist through diversity, redundancy, and adaptation.

This diversity is expressed through variation in height, leaf size, growth form (annual and perennial), seasonal timing, bloom characteristics, rooting depth, and wildlife support. Differences in rooting depth improve soil structure, aeration, and carbon sequestration, while variation in canopy height and seasonal activity allows plants to partition resources across space and time. Together, these traits enable species to access light through multiple canopy layers, draw water and nutrients from different soil depths, and stagger resource use throughout the growing season (Vogt, 2023).

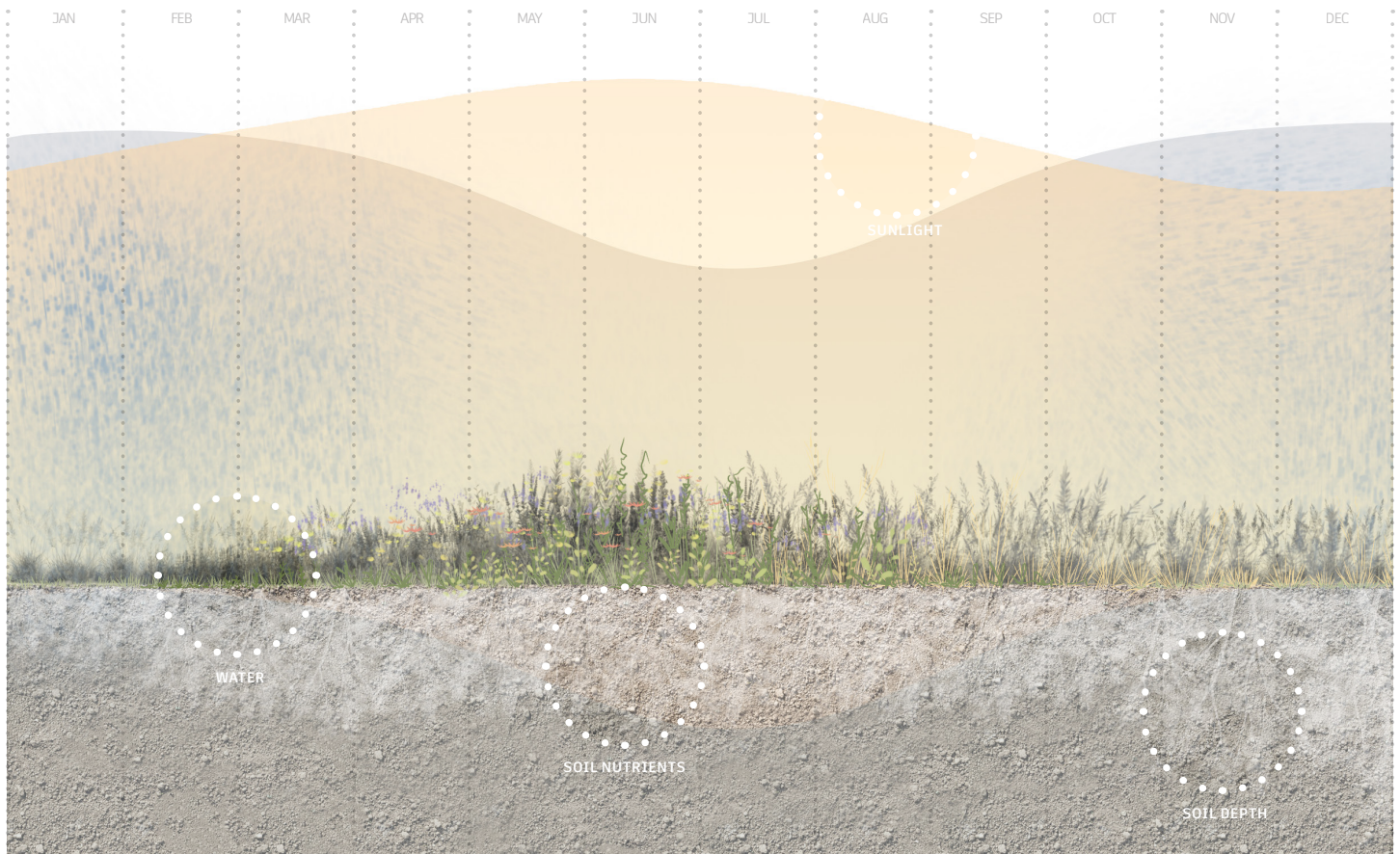


Figure 3.11 : Functional biodiversity relies on plant communities sharing diverse niches within the landscape, by author, 2026

Like a musical ensemble in which instruments occupy distinct ranges and rhythms, compatible plant communities function through complementarity rather than competition. These relationships can be understood as a layered composition: structural plants establish form while providing shade and microclimatic buffering; seasonal species introduce temporal variation and ecological function; and groundcovers stabilize soil, retain moisture, and suppress weeds. Beyond optimizing resource use, these layers create habitat structure, offering shelter, nesting opportunities, and microclimatic refugia for a range of organisms. Ecological planting design seeks to emulate these relationships in order to cultivate resilient and self-sustaining systems.

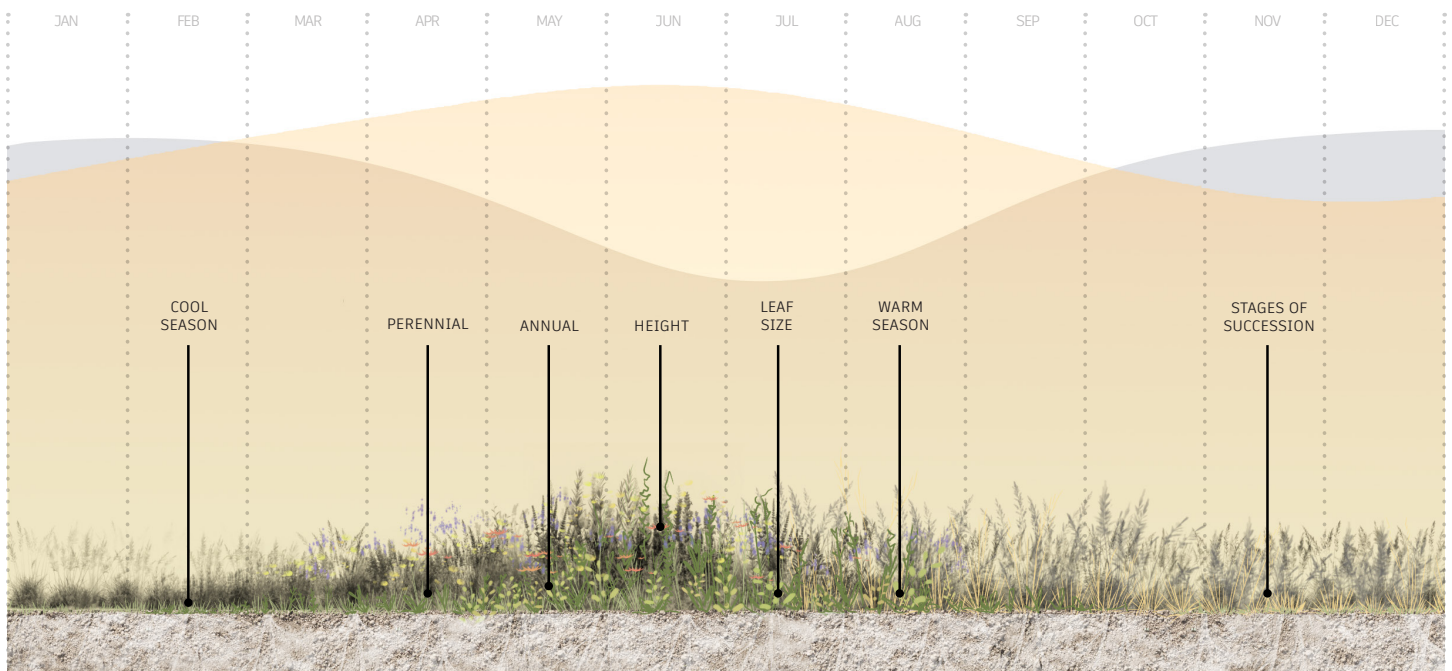


Figure 3.12 : Functional biodiversity relies on plant communities to fill diverse niches throughout the season, by author, 2026

As climate stressors intensify, functionally diverse plant communities act as ecological insurance. When individual species decline due to drought, disease, or disturbance, others can compensate and maintain broader system function. In contrast, low-diversity systems are often more vulnerable to ecological failure. This becomes especially important in larger landscapes where reduced management requires systems capable of sustaining themselves through internal ecological processes rather than continuous human intervention (Vogt, 2023).

FUNCTIONAL BIODIVERSITY

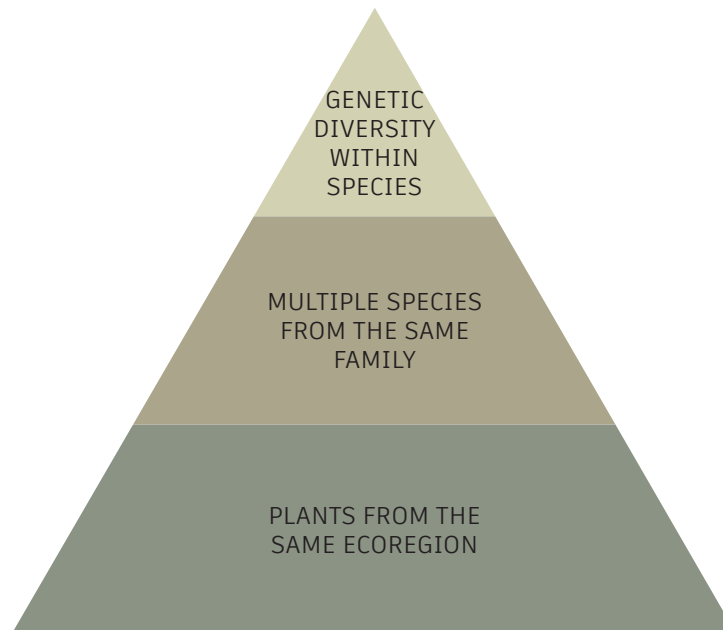


Figure 3.13 : Components for improved functional biodiversity, by author, 2026

Functional biodiversity includes not only species diversity, but also genetic diversity within species. Like species diversity, genetic diversity functions as a form of ecological insurance, increasing a plant community's capacity to adapt to changing environmental conditions. Locally sourced seed, adapted to regional seed zones, improves resilience to stressors such as drought and disease while maintaining coevolved relationships with local fauna.

Direct seeding generally supports greater genetic variation, whereas nursery stock is often propagated through cloning or tissue culture, producing genetically uniform plants with reduced adaptive capacity. The introduction of identical genetic material may also dilute local gene pools. Additionally, plant breeding and cultivar selection can alter traits such as floral structure and nutrient quality, potentially disrupting plant–animal relationships and reducing ecological value to wildlife (Vogt, 2023). For these reasons, locally sourced seed is critical to supporting resilient plant communities and sustaining coevolved ecological relationships.

We can conclude that ecosystem function increases when landscapes feature more plants from the same ecoregion, when multiple species within the same plant family are present, and when genetic diversity within those communities is higher. Together, these characteristics enhance ecosystem function and strengthen ecological resilience of the landscape (Vogt, 2023).

Assessing bloom timing within plant communities helps determine when the landscape provides resources for local fauna while also shaping the seasonal aesthetic experience of the landscape for humans. Staggered bloom periods extend the availability of nectar, pollen, seed, and habitat resources across seasons, supporting a wider range of species and ecological interactions over time. Bloom and seed production timing additionally informs how plant communities may respond to disturbance regimes, helping predict patterns of succession, regeneration, and species establishment following disturbance events.



Figure 3.14 : Bloom calendar of functional and aesthetic resources offered throughout the seasons, by author, 2026.

SPATIAL CONFIGURATION OF PLANT COMMUNITIES

Within the site, the spatial configuration of plant communities plays an important role in supporting biodiversity and ecological resilience. Larger and more connected habitat patches generally support greater species richness, while increasing the amount of edge condition between communities further amplifies ecological diversity (Suzán, Esponda, Carrasco-Hernández, & Aguirre, 2012). These edge conditions are significant because they create ecotones, transitional zones between habitat types where species and ecological processes from multiple systems overlap and interact.

Connectivity between habitat patches is equally important. Ecological corridors enable the movement of organisms, genes, nutrients, and broader ecological processes across the landscape, strengthening biodiversity and improving ecosystem resilience over time and across the site (Anjanalakshmi, 2024).

Taking inspiration from *Two Birds* by M. C. Escher, this project explores tessellation as a potential organizational framework for the site. Interlocking plots create opportunities for increased ecotones and ecological corridors

between plant communities, reinforcing connectivity and diversity across the landscape. The tessellated geometry itself is less important than the ecological relationships it supports; in reality, many spatial configurations could achieve similar outcomes so long as they promote connectivity, edge conditions, and ecological exchange between communities.

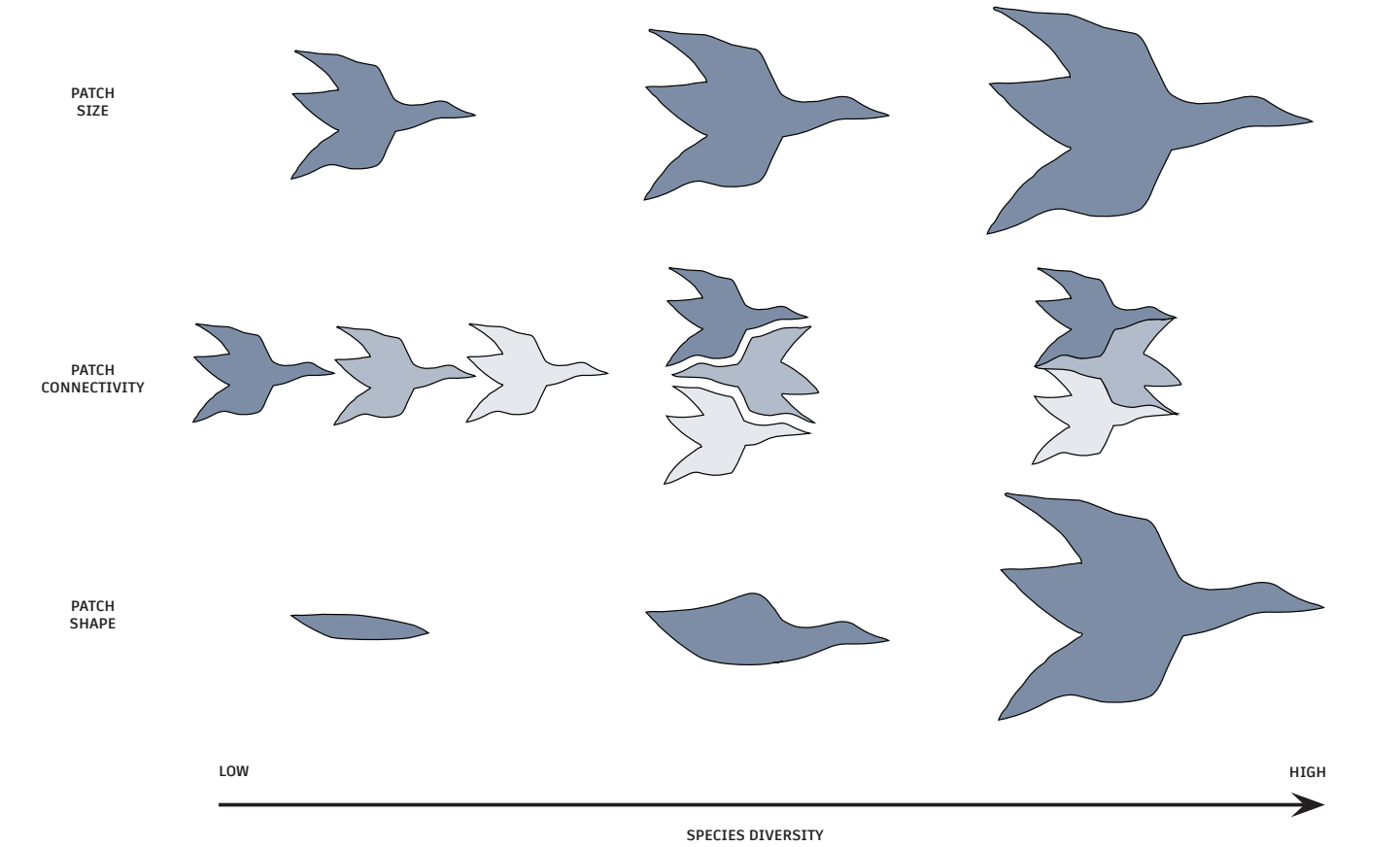


Figure 3.15 : Habitat Patches for increased species diversity, by author, 2026.
(Data source: Suzan, Esponada, Carrasco-Hernández, & Aguirre, 2012)

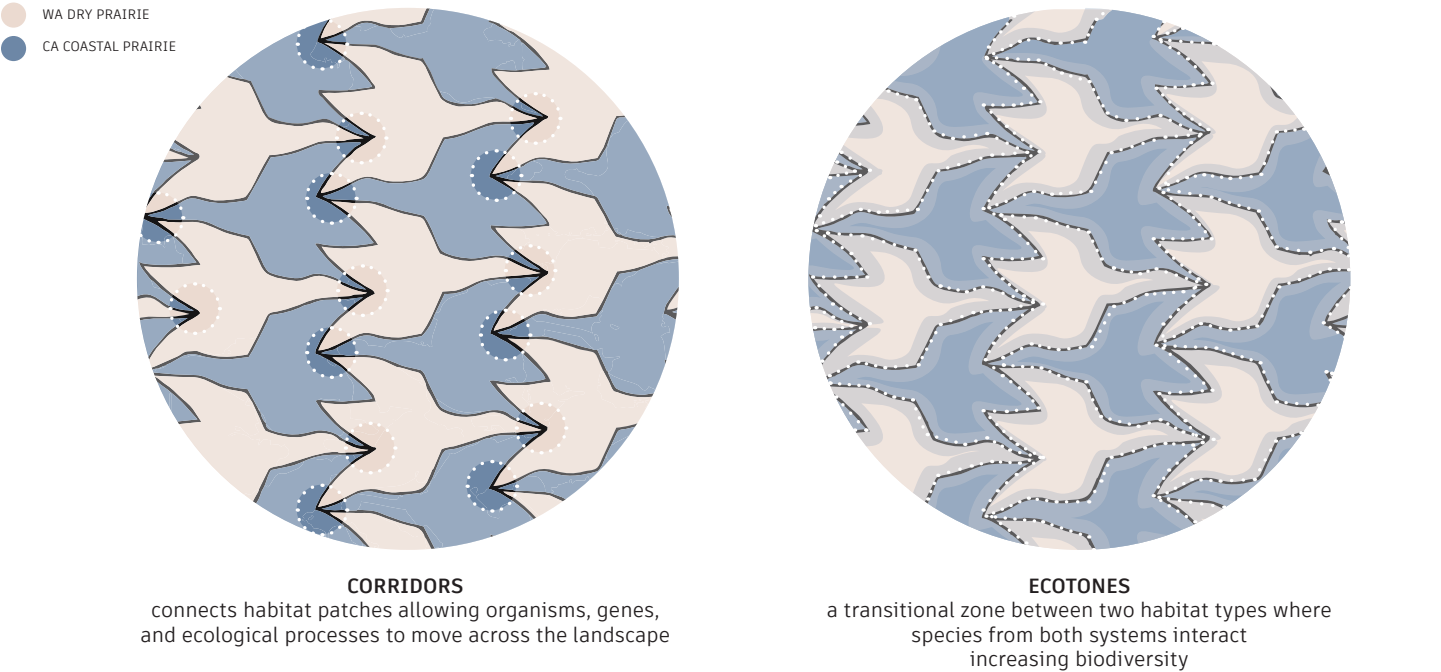


Figure 3.16 : Corridors + Ecotones, by author, 2026.
(Image source: Escher, 1938)

STAKEHOLDERS

Altogether, prioritizing functional biodiversity enables the landscape to support a wide range of stakeholders within the prairie ecosystem, including birds, pollinators, reptiles, amphibians, mammals, plants, grazers, and people who inhabit and interact with the landscape throughout different seasons and times of year. While intact Washington prairies can support more than 300 species (Payton, 2023), restored prairies are estimated to achieve approximately 40% of that species richness (Vogt, 2023), equating to more than 100 species of flora and fauna supported within the landscape. By designing for functional biodiversity, this project aims to cultivate a resilient and ecologically dynamic system capable of sustaining diverse forms of life and interaction across the site.



Figure 3.17 : Regional prairie stakeholders and a selection of species that rely on prairie plant communities, by author, 2026.
(Data source: Noland & Carver, 2011)

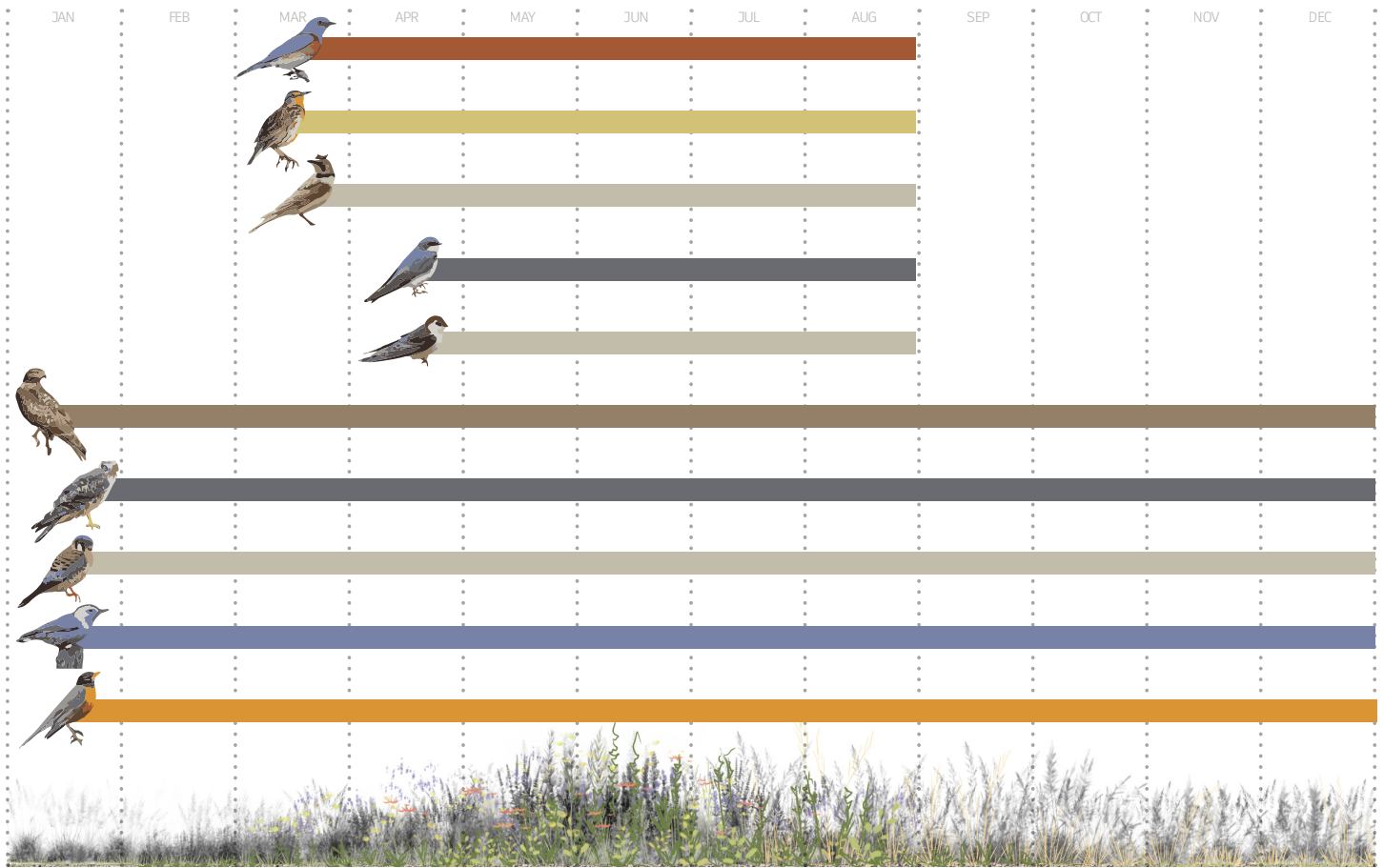


Figure 3.18 : Seasonal occupation of native bird populations in prairie landscape, by author, 2026.
(Data source: Noland & Carver, 2011)

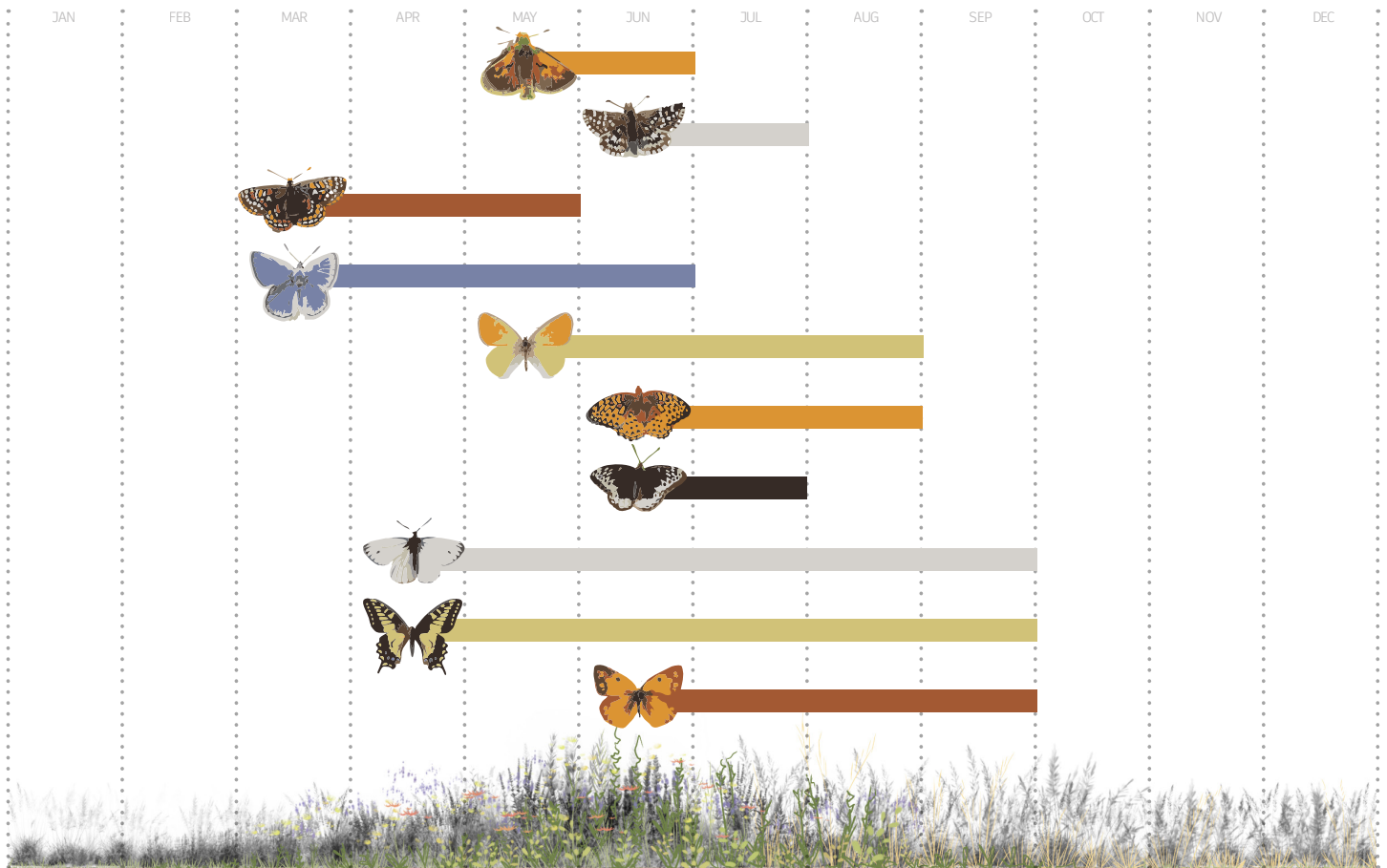
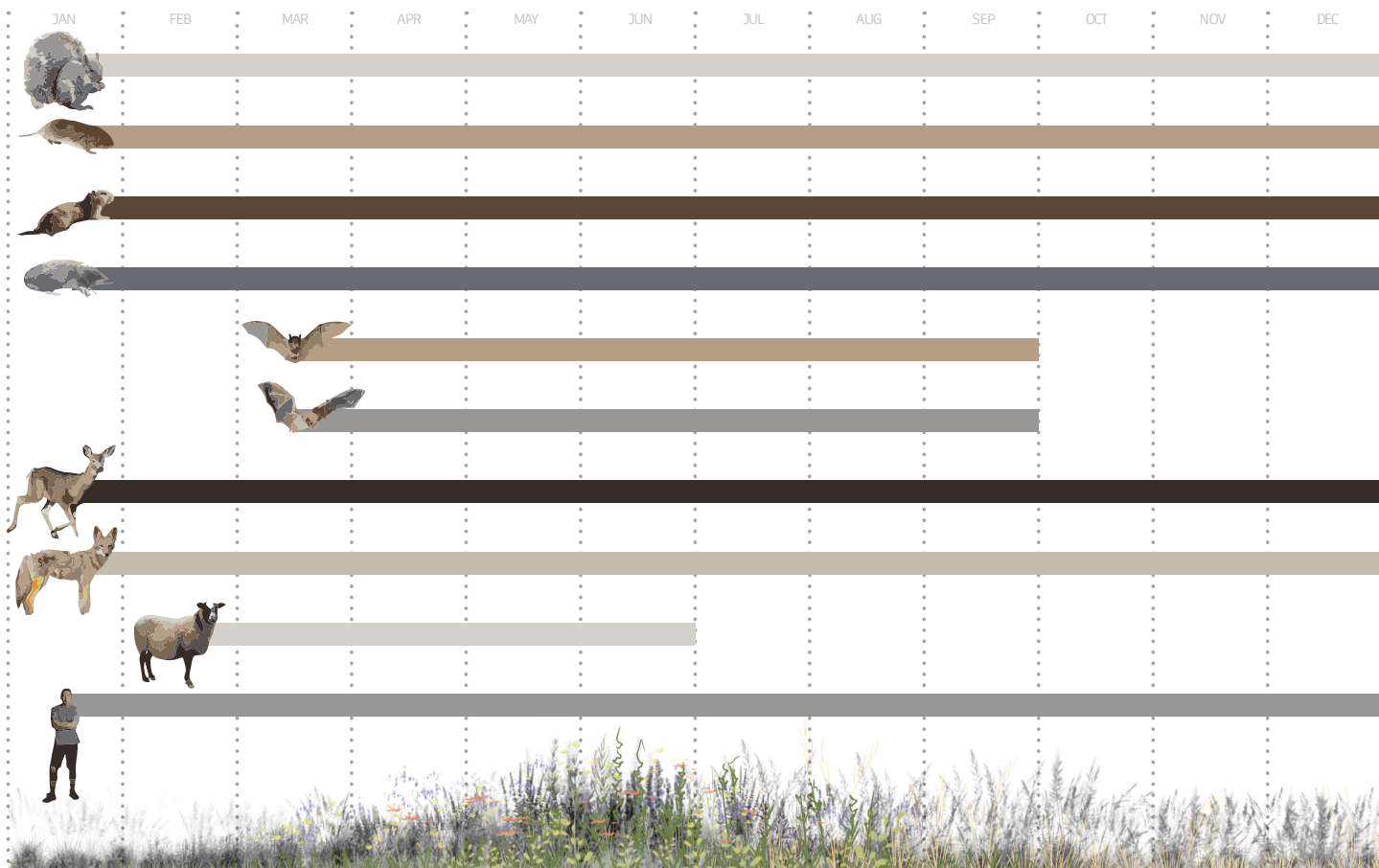
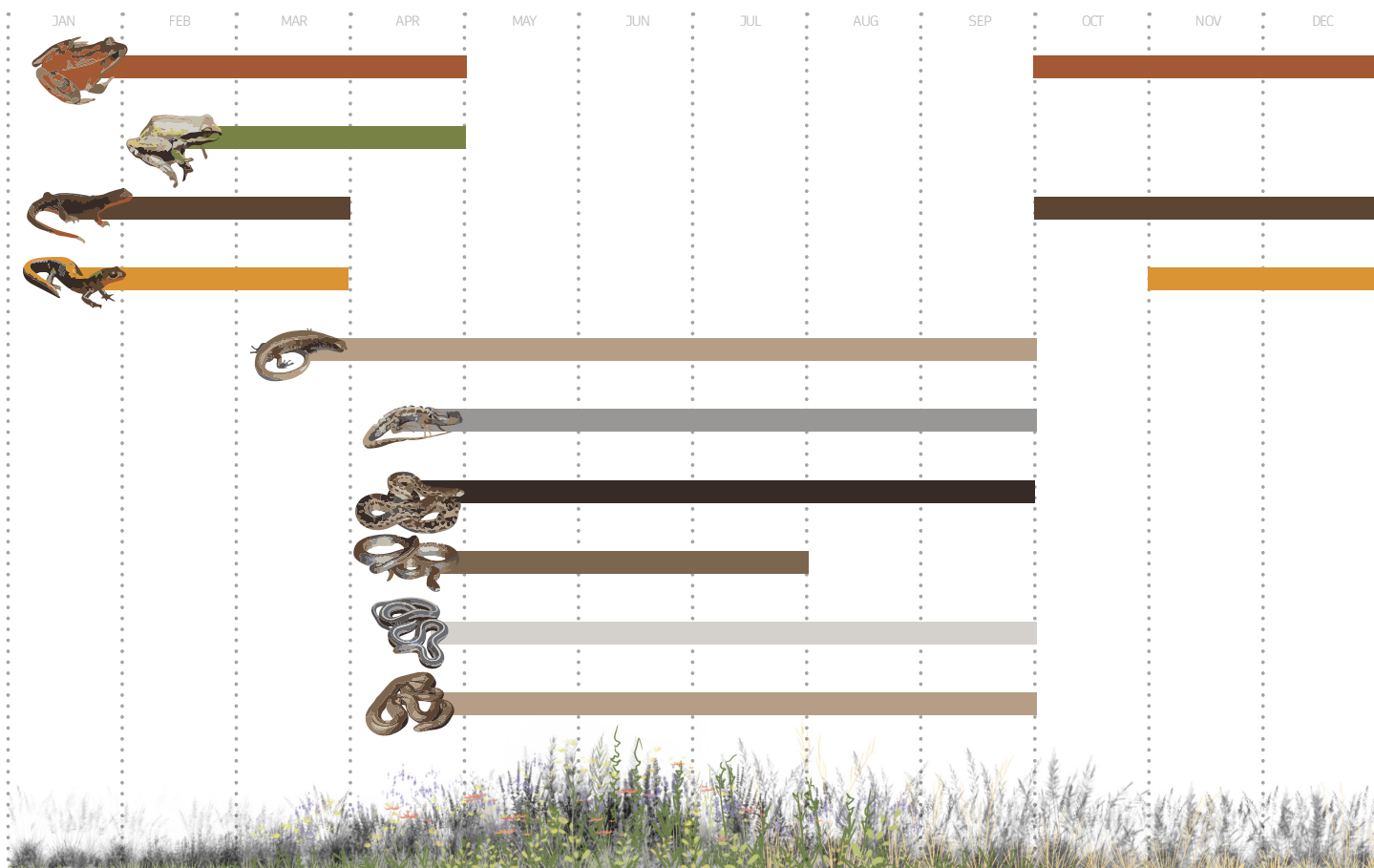


Figure 3.19 : Seasonal occupation of native butterfly populations in prairie landscape, by author, 2026.
(Data source: Noland & Carver, 2011)



PLANT SOURCING



nursery stock can be unreliable, limited, and difficult to source



nurseries increasingly going out of business



horticultural techniques often rely on **cloning** reducing genetic diversity



selective breeding can disrupt plant pollinator interactions

Figure 3.22 : Challenges of plant sourcing (Midjourney, 2026)

Plant sourcing presents a significant challenge in landscape practice, particularly for long-term public projects where availability fluctuates seasonally and nursery inventories shift over time. As a result, even well-developed planting strategies are often constrained by what is available at the time of installation.

Given this project's extended horizon, plant sourcing is reframed as an opportunity to engage more regenerative methods. This thesis proposes community-based seed collection as a primary strategy, supporting regionally adapted and genetically diverse plant material while creating opportunities for education, stewardship, and ecological awareness. By involving community members directly in sourcing, the landscape becomes not only a designed outcome, but a system co-created through long-term relationships with place.

Locally sourced seed and seed-grown plugs strengthen ecological resilience by maintaining genetic diversity and supporting coevolved relationships with local fauna. Community-led seed collection additionally fosters deeper connections between participants and plant species, though it requires careful planning, ethical harvesting practices, and seasonal coordination to avoid ecological harm.

While seed-based sourcing is prioritized, plugs remain important for establishing plant communities, particularly dominant matrix species such as grasses. Plugs provide immediate structure, improve establishment success, and help suppress weed pressure. Where possible, seed-grown plugs are prioritized over cloned stock to maintain genetic diversity.

Central to this approach is a shift from extractive to regenerative practice, extending community engagement beyond discourse into the active co-creation and stewardship of the landscape itself. In *Braiding Sweetgrass* (2013), Robin Wall Kimmerer describes the principles of the Honorable Harvest, emphasizing reciprocity, restraint, and respect. These principles establish an ethical framework for sourcing strategies, ensuring that the collection of plant material remains reciprocal and accountable to the ecosystems from which it is gathered.



Figure 3.23 : Community-based seed-collection initiatives (Midjourney, 2026)

*Know the ways of the ones who take care of you, so that you may take care of them.
Introduce yourself. Be accountable as the one who comes asking for life.
Ask permission before taking. Abide by the answer.
Never take the first. Never take the last.
Take only what you need.
Take only that which is given.
Never take more than half. Leave some for others.
Harvest in a way that minimizes harm.
Use it respectfully. Never waste what you have taken.
Share.
Give thanks for what you have been given.
Give a gift in reciprocity for what you have taken.
Sustain the ones who sustain you, and the earth will last forever.*

(Kimmerer, 2013)

AESTHETICS + LEGIBILITY

“What is good in terms of ecological function is often disorderly, and what is neat and tidy (lawns and clipped hedges) is often not sustainable.” (Rainer & West, 2015)



Figure 3.24 : Perceptions of prairies in the urban public landscape(Tapsell, n.d)

The prairie typology in an urban setting can be particularly challenging to public perceptions because of its association with urban decay and ruin when grasses grow tall and are perceived as unkempt or neglected. While context matters, addressing aesthetics and legibility is essential for building public buy-in and establishing these landscapes as worthy of care and stewardship.

This reflects a persistent tension between ecological function and cultural perceptions of beauty. Aesthetic preferences, shaped over time by cultural, political, and social forces, tend to favor order, neatness, and clear boundaries. At a large scale, grasslands may read as uniform, but at closer range their layered complexity becomes evident. Yet when placed within urban contexts, these same qualities are often perceived as disorderly, contrasting with the rectilinear logic of the built environment.

There is also a disconnect between perception and intentionality. Landscapes perceived as designed are more readily accepted, while spontaneous growth is often read as neglect. Encouraging new standards of beauty that align with ecological function is therefore critical to the success of public support of biodiverse urban landscapes. Designers can work within existing cultural frameworks to foster appreciation, care, and stewardship—evoking pleasurable associations with wildness rather than confusion or discomfort.

Several tools can help communicate intentionality and enhance the legibility of ecologically functional landscapes:



Figure 3.25 : Aesthetic tactics designers can use to improve legibility of the landscape (Image Credits: Vogt, 2023; CIMBY Environmental Interns, n.d.; Islet, n.d.; Carlson, 2016; GGN, n.d.; Georgia Native Plant Society, n.d.)

Repetition and rhythm in planting patterns– this creates a sense of predictability and patterning, demonstrating intentionality

Framing and edges, whether through designed borders, mowing lines, or hardscape elements, to delineate structured areas within more spontaneous plantings

Clipped hedges or small fences to suggest orderly frames

Seasonal interest, including year-round color and texture variations

Complementary seasonal color palettes to unify the planting palette at large

Large drifts or massing of color, creating tiers, visual hierarchy, and emphasizing design intention

Negative space, such as open areas, paths, or seating, provides visual rest and enhances legibility

Visual anchors, like sculptures or art, that reinforce intentionality and draw the eye

Interpretive messaging, including signage or cues to communicate design or ecological intent

By carefully combining these strategies, designers can create landscapes that are both ecologically functional and aesthetically legible, demonstrating a new, more sustainable and resilient version of beauty.

PRECEDENT | LURIE GARDEN AT MILLENNIUM PARK

Location: Chicago, Illinois
Designer: GGN, Piet O'Doulf
Year: 2004
Acreage: 3

This precedent demonstrates a highly designed, naturalistic prairie meadow within a dense urban context, creating a strong aesthetic experience while significantly reducing the water and resource inputs required for maintenance. It also exemplifies a designed landscape that supports functional plant communities and promotes biodiversity.



Figure 3.26 : Lurie Garden at Millennium Park, designed by GGN, Chicago, Illinois (Gustafson Guthrie Nichol, 2004)

This small and modest park was constructed over the lid of an underground parking garage, transforming three acres of downtown Chicago's urban space into a thriving native prairie. The project was tasked with creating an ecological gardenscape capable of withstanding heavy visitor traffic (LAF, 2011).

The significance of this project is marked by its remarkable plant diversity and richness. The design emphasizes regional materials and incorporates 35,000 perennials across 240 varieties and 5,800 woody plants representing 15 varieties—approximately 60% of which are Midwestern natives. The Landscape Performance Series notes that no insecticides, fungicides, or herbicides are used to maintain the garden and that native prairie species require minimal water (LAF, 2011).

MATRIX + PHASED PLANTING STRATEGY

Within the specific context of the Arboretum Montlake Peninsula, the site's scale makes seed-based planting both practical and economical. Plant material may be sourced through community seed harvesting, UW-grown plugs, or nursery stock. Establishing the majority of the landscape through seed mixes—anchored by a matrix of grasses and supplemented with plugs—allows for efficient large-scale implementation. This strategy emphasizes repetition and massing, creating a gridded framework that organizes the landscape while minimizing exposed soil to support both ecological function and visual cohesion.

The proposed planting strategy occurs in phases, mimicking natural successional processes following disturbance. In the first year, ruderal seed species are introduced to rapidly establish ground cover and stabilize the site, reflecting how ruderal species are often the first to colonize disturbed landscapes. In subsequent years, grass plugs are introduced in a matrix to provide structure, repetition, and spatial cohesion across the site. Forb species are then incorporated through both plugs and seed mixes to increase habitat complexity, seasonal variation, and ecological diversity while reinforcing patterns of rhythm, massing, and repetition within the landscape. Together, these planting communities form a continuous yet heterogeneous system in which ecological function, disturbance response, and succession inform the spatial organization of the landscape.

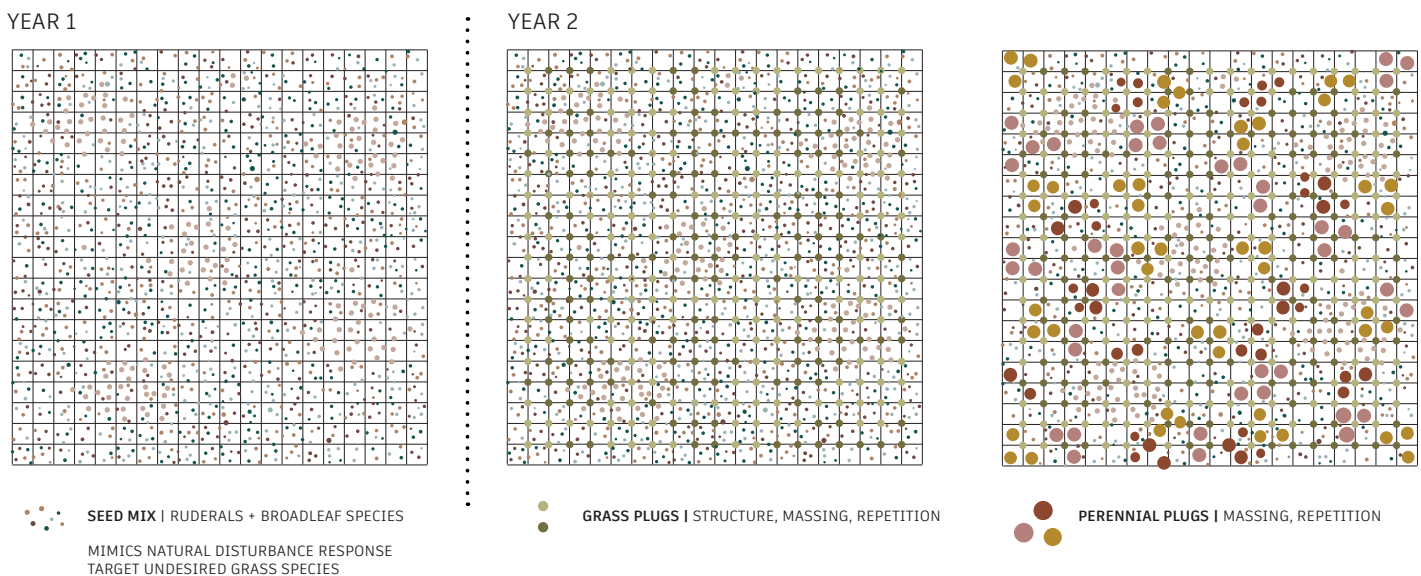


Figure 3.27 : Matrix + phased planting strategy, by author, 2026

Within each plot, competitive species may be concentrated along edges and in areas with high weed pressure to suppress antagonist plants while supporting biodiversity. Lower C-value species occupy more disturbed edge conditions, while higher C-value species are situated within more stable interior zones. This creates a nested spatial hierarchy in which ecological strategies shift across both site and plot scales.

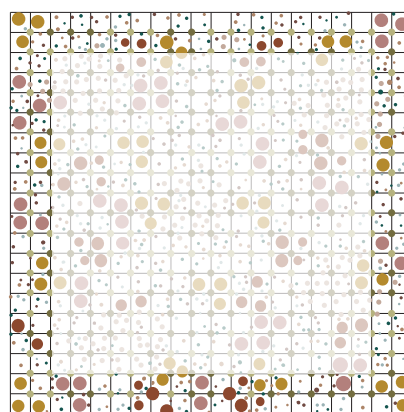


Figure 3.28 : Strategizing plant competition at edges, by author, 2026

PLANTING PLAN

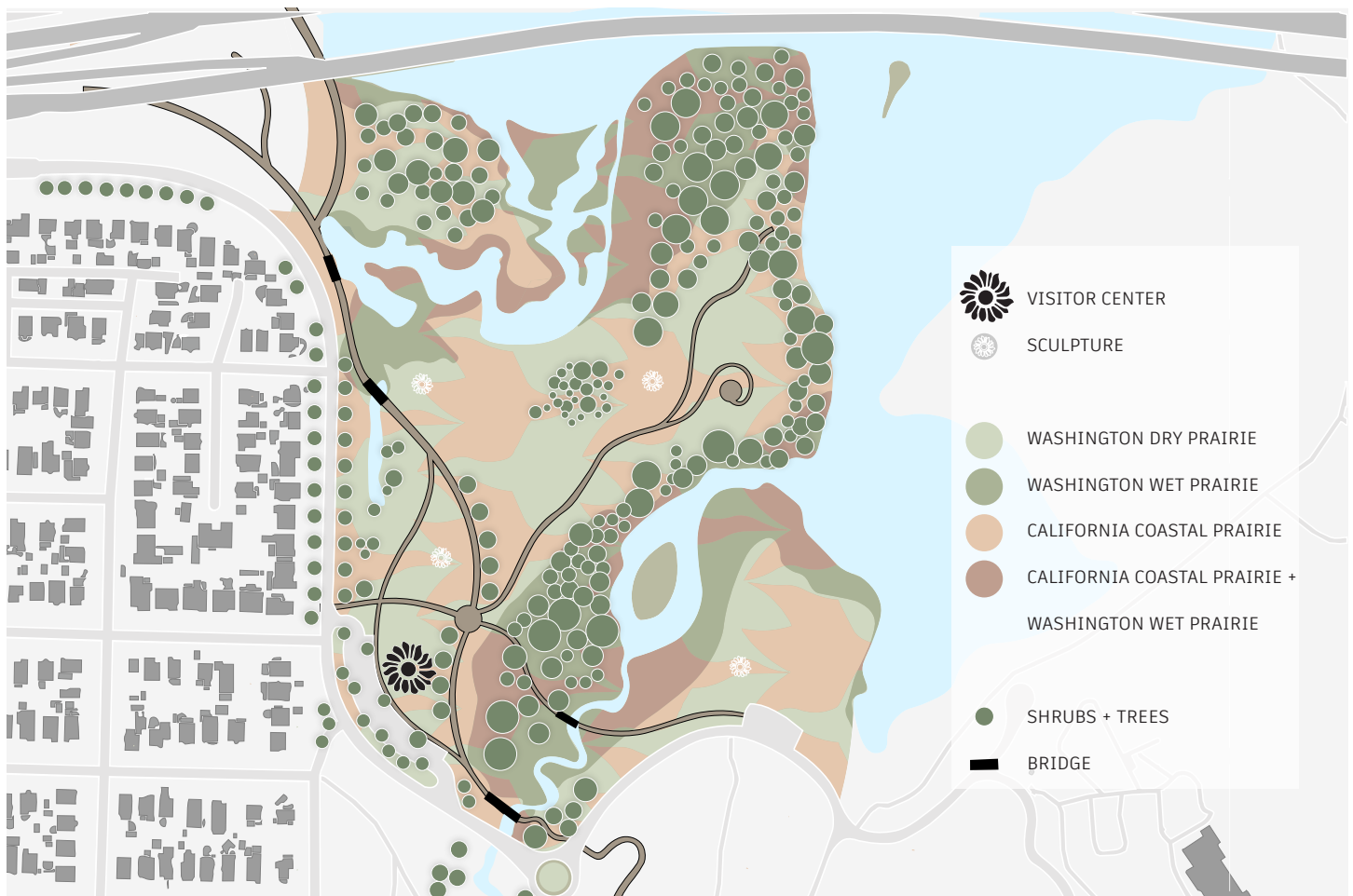


Figure 3.29 : Proposed planting plan for the site, by author, 2026

Across the site, plant communities are organized as a mosaic of interwoven plots defined by regional typologies, including Washington dry prairie, Washington wet prairie, and California coastal prairie communities. Select plots are supplemented with pasture species to support grazing regimes. The distribution of these communities responds to gradients of moisture and disturbance allowing each planting typology to align with site-specific environmental conditions.

Together, this spatial configuration strengthens ecotones and ecological corridors while responding to the site's wetland conditions. Aesthetically, the arrangement emphasizes massing, rhythm, and repetition, creating planted drifts that move across pathways while allowing gathering spaces to emerge as areas of negative space, providing visual rest within an ecologically complex landscape. Artifacts such as sculpture may further reinforce the design intent, serving as visual anchors that communicate legibility, care, and intention within the landscape throughout both bloom and dormancy.



Figure 3.30 : Landscape rendering in bloom, by author, 2026



Figure 3.31 : Landscape rendering in dormancy, by author, 2026

SUMMARY OF ECOLOGICAL PLANTING DESIGN

This section argues that ecological planting design must move beyond the ethics of purely restorative approaches toward adaptive, function-driven systems capable of responding to climate change, disturbance, and urban conditions, while remaining aesthetically legible to those who inhabit and experience the site. By integrating native, novel, and emerging plant communities, planting design can support biodiversity while anticipating future ecological shifts. Functional biodiversity, informed by CSR theory, C-values, and Floristic Quality Index metrics, emphasizes how species interactions, spatial organization, and genetic diversity contribute to ecological resilience and long-term landscape performance.

This research proposes a phased, matrix-based planting strategy for the Arboretum Montlake Peninsula that combines seed-based establishment, community-sourced plant material, and adaptive spatial organization to strengthen ecotones, ecological corridors, and habitat complexity. At the same time, the work recognizes that successful ecological landscapes must address aesthetics, legibility, and human perception in order to foster public appreciation, stewardship, and long-term care. Ultimately, ecological planting design is framed as an iterative and evolving process in which disturbance, succession, and adaptive management become essential tools for sustaining resilient urban prairiescapes over time. The more these systems support functional biodiversity, the greater their capacity to sustain resilient and reciprocal relationships between humans, more-than-humans, and the landscape through time.

04

DISTURBANCE ECOLOGY

How disturbances such as fire, grazing, and human activity alter resource availability and physical structure for a more biodiverse and resilient system to emerge.



INTRODUCTION



DROUGHT



BURNING



GRAZING

Figure 4.1 : Natural disturbance processes in prairie landscapes (Midjourney, 2026)

The long-term success of a landscape is determined not by its initial design, but by how it is stewarded over time. In practice, stewardship is the design of disturbance. Ecologically, disturbance is not a disruption, but a necessity. Plant communities depend on periodic disturbance to regulate competition, redistribute resources, and maintain biodiversity. In prairie systems, processes such as fire, grazing, and drought shape species composition and support long-term ecological resilience.

Disturbance ecology formalizes this understanding, defining disturbance as events that alter resource availability, substrate conditions, or physical structure. While early ecological theory framed disturbance as a deviation from equilibrium, contemporary perspectives recognize it as a continuous and intrinsic driver of ecosystem function (Newman, Moritz, & Davis, 2024). In prairie systems, disturbance regimes, characterized by their timing, frequency, extent, and intensity, generate the heterogeneity necessary to sustain diverse plant communities (Helzer, 2015).

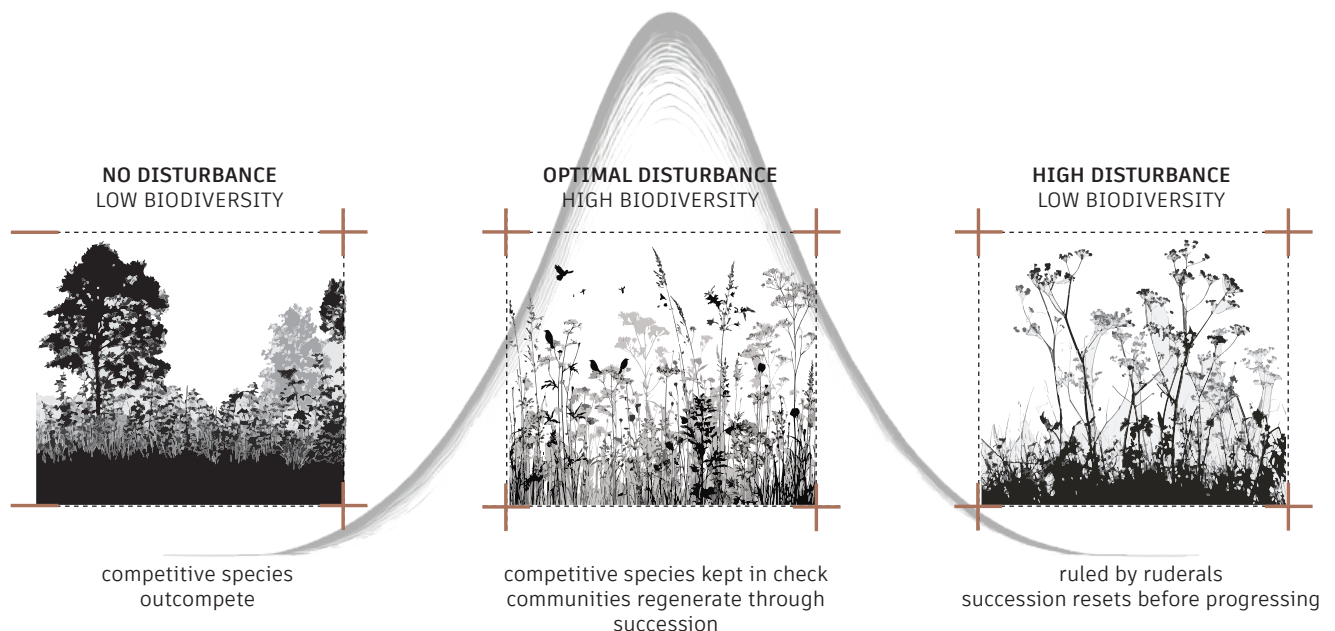


Figure 4.2 : Disturbance driving biodiversity, by author, 2026

Different species respond to disturbance in distinct ways. Some depend on disturbance to reduce competition, while others are adapted to persist through or regenerate following it. Many prairie species require specific disturbance cues, such as heat, scarification, or digestion, to trigger germination. Disturbance serves important regulatory functions by limiting thatch accumulation, suppressing woody encroachment, reducing disease pressure, and moderating competitive dominance. In its absence, a small number of species can come to dominate while others decline, resulting in reduced diversity and the gradual deterioration of ecological integrity over time (Helzer, 2015; Cuello & Rodriguez, 2020).

Conversely, excessive disturbance can repeatedly reset succession before communities are able to establish greater complexity, creating conditions dominated by only a few ruderal species adapted to high levels of disturbance. The goal, therefore, is to maintain a balanced disturbance regime in which competitive species are kept in check while ecological succession and regeneration are allowed to proceed, ultimately supporting greater biodiversity overall.

Although prairies are shaped by multiple disturbance types, this project focuses on fire and grazing as primary, designable management tools. Drought, while an increasingly significant force under climate change, is not treated here as an active intervention but as an underlying condition to which the system must adapt.

By working with multiple, complementary disturbance regimes, this approach frames stewardship as an active, evolving process—one that supports both ecological resilience and new relationships between humans, more-than-humans, and the land itself.

MOWING AS DISTURBANCE

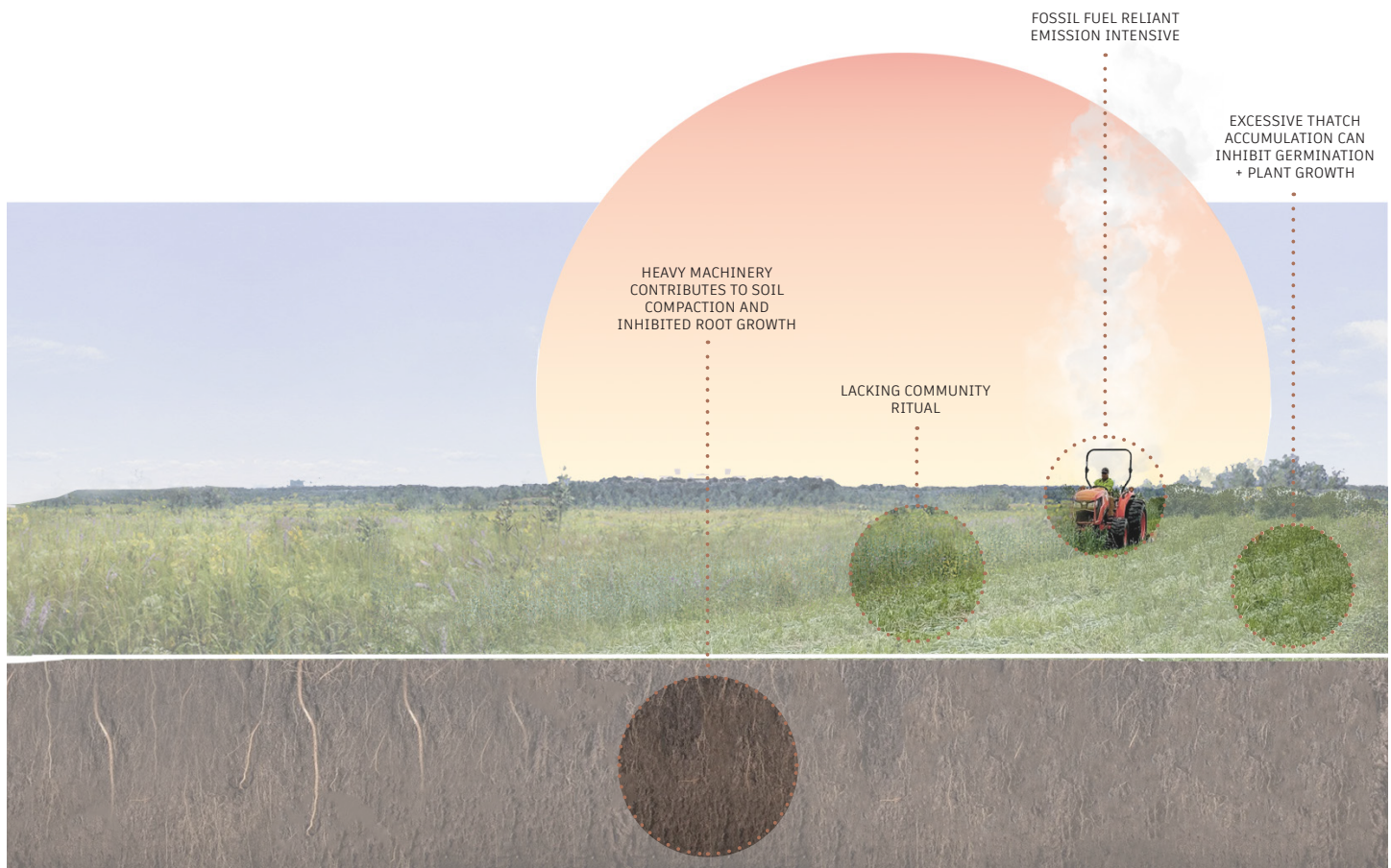


Figure 4.3 : Mowing as disturbance, by author, 2026

In most public landscapes, disturbance is applied through routine mowing—a fossil fuel-dependent practice that emits greenhouse gases while imposing a uniform, site-wide disturbance regime. This approach often contributes to excessive thatch accumulation, which can inhibit seed germination and plant establishment. Additionally, the repeated use of heavy machinery can compact soils, restricting root growth and reducing soil aeration (UCANR, 2015). Lastly, mowing is often treated as a purely maintenance-driven operation, lacking the cultural ritual, visibility, and opportunities for public engagement that other forms of stewardship may foster within the public landscape.

Because mowing is typically applied homogeneously across a site, with vegetation cut to a consistent height, it creates uniform structural and ecological conditions. This homogenization can favor species adapted to repetitive mowing while suppressing others, ultimately reducing structural diversity and ecological variability across the landscape. Over time, these simplified disturbance regimes can limit habitat complexity, contribute to thatch buildup, and reduce overall biodiversity.

GRAZING AS AN ECOLOGICAL PROCESS

This proposal introduces managed, domesticated grazing animals to enact controlled disturbance regimes. Species such as sheep allow for precise control over timing, intensity, and duration of grazing, enabling adaptive responses to ecological goals and balancing biodiversity objectives with public use. Livestock are recontextualized in this instance as participants in a managed ecological system oriented toward regeneration, redirecting these practices toward more reciprocal outcomes.

While grazing offers significant ecological and operational benefits, it is not a standalone solution. Prairie ecosystems depend on interacting disturbance regimes—including fire and drought—each contributing distinct ecological functions (Helzer, 2015). Integrating multiple disturbance processes ultimately supports a more adaptive and resilient model of stewardship.



Figure 4.4 : Sheep of the *The Goat Lady* herd grazing in a private residential paddock, photographs by author, 2026

THE CASE FOR MANAGED LIVESTOCK

It is important to acknowledge that large grazing animals historically had a limited presence within Washington prairie ecosystems, which were primarily sustained through Indigenous burning practices. While these historical conditions shaped prairie ecology over millennia, this project responds to contemporary ecological realities that differ significantly from the past. Today, Washington prairies face increasing pressures from invasive and introduced species, altered disturbance regimes, habitat fragmentation, and changing climatic conditions. In conversations with researchers Sarah Hamman and Jon Bakker, both emphasized the growing body of promising research supporting grazing as a tool for increasing biodiversity, managing invasive species, and strengthening

ecological resilience within Washington prairie systems today.

In response to questions about using domesticated, settler-colonial grazing animals within a project that seeks to challenge colonial land management paradigms, this approach reflects both ecological pragmatism and urban constraints. While wildlife such as deer contribute to grazing pressure in some landscapes, their presence in dense urban environments is inconsistent, difficult to manage, and can become ecologically disruptive when unchecked.

In a highly urbanized setting like Seattle, reliance on large wild herbivores is neither practical nor desirable. The built environment does not support their safe movement, and unmanaged grazing can quickly lead to overgrazing and reduced biodiversity. Unlike expansive rangelands, this is a constrained urban site where grazing pressure must be carefully managed to avoid ecological degradation.

GRAZING AS DISTURBANCE

Throughout much of human history, domesticated livestock were common within urban and peri-urban landscapes. Their more recent exclusion reflects shifting ideals of modernization, sanitation, and risk management, where grazing has largely been replaced by mechanized maintenance practices. Historically, grazing was understood primarily through the lens of livestock production, emphasizing forage yield and agricultural efficiency. More recently, however, ecological research has reframed grazing as a tool for conservation and landscape management due to its role in shaping biodiversity, habitat structure, and ecosystem processes.

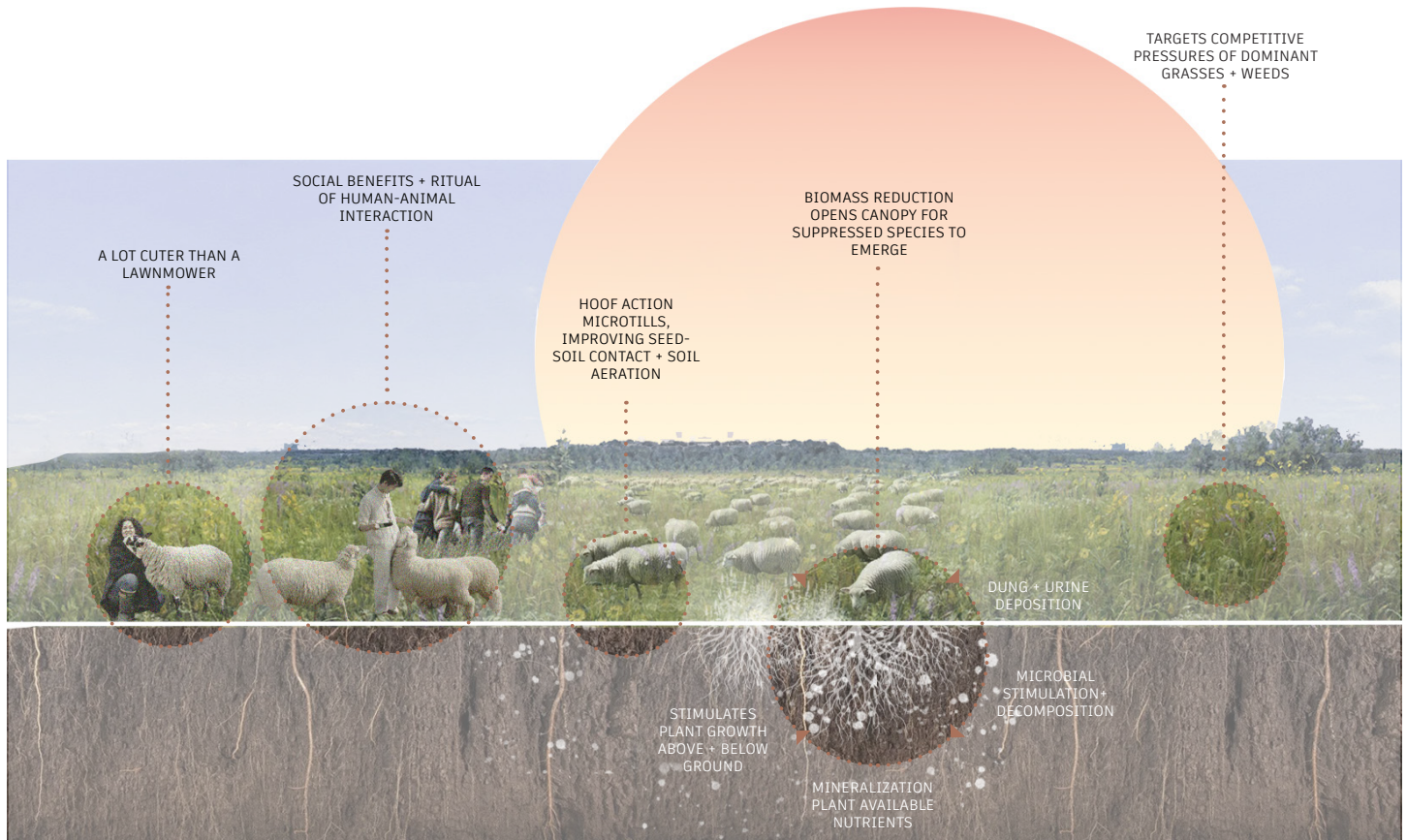


Figure 4.5 : Grazing as disturbance, by author, 2026

Unlike mowing, grazing creates a dynamic and heterogeneous disturbance regime. Because animals graze selectively, they generate patchiness across the landscape, supporting greater habitat diversity and ecological variability. Ecologically, grazing reduces biomass, increases nutrient cycling, improves soil aeration, moderates disease pressures, and can help suppress invasive species (UCANR, 2015).

Importantly, grazing helps regulate competition by keeping dominant competitive species in check, creating

opportunities for stress-tolerant and ruderal species to persist within the plant community. By removing dominant vegetation and exposing patches of bare ground, grazing facilitates seed germination and the establishment of ruderal and early-successional species. These shifting conditions support successional dynamics and contribute to greater biodiversity over time.

When carefully managed, grazing can support healthy competition dynamics while avoiding overuse and vegetation degradation. Grazing intensity should therefore be monitored closely, with a general guideline of maintaining vegetation at a minimum height of approximately 4 inches.

Livestock additionally influence ecosystems through trampling, dunging, urinating, and salivating, all of which affect soil structure, nutrient redistribution, microbial activity, and seed incorporation. Trampling, for example, can help prepare seedbeds and press seeds into the soil surface (UCANR, 2015). Beyond these ecological functions, grazing also creates opportunities for public engagement and human–animal interaction within the urban landscape. Several contemporary precedents demonstrate that grazing events can foster education, curiosity, stewardship, and stronger relationships between people and ecological processes.

HUMAN–ANIMAL RELATIONSHIPS IN LANDSCAPE



Figure 4.6 : A couple of goats requesting chin scratches, photograph by author, 2026

Within this project, grazing is understood not only as an ecological strategy, but also as a social one. Human–animal relationships within landscape settings have the capacity to shape public perception, emotional response, and community engagement, positioning grazing animals as active participants in public life rather than passive maintenance tools. As Josh Farmer of The Goat Lady notes, “Sheep are a lot cuter than a lawnmower,” highlighting the immediate perceptual and emotional shift that occurs when mechanical maintenance is replaced by living systems.

Research and field observations reinforce this social dimension. In her work on campus grazing systems, Haven

Kiers emphasizes that one of the most significant outcomes of her research has been the public response to the animals themselves. She describes increased excitement, elevated mood, and a sense of decompression among students and visitors, particularly during periods of high stress such as exams. In her words, “sheep want to be around people, and people want to be around sheep” (Kiers, personal communication, 2025), underscoring the reciprocal nature of these relationships.

These effects extend beyond casual observation into more profound forms of human–animal interaction. In conversation with Josh Farmer, he described an experience in which an army veteran experiencing severe PTSD visibly relaxed while assisting in the birth of a goat. He also discussed consulting work connected to communities in Ukraine, where interactions with goats have been used to support individuals experiencing shell shock and psychological trauma during wartime. Reflecting on these experiences, Josh explained:

“When guys come back from the front, you know, in the old days they called it shell shock or whatever, and it was very expensive through therapies and all that. And I told them what I’d seen work for people. And so they started doing the same and it helped the guys and ladies.”

– Josh Farmer, *The Goat Lady*

These examples suggest that grazing systems can function as sites of care, where animal presence mediates stress, attention, grounding, and emotional regulation. Reintroducing animals into public landscapes may therefore provide not only ecological and operational benefits, but also meaningful social and psychological value.

Within the context of this project, the decision to utilize domesticated livestock rather than wild grazers such as deer or elk is therefore both ecological and social. Wild animals are generally governed by norms of distance and non-interaction, whereas sheep and goats have coexisted alongside humans for thousands of years, making close interaction culturally legible and socially accepted. Their presence creates opportunities for curiosity, stewardship, and connection that are rarely possible through mechanized maintenance systems.

Finally, the visibility of the Arboretum Montlake Peninsula amplifies these effects. As a major public threshold with visibility from the SR-520 bridge, the site allows grazing animals to be experienced at multiple scales and distances—both as intimate encounters within the landscape and as visible figures within the broader urban environment. In this sense, animals operate simultaneously as ecological agents and social mediators, shaping both landscape function and public experience.



Figure 4.7 : The Goat Lady herd, grazing in a private residential paddock, photograph by author, 2026

Location: Davis, California

Year: 2021



Figure 4.8 : The UC Davis Sheepmowers (Image Sources: UC Davis Sheepmowers, n.d.; Kerlin, 2024)

Haven Kiers' research with the UC Davis campus and arboretum has been highly influential to this project, serving as an early source of inspiration and demonstrating the potential for grazers within public landscapes. While the research initially focused on the ecological and economic benefits of grazing in a campus setting, some of the most impactful outcomes emerged through the sheep's social presence within the public landscape.

Since the project's inception, seasonal grazing has evolved into a celebrated campus ritual, drawing students and visitors to gather around and engage with the animals. Kiers' team has conducted studies examining student well-being following interactions with the sheep, documenting notable improvements in mood, emotional well-being, and public engagement with the landscape. In this way, the grazers function not only as ecological stewards, but also as social catalysts that foster curiosity, joy, and stronger human relationships with the land.

Operationally, the sheep maintain turf areas through targeted grazing while being safely contained within a dual-fencing system of electric and wood panel fencing. This infrastructure allows the sheep to remain visible and engaging within the public landscape while ensuring controlled grazing within designated areas.

PRECEDENT | HOUSTON ARBORETUM + NATURE CENTER, PHASE 1

Location: Houston, Texas

Designer: Design Workshop; Reed Hilderbrand

Year: 2018

Acreage: 65 acres



Figure 4.9 : Houston Arboretum + Nature Center, designed by Design Workshop + Reed Hilderbrand, Houston, Texas
(Newman, Li, & Zhu, 2022)

The Houston Arboretum is an important precedent because it is one of the few designed public landscapes to integrate both grazing and prescribed burning into a long-term management strategy within a public arboretum setting. Beyond ecological management, the project also demonstrates the strong social appeal of grazing animals, generating substantial annual revenue through visitors specifically coming to experience and interact with the goats (Newman, Li, & Zhu 2022).

Following severe flooding from Hurricane Ike and one of Texas's worst recorded droughts, the Houston Arboretum + Nature Center converted portions of its woodland into resilient native grasslands better adapted to flooding and drought conditions. Today, the site functions as both an ecological refuge and a demonstration of disturbance-based management through grazing and burning. The project's goat grazing events generate an estimated \$27,200 annually in agrotourism revenue, even after management costs. The Landscape Performance Series additionally documents increased biodiversity, expanded wildlife habitat, reduced urban heat island effects, and enhanced public engagement with ecological stewardship practices (Newman, Li, & Zhu 2022).

PRECEDENT | JUPITER ARTLAND

Location: Edinburgh, Scotland

Designer: Charles Jencks

Year: 2009

Acreage: 100 acres



Figure 4.10 : Jupiter Artland designed by Charles Jencks, Edinburgh, Scotland
(Jupiter Artland, n.d.; Jupiter Artland, 2024)

Jupiter Artland is a contemporary sculpture park where a resident flock of sheep actively shapes the landscape experience. Grazing year-round across the estate, the sheep move through a predominantly turf landscape interwoven with land art installations. Rather than relying on fixed fencing, the park employs GPS collars to guide and contain the flock within seasonally shifting boundaries, allowing for a more flexible and dynamic management approach without the visual interference of fencing.

The sheep are central to the visitor experience, with seasonal events such as lambing offering opportunities to observe newborns up close. The sheep are described as a highlight of the park. Jupiter Artland also permits dogs, providing clear guidelines to ensure respectful coexistence with the grazing sheep and resident deer, reinforcing a shared, multi-species use of the landscape.

GRAZING CONSIDERATIONS

Grazing also presents challenges, as animal behavior and dietary selection cannot be fully controlled. When mismanaged, grazing can weaken vegetation, contribute to soil compaction, and accelerate desertification. When appropriately managed, however, it can increase habitat heterogeneity, improve plant and soil productivity, and strengthen ecosystem resilience (UCANR, 2015). Light to moderate grazing generally supports biodiversity, whereas heavy grazing can degrade vegetation and compact soils.

Stocking rate is a key factor influencing these outcomes. Lower stocking rates tend to increase selectivity and spatial heterogeneity, while higher stocking rates create more uniform grazing patterns. Grazing calculators may assist in determining flock size based on forage availability and management goals, though experienced herders can also adapt grazing intensity in response to site conditions.

Different livestock species influence vegetation differently due to variations in diet and morphology. Goats preferentially browse woody vegetation, while sheep favor grasses and forbs, though some sheep breeds will also consume woody material while remaining easier to contain (UCANR, 2015). Sheep are generally preferred in urban settings due to their manageability, whereas goats, although effective, are more difficult to contain. Mixed herds may further increase habitat heterogeneity and biodiversity (UCANR, 2015).

Implementation additionally requires supporting infrastructure and careful attention to animal welfare. Grazing systems depend on fencing, reliable water access, and shelter, with predator protection necessary in some contexts. In urban environments, sheep are particularly vulnerable to coyotes, dogs, and human harassment, often necessitating electric fencing or guard animals. Livestock also require clean water, with intake influenced by forage moisture, temperature, and stress (UCANR, 2015). Urban conditions further introduce constraints related to site access, pollutants, and public interaction (The Nature Conservancy, 2025).

Plant toxicity must also be considered, though plant–animal relationships can be more nuanced than simple exclusion. In conversation with Josh Farmer of The Goat Lady, he explained that certain toxic species, such as azalea, are not always excluded from grazing areas because animals can learn avoidance behaviors through exposure. Mothers often guide offspring away from harmful plants, and limited exposure may result in long-term aversion. In some cases, supervised exposure is followed by B12 administration, after which animals continue to avoid those species.

One particularly important consideration within the Arboretum context is the toxicity of oak leaves to livestock. Berger Partnership is currently proposing a Garry oak area within the site as an homage to historic Garry oak prairie systems in Washington. This condition will require careful consideration within the broader disturbance and grazing management plan.

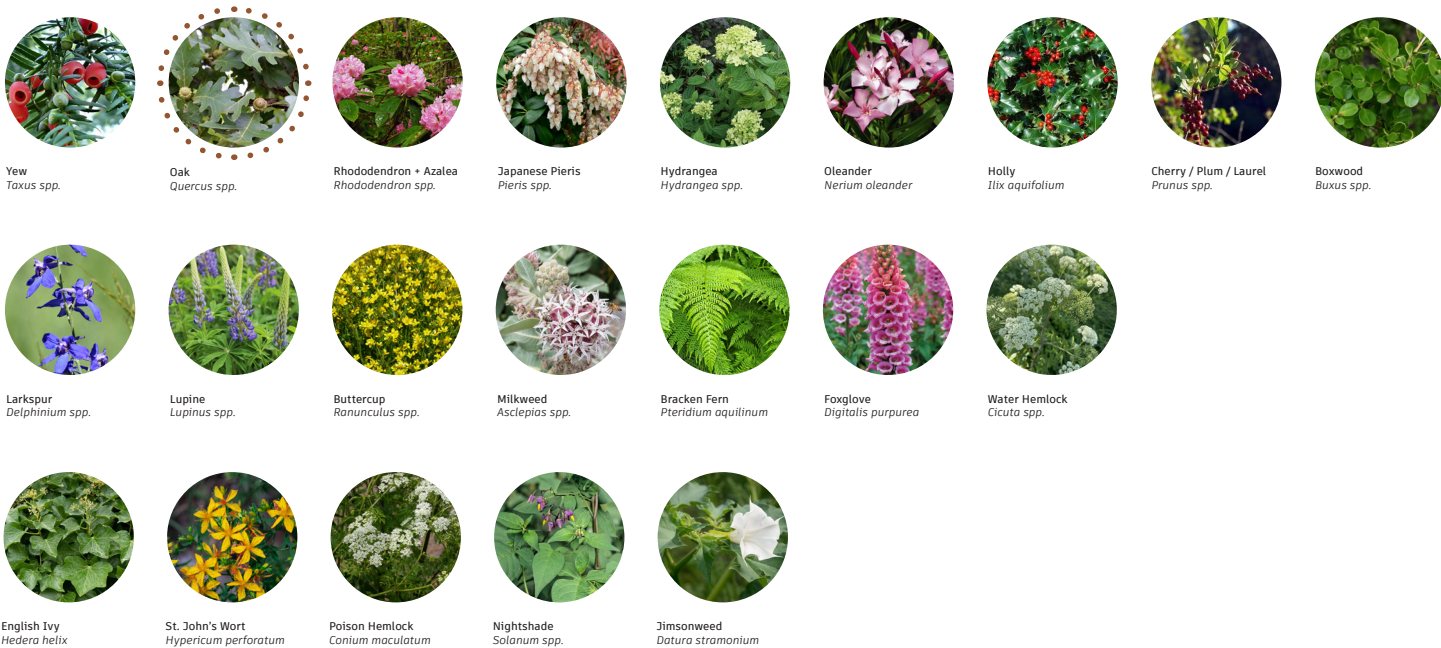


Figure 4.11 : Plants toxic to goats and sheep

In conversation with prairie restoration specialist Sarah Hamman, she suggested that integrating pasture species into the seed mix may provide additional benefits for grazing animals, as native prairie species alone can offer lower-quality forage. Within the context of novel urban ecosystems, pasture plants can therefore serve multiple functions: providing more nutritious forage that increases incentive for ranchers to bring animals to the site, while also contributing ecological function, seasonal variation, and aesthetic diversity to the broader planting palette.

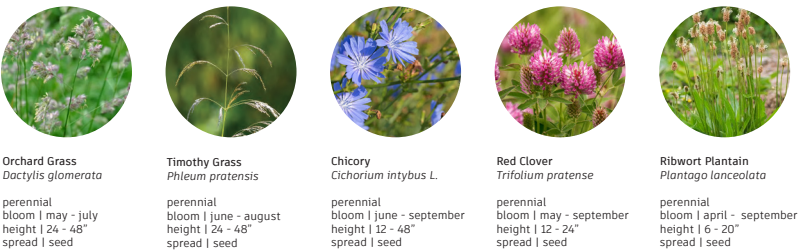


Figure 4.12 : Supplemental pasture plant palette to support grazers

FIRE AS AN ECOLOGICAL PROCESS



Figure 4.13 : Burke Meadow Burn (Fan, 2025)

In recent decades, prescribed fire has become increasingly used in public land management, particularly for reducing fuel loads and mitigating high-intensity wildfires. Fire is also utilized in agricultural and turf management to reduce thatch and stimulate vegetation regeneration, though its application within urban public landscapes remains relatively limited and site-specific. Recent examples include the Burke Meadow at the University of Washington and the Houston Arboretum & Nature Center.

Ecologically, fire reduces biomass and thatch, moderates competitive pressures, exposes bare ground for establishment, stimulates seed germination, redistributes nutrients, suppresses fire-sensitive invasive species, and promotes habitat heterogeneity (Helzer, 2015). Fire additionally influences nutrient cycling by converting biomass-bound nutrients into more plant-available forms, though high-intensity burns can degrade soil structure and increase erosion risk (Northern Arizona University, n.d.). Prescribed fire is generally most effective in areas with sufficient fuel loads to carry low- to moderate-intensity burns.

Beyond its ecological role, fire also holds deep cultural significance within many Indigenous stewardship practices, serving as a ritual of care that supports cultural regeneration, community gathering, and opportunities to learn from traditional land management practices. Altogether, fire promotes the regeneration and succession of prairie plant communities while creating patchy, heterogeneous conditions that increase structural diversity and generate short-term pulses of species richness.

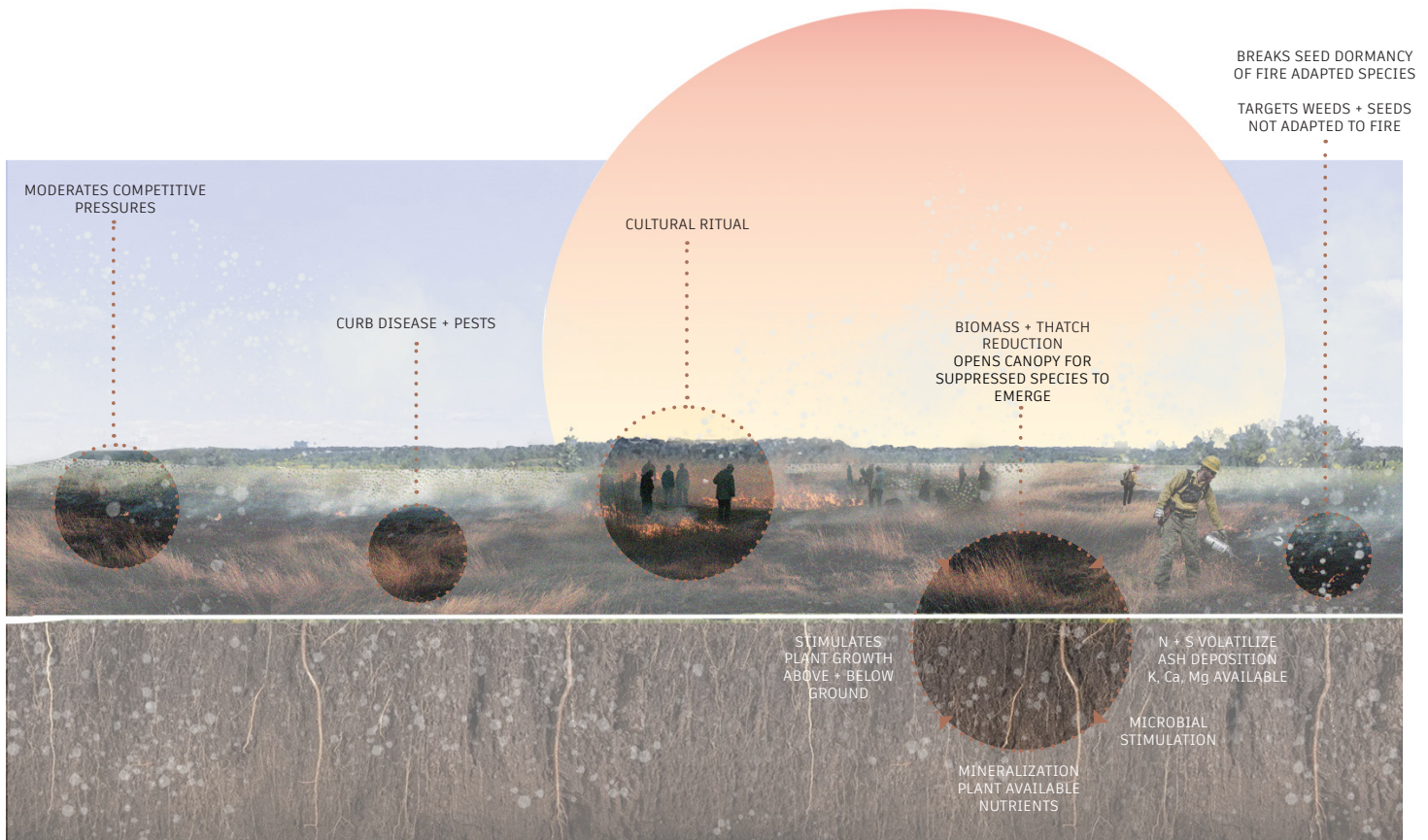


Figure 4.14 : Fire as Disturbance, by author, 2026

FIRE AS CULTURAL RITUAL

Indigenous peoples have shaped and actively managed landscapes through fire for tens of thousands of years, with some evidence suggesting intentional landscape burning as early as 80,000 years ago. Fire was used to clear vegetation, create grassland and savanna conditions, improve hunting and travel access, and promote desirable food-producing plants (Zimmer, 2021).

With the rise of settler colonialism and the deliberate suppression of Indigenous peoples and cultural practices, fire was systematically excluded from many landscapes. In the Pacific Northwest, this suppression has contributed to forest encroachment—particularly by Douglas fir—into historic grassland and prairie systems. Fuel accumulation has additionally shifted fire regimes toward higher-severity events, contributing to increasingly destructive wildfires and reduced biodiversity as woody species displace diverse herbaceous communities (Jones, 2025).

Within this context, fire becomes not only an ecological process, but also an opportunity to support cultural regeneration within the public landscape and create space for learning from and honoring traditional land stewardship practices.

PRECEDENT | BURKE MUSEUM OF NATURAL HISTORY AND CULTURE

Location: Seattle, Washington

Designer: GGN

Year: 2019

Acreage: 5.3

This precedent is particularly significant due to its regional and institutional relevance to the Arboretum project, given its location on the University of Washington campus. It demonstrates the use of seeding for meadow establishment while highlighting the importance of plant competition dynamics, long-term stewardship, and alternative management practices within the UW context, including meadow planting, cultural burning, and ongoing monitoring (Gustafson Guthrie Nichol, 2019; Fen, 2025).



Figure 4.15 : Burke Meadow, designed by GGN, Seattle, Washington
(Gustafson Guthrie Nichol, 2019; Fen, 2025)

The 10,000 sq. ft. meadow at the Burke Museum of Natural History and Culture functions as a living laboratory, planted with approximately 70,000 meadow plants grown from locally collected and propagated seed (Gustafson Guthrie Nichol, 2019). The project also revealed the importance of adaptive stewardship following a “lupine mishap,” in which a misidentified species aggressively spread throughout the meadow and was later removed through volunteer, student, and staff efforts.

In December 2024, UW students and researchers conducted the meadow’s first controlled burn in the modern era after years of permitting and coordination (Fen, 2025). Beyond its ecological function, the burn held important cultural significance for Indigenous communities, while also serving as a highly visible public event that brought students, researchers, and community members together around practices of ecological stewardship and cultural learning.

FIRE CONSIDERATIONS

Fire operates as a structuring disturbance, but its effects are scale-dependent. Infrequent fire can maintain heterogeneity and ecological renewal, while overly frequent fire regimes (every 1–3 years) can reduce diversity by favoring only fire-tolerant species. Historic and contemporary management practices suggest a return interval of approximately 3–7 years as more conducive to habitat heterogeneity in prairie systems (Savory & Butterfield, 1999; Hammon, personal communication, 2026). Prairies are generally well adapted to recover quickly following fire. Cool and moderate burns do not penetrate deeply into the soil profile, enabling rapid regeneration. In contrast, high-intensity burns may sterilize soil, requiring significantly longer recovery times.

It is important to acknowledge the challenges posed by fire in urban environments, not only ecologically but also infrastructurally and politically. Burn bans, air quality regulations, and public health concerns limit the feasibility of prescribed burning. In city contexts, fire requires extensive permitting, safety planning, and public risk mitigation. As a result, prescribed fire must be understood as a highly managed intervention embedded within regulatory and social frameworks rather than a purely ecological process. Emerging alternatives, such as biochar applications, are being explored as partial substitutes for soil amendment without open burning (Babalola, Oziegbe, & Olawole, 2019).

Implementation is therefore highly dependent on conditions. As noted by Cory Gardner of Padilla Bay, fire effectiveness is contingent on fuel load, vegetation moisture, and weather conditions sufficient to carry combustion. Case studies such as the Burke Museum Meadow demonstrate alternative ignition systems, including propane carriage burners that produce high-heat, low-smoke combustion under wetter seasonal conditions. While effective, these systems are highly labor-intensive and produce relatively uniform burn patterns. In contrast, torch-based ignition systems used in public land management offer greater flexibility and more heterogeneous disturbance, but require careful operator control and can result in greater variability in burn intensity and extent.

Urban fire use also requires explicit spatial and material design considerations. Firebreaks must be integrated into the landscape structure through paths, mown strips, hardscape edges, or irrigated zones to prevent unintended spread. Material selection is equally critical: fire-adjacent infrastructure should avoid combustible elements such as wood fencing, favoring non-combustible or fire-resistant materials where appropriate. Edge conditions, adjacency to public circulation, and emergency access routes must all be designed as part of the burn system rather than treated as external constraints.

In the context of the Arboretum Montlake Peninsula, the adjacency to Lake Washington provides an additional layer of spatial containment and contingency, functioning both as a natural firebreak and as a readily accessible resource for emergency response within the broader risk management framework. While fire and grazing are essential to sustaining prairie structure and biodiversity, both require temporal balance. Excessive disturbance can be as detrimental as its absence. Intentional periods of rest are therefore integral to ecosystem recovery and long-term resilience.

REST FOLLOWING ECOLOGICAL DISTURBANCE

Biodiversity in prairie ecosystems depends on a balance between disturbance and rest. While grazing and fire are integral to prairie succession and regeneration, periods of rest are equally critical to allow ecological recovery. Without adequate recovery time, opportunist species can proliferate, reducing overall biodiversity and altering community composition.

In the North Puget Sound Island prairies, variation in deer presence has created a natural experiment illustrating the effects of differing disturbance pressures. Islands with high deer populations show significantly reduced plant species cover, richness, and diversity—up to 92% lower compared to deer-free sites, and 52% lower where deer are moderately present. In contrast, SISCENEM (Halibut) Island, which remains free of deer due to strong local currents, exhibits some of the highest biodiversity levels in the region (Payton, 2023).

These patterns reflect a broader ecological principle: landscapes recover most effectively when disturbance is followed by appropriate periods of rest. Rest regimes can be understood along a spectrum, ranging from partial rest, where low-intensity or intermittent grazing occurs, to full rest, where disturbance is largely absent, and no rest, where continuous grazing pressure persists (Savory & Butterfield, 1999).

Ecological outcomes vary across this gradient. Many federal rangelands in the United States are experiencing degradation due to open-access grazing systems that provide insufficient recovery time, resulting in soil compaction and reduced productivity. However, partial rest can also be detrimental when grazing repeatedly targets high-quality forage species, leading to their decline and shifts in plant community structure (Sircely, 2020). Conversely, emerging research suggests that prolonged full rest and suppression of natural disturbance processes such as fire and grazing can also contribute to prairie degradation by reducing habitat heterogeneity

and long-term resilience (Weber & Horst, 2011).

In practice, rest periods are highly context-dependent. In the United States, rangelands are commonly rested for up to three years following wildfire (high-intensity burn), while recovery from severe overgrazing and soil compaction may require even longer periods (USDA, 2017). The duration of rest depends on disturbance intensity, site conditions, and pre-disturbance vegetation vigor, requiring case-by-case assessment (Sanders, 2000).

This variability is reflected in management strategies: in this proposal, grazing may occur at moderate intensity for short durations (less than one week annually), while fire may operate on longer cycles of approximately 3–5 years, creating extended recovery periods between disturbance events. Although some guidelines recommend full-season rest following burning, emerging research on patch-burn grazing suggests that immediate post-fire grazing can also support habitat heterogeneity, underscoring the context-specific nature of disturbance–rest relationships.

In urban contexts, rest can also be designed spatially and temporally. This may include restricting access to sensitive areas, limiting foot traffic through fencing or signage, or designating zones of reduced human interaction to allow ecological recovery within heavily used public landscapes.

PATCH-BURN GRAZING

Prairie systems are complex, dynamic landscapes that cannot rely on fire or grazing in isolation. Increasingly, research emphasizes the importance of their interaction, particularly through patch-burn grazing systems in which fire and grazing operate as interconnected ecological processes. In this model, grazers are drawn to recently burned areas where fresh growth is more palatable and nutrient-rich, concentrating grazing pressure within those zones. This relationship, known as pyric herbivory, creates shifting patterns of selective grazing, biomass reduction, nutrient cycling, and soil disturbance that contribute to long-term plant and soil regeneration (The Prairie Project, n.d.).

As previously discussed, homogeneous disturbance regimes can reduce ecological complexity and overall biodiversity. If biodiversity is the goal, prairie systems require varied management strategies applied across different intensities, frequencies, and spatial scales. Patch-burn grazing therefore becomes a dynamic stewardship framework that promotes heterogeneity, supports diverse successional conditions, and reinforces the adaptive ecological processes upon which prairie systems depend.

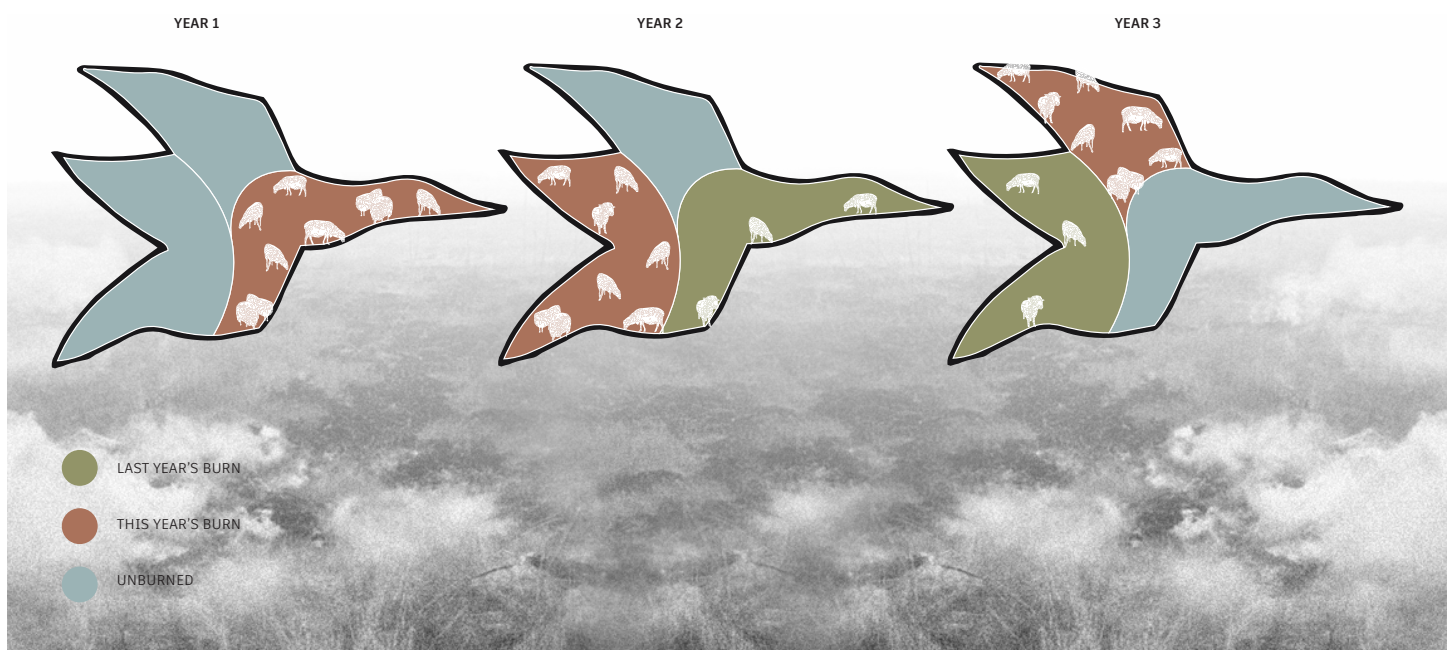


Figure 4.16 : Cycles of Patch-Burn Grazing, by author, 2026

Patch-burn grazing integrates fire and grazing into a cyclical, spatially varied management strategy that emulates natural disturbance dynamics over a 3-year cycle. Rather than applying disturbance uniformly across the landscape, discrete patches are burned on a rotating basis. Grazing animals are naturally drawn to these recently burned areas where fresh vegetative growth is most abundant, concentrating grazing pressure within newly disturbed patches while leaving surrounding areas relatively undisturbed.

In conversations with prairie restoration researchers, several noted that non-native annual grasses are often among the first species to emerge following fire. This observation supports the use of grazing shortly after burning, as concentrated grazing pressure may help suppress competitive non-native species while benefiting the succession and regeneration of desired prairie communities.

This system is generally structured around short-term, higher-intensity grazing events lasting approximately 2–5 days, depending on stocking density. Stocking rate strongly influences grazing distribution: lower stocking rates tend to concentrate animals within recently burned areas, while higher stocking rates encourage overflow into adjacent patches. Unburned areas, often characterized by denser thatch and taller vegetation, are typically grazed less intensely, allowing those communities to rest, recover, and accumulate biomass.

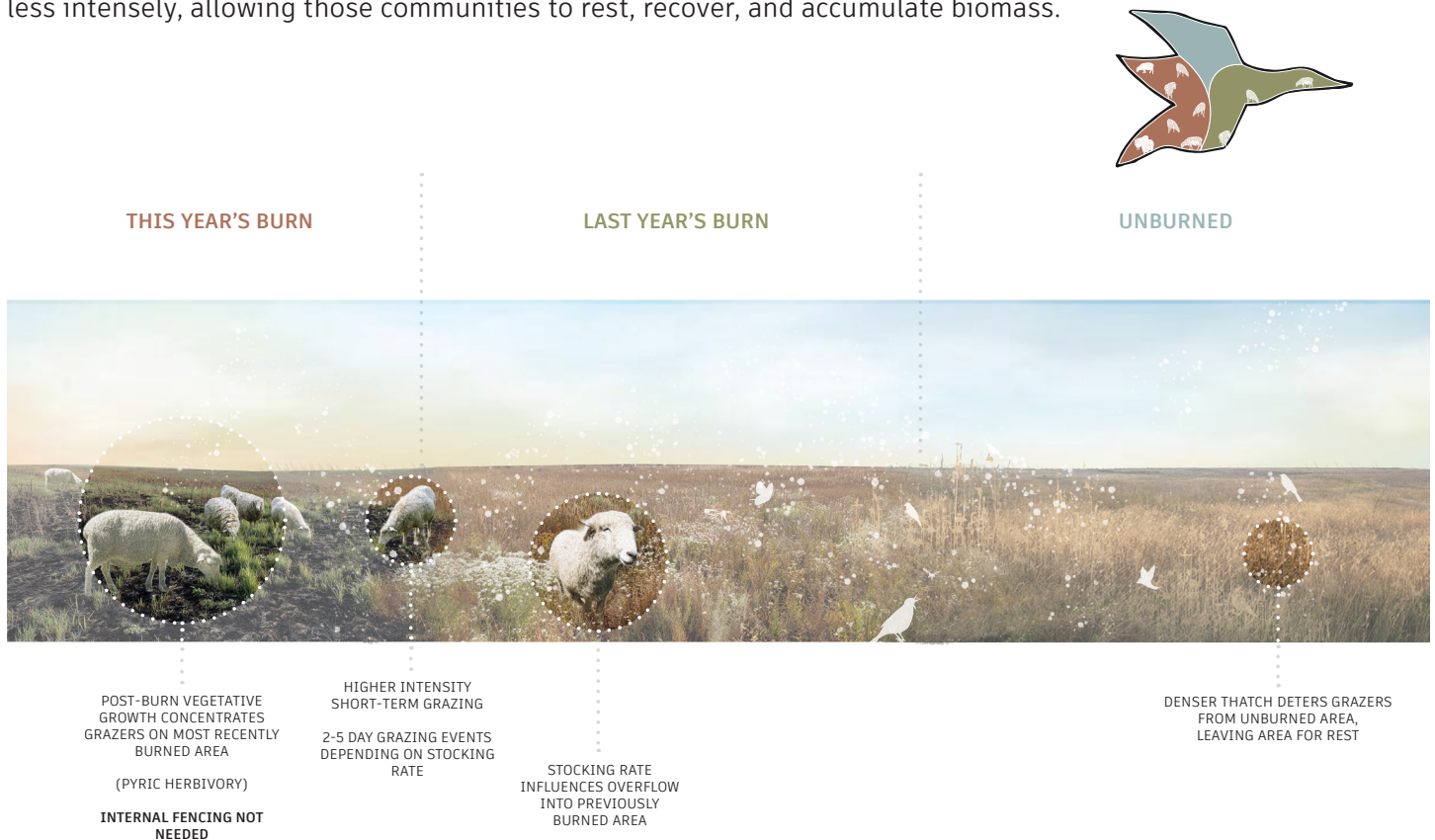


Figure 4.17 : Function of Patch-Burn Grazing, by author, 2026

As new patches are burned in subsequent years, grazing pressure shifts accordingly, creating a continually changing mosaic of heavily grazed, lightly grazed, and recovering conditions across the landscape. This shifting disturbance pattern increases structural diversity, habitat heterogeneity, and successional variability over time (Helzer, 2015). Because only portions of the landscape are disturbed at any given time, patch-burn grazing additionally preserves habitat refuge across much of the site while generating ecotones between disturbance conditions.

Unlike conventional rotational grazing systems, patch-burn grazing does not rely on paddock fencing, but rather relies on the animals' natural preference for recently burned vegetation. This creates an exceptional opportunity to further enhance human-animal interaction by bypassing paddock fencing altogether, and relying only on external fencing within the site. In this way, fire and grazing function together as complementary processes that regulate competition, maintain biodiversity, and support resilient prairie systems.

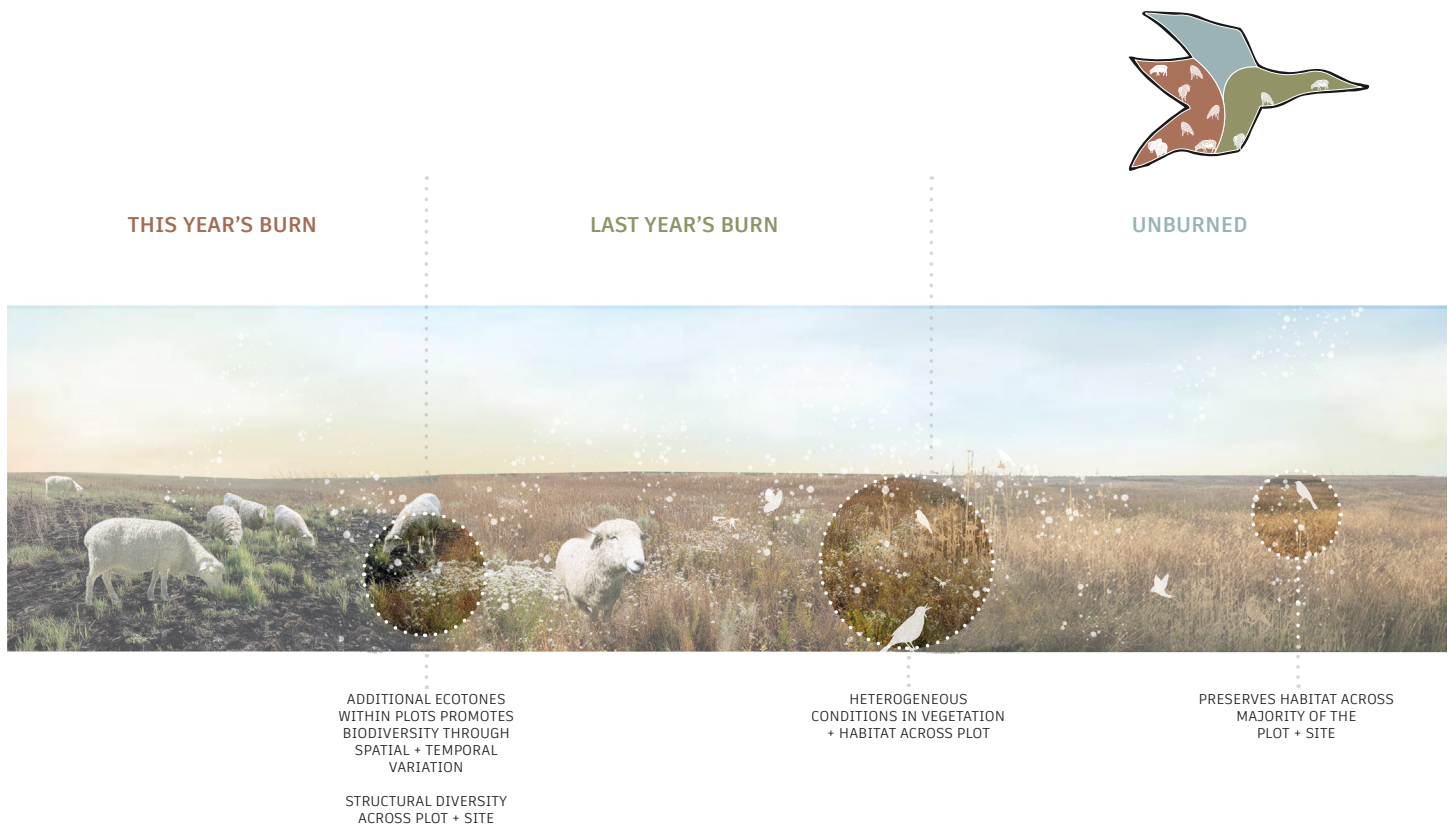


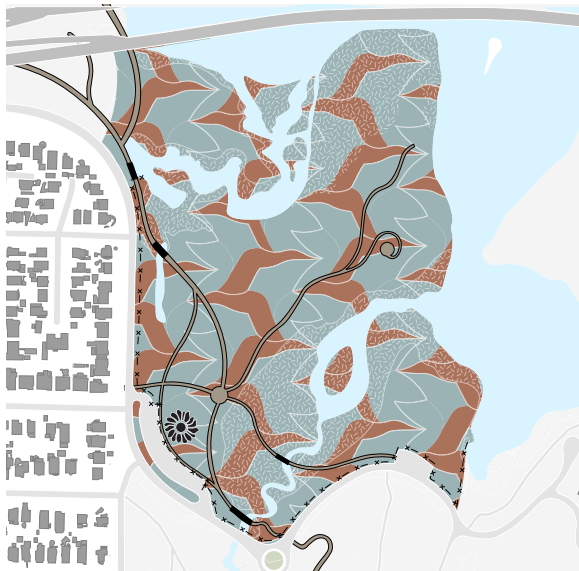
Figure 4.18 : Ecological Benefits of Patch-Burn Grazing, by author, 2026

This pattern of disturbance produces a heterogeneous landscape structure, supporting a wide range of plant communities and habitat conditions. By avoiding uniform disturbance, the system reduces the risk of biodiversity loss and instead promotes varied ecological responses across space and time (Helzer, 2015).

Importantly, this variability also functions as a feedback mechanism. Different areas of the site respond uniquely to disturbance regimes, providing ongoing insight into species performance and site conditions. These observations can then inform future management decisions, reinforcing an adaptive stewardship approach.

DISTURBANCE PLAN

YEAR 1



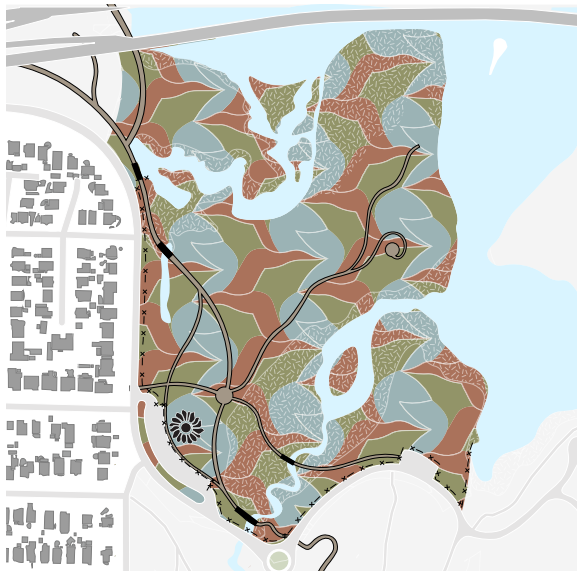
YEAR 2



YEAR 3



YEAR 4



- LAST YEAR'S BURN
- THIS YEAR'S BURN
- UNBURNED
- x — x — x — PERIMETER FENCING
- SHEEP SHELTER

Figure 4.19 : Disturbance Plan, by author, 2026

This project proposes a patch-burn grazing framework that subdivides larger planting communities into rotating disturbance patches across the site. In this approach, disturbance itself becomes a spatial design strategy, using patterns of burning and grazing to create rhythm, repetition, and massing that increase ecological legibility within the landscape. Burning smaller portions of the site at a given time additionally minimizes the visual impact of disturbance, helping maintain public acceptance within the context of an arboretum collection landscape.

Because grazing animals naturally concentrate within recently burned areas, the system relies primarily on perimeter fencing rather than extensive internal divisions, reinforcing visibility and opportunities for human–animal interaction throughout the site. Fire-resilient materials, including metal fence posts and gravel pathways, are integrated throughout the framework to support long-term disturbance management and fire safety.

The site's pathways and surrounding water bodies additionally function as critical firebreaks while continuing to provide circulation and water access for grazing animals. Livestock loading and unloading is concentrated near the proposed visitor's center and southwest parking area, simplifying operational access and animal management during grazing events.

Finally, the project proposes the visitor's center as a multifunctional structure capable of serving as shelter for grazers during grazing periods. In doing so, the architecture becomes both operational infrastructure and a visible point of connection between humans, animals, and stewardship practices throughout the year.

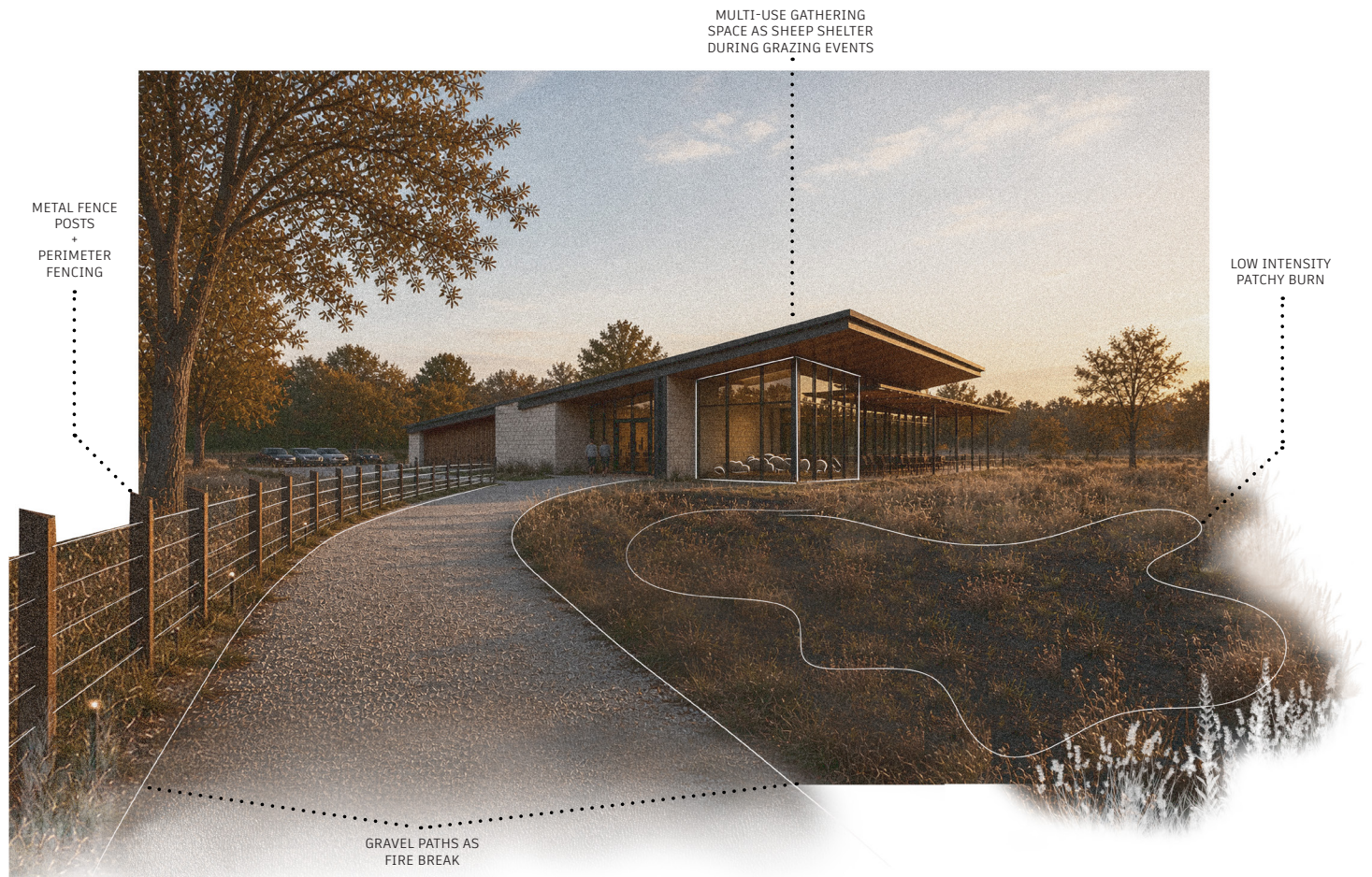


Figure 4.20 : Rendering of considerations for supporting disturbance regimes, by author with use of ChatGPT, 2026

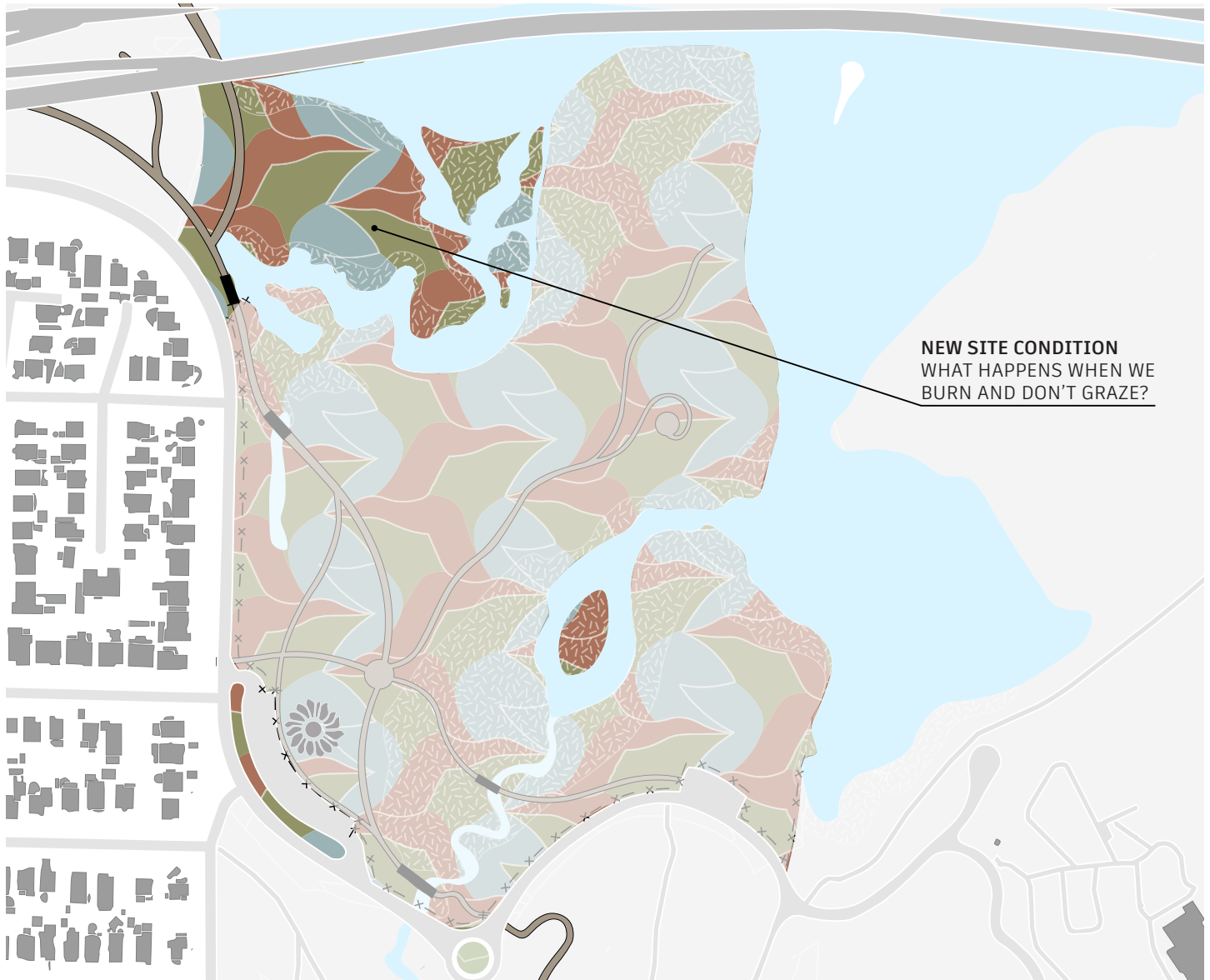


Figure 4.21 : Proposed considerations for Garry Oak collection, by author, 2026

The northwest portion of the site presents an opportunity to concentrate the Garry oak planting palette outside the reach of grazing animals, beyond the perimeter fencing, due to the toxicity of oak foliage to livestock. This condition creates an opportunity to observe and monitor a distinct disturbance regime in which areas are burned but not grazed. In doing so, the site supports comparative stewardship conditions that may further inform long-term management strategies while contributing to greater heterogeneity across the landscape.

SUMMARY OF DISTURBANCE ECOLOGY

Disturbance is a necessity for promoting biodiversity. If biodiversity is the goal, disturbance itself must become diversified. Homogeneous maintenance regimes such as mowing simplify ecological conditions, suppress successional dynamics, and reduce habitat heterogeneity over time. In contrast, varied disturbance processes operating across multiple spatial and temporal scales create the patchiness, competition dynamics, and ecological variability necessary to sustain resilient prairie systems.

This thesis argues for a shift away from standardized, extractive maintenance practices toward adaptive and regenerative stewardship strategies that work with ecological processes rather than against them. Through the integration of fire and grazing within a patch-burn grazing framework, disturbance becomes both an ecological and spatial design strategy. By mimicking cyclical disturbance patterns found within prairie ecosystems, patch-burn grazing promotes succession, regulates competitive dominance, increases habitat heterogeneity, and supports greater biodiversity across the site.

Importantly, this framework extends beyond ecology alone. Both fire and grazing create opportunities for cultural ritual, public engagement, education, and human connection with ecological processes. Grazing animals transform maintenance into a visible and socially engaging act of stewardship, while prescribed fire offers opportunities to reconnect with Indigenous land management practices and collective care for the landscape. In this way, stewardship itself becomes a celebrated ritual within the public realm.

The design framework also emphasizes the visual legibility of disturbance as an intentional and cared-for process. Through aesthetic patterning, massing, repetition, and the selective disturbance of smaller portions of the site over time, disturbance becomes more understandable and publicly acceptable within an urban context. Rather than appearing chaotic or neglected, these phased and patterned interventions communicate care, intentionality, and ecological purpose while reinforcing spatial order and seasonal change across the landscape.

Ultimately, this project positions disturbance as a regenerative force capable of supporting ecological resilience, cultural learning, and reciprocal relationships between humans, more-than-humans, and the land. Disturbance is used to manipulate plant competition in a way that pushes plant communities in a desired direction of greater biodiversity. The more biodiversity is reinforced across the landscape, the greater the system's capacity for resilience, adaptation, and the sustained reciprocity of ecological relationships over time.

05

REGENERATIVE STEWARDSHIP

The practice of managing land and resources to improve soils, plants, humans, and more-than-human well-being, creating a net-positive, more sustainable system.



INTRODUCTION

Prairies are a unique landscape typology in that they are cultural landscapes whose ecological richness has long depended on human participation. As Robin Wall Kimmerer emphasizes in *Braiding Sweetgrass*, stewardship is rooted in reciprocity, where humans collaborate with the land rather than impose upon it (Kimmerer, 2013). Drawing from these relational models of care, regenerative stewardship refers to practices that actively restore landscapes toward healthier, more resilient, and ecologically vibrant conditions. Rather than treating landscapes as static objects to be maintained, regenerative stewardship understands them as dynamic, co-evolving systems shaped through ongoing relationships between people, ecology, and place (ATTRA, 2022). In this sense, regeneration is not a fixed outcome, but an ongoing process of care, adaptation, disturbance, and renewal.

Unlike sustainability, which often focuses on minimizing harm and maintaining existing conditions, regenerative stewardship emphasizes active repair and continual improvement. It adopts a systems-based perspective that recognizes soils, water, vegetation, animals, climate, and human communities as deeply interconnected. Stewardship practices become regenerative only when these relationships strengthen over time—when soils recover, biodiversity increases, ecological processes are restored, and cultural and social relationships to place deepen rather than degrade. Observation, monitoring, and adaptive feedback loops guide management decisions, allowing landscapes to evolve in response to changing ecological conditions and human needs (ATTRA, 2022).

Through this lens, conventional notions of landscape management shift toward stewardship, and maintenance itself becomes an active ecological and cultural process embedded within the life of the landscape. Combined with ecological planting design and disturbance ecology, landscapes are understood as living systems shaped by cycles of disturbance, recovery, succession, and care. Rather than relying on extractive and homogeneous maintenance models characterized by high inputs, fossil-fuel dependence, and ecological simplification, this project proposes regenerative approaches to both landscape establishment and long-term stewardship. These approaches include site preparation and installation strategies that build soil health and ecological function in place, alongside stewardship practices that integrate disturbance, rest, adaptation, and community participation.

Within this framework, regenerative stewardship operates across ecological, social, and cultural scales. Ecologically, it supports biodiversity, soil regeneration, and climate resilience. Socially, it fosters education, participation, and reciprocal relationships between people and the landscapes they inhabit. Culturally, it reconnects communities to place-based ecologies and stewardship traditions that have long shaped and sustained these landscapes.

Within the context of the Washington Park Arboretum, this creates an opportunity for the public to become active participants in the stewardship of the site, with stewardship positioned as a visible and participatory process embedded within the lifecycle of the landscape rather than concealed as routine maintenance. In the context of the Washington Park Arboretum, the University of Washington, and the Seattle Botanic Gardens, the project becomes an opportunity to test restoration methods in highly disturbed urban conditions, develop new models of public stewardship, and educate visitors about local ecologies, disturbance systems, and regenerative care practices. In this way, the site functions as both a public landscape and living laboratory, contributing to climate adaptation research while exploring what arboretums of the future might become.

Unlike forest restoration projects, which may take decades before meaningful transformation becomes visible, prairie landscapes often demonstrate dramatic change within the first few years of establishment. Seasonal flowering, grazing patterns, and cycles of disturbance allow visitors to witness ecological processes unfolding in real time. The prairie therefore becomes a living educational landscape capable of sustaining public engagement, collective stewardship, and long-term cultural investment in the care of urban ecologies.

COMMUNITY PARTICIPATION

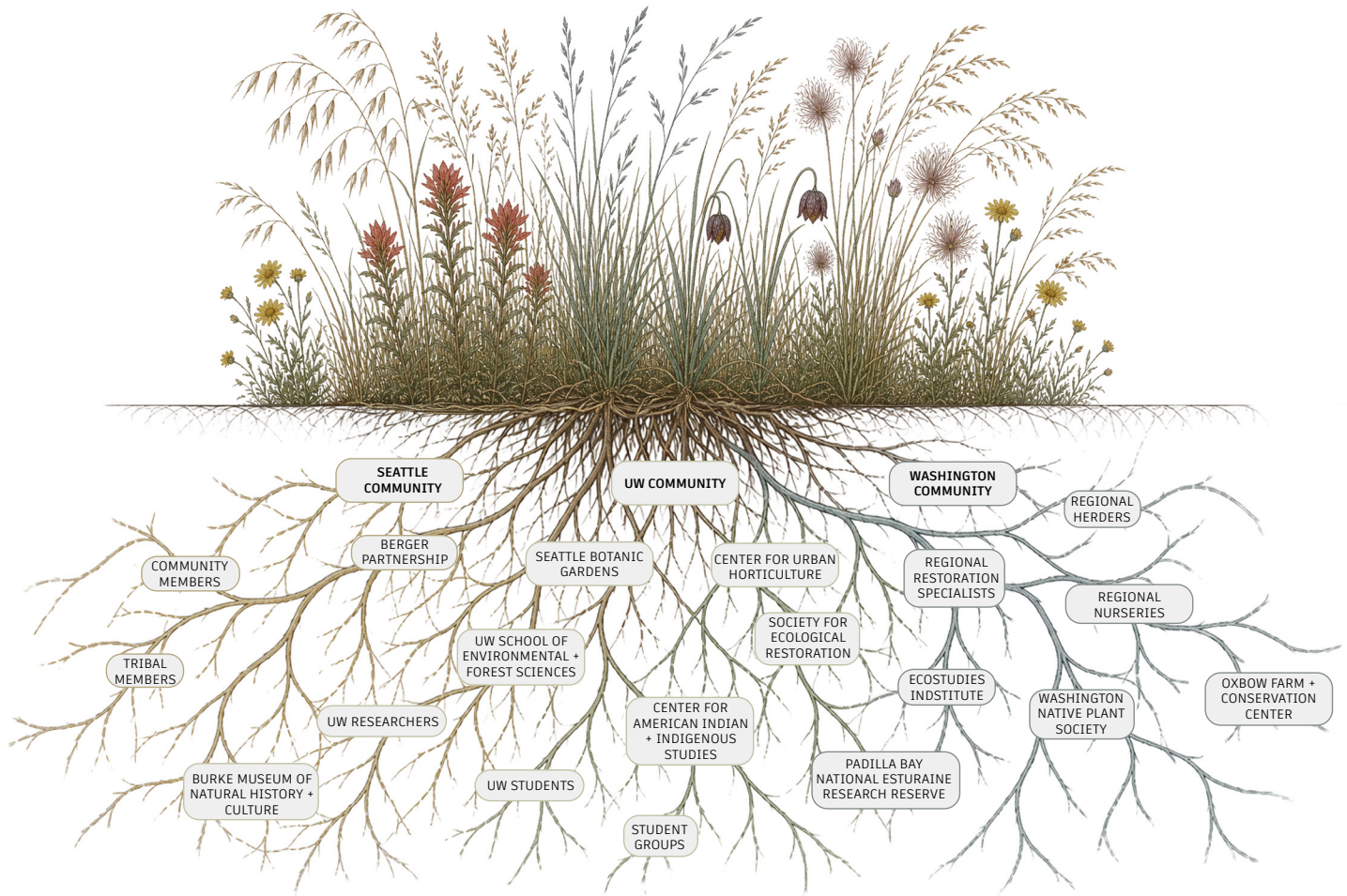


Figure 5.1 : Potential stakeholders of the Montlake Peninsula Prairie, by author, with use of ChatGPT, 2026

This project emphasizes opportunities for community stewardship and ritual, positioning care as a shared and ongoing practice rather than a hidden maintenance task. As discussed in Section 3: Ecological Planting Design, community involvement can begin with seed collection, allowing participants to directly contribute to the co-creation of the landscape. As the prairie establishes, stewardship expands into recurring cycles of harvesting, redistribution, replanting, monitoring, and adaptive care within the Montlake Peninsula Prairie, reinforcing reciprocal relationships between people and place.

Potential stewardship partnerships may emerge across multiple scales, including the University of Washington community, the greater Seattle region, and broader networks of restoration practitioners and organizations throughout Washington State. These collaborations may involve researchers, students, Indigenous and tribal communities, ecological restoration organizations, regional nurseries and herders, public institutions, and community members, creating an interdisciplinary and intergenerational framework for long-term stewardship.

Together, these stewardship strategies cultivate shared ownership of public space, transforming care into a recurring cultural and ecological practice that strengthens relationships between community, landscape, and more-than-human systems over time.

SITE PREPARATION

Site preparation is one of the most critical determinants of prairie establishment, as early interventions shape the long-term ecological trajectory of the landscape. Prairie restoration is highly dependent on how effectively weed pressure and soil conditions are addressed at the outset. Within the Montlake Peninsula, these challenges are intensified by the site's history of extreme disturbance. Portions of the site function as a former landfill capped with shallow clay that limits excavation depth, while other areas consist of compacted gravel associated with former parking and staging infrastructure. Additional challenges include an extensive weedy seed bank, ongoing weed encroachment, and heavily compacted soils.



Figure 5.2 : Considerations of Site Preparation, by author, with use of ChatGPT, 2026

Given the ecological and economic limitations of importing large quantities of soil, this project instead proposes working with existing site conditions through staged, in-place soil building strategies. Rather than replacing the soil, the approach focuses on gradually restoring ecological function by building soil health over time and utilizing on-site materials wherever possible. This aligns with broader regenerative principles that prioritize adaptation, resourcefulness, and working with site processes rather than imposing uniform solutions.

Prairie restoration is also inherently site-specific. In discussion with Restoration Specialist Jon Bakker, he emphasized that sites located only a few miles apart can require drastically different preparation methods depending on soil composition, hydrology, compaction, disturbance history, and weed pressure. This reinforces the need for adaptive and experimental approaches to site preparation, where multiple methods are tested, monitored, and refined over time to determine what is most effective within the ecological and social conditions of the site.

Conventional landscape installation methods often prioritize speed and visual completion, relying heavily on imported soils and intensive grading. These approaches can be economically costly, ecologically disruptive, and, in the context of prairie establishment, sometimes counterproductive. Imported soils may contain nutrient levels that favor aggressive weeds over prairie species, while plowing or tilling can expose weed seed banks to light and moisture, triggering additional weed germination rather than suppressing it. Minimizing soil disturbance therefore becomes a foundational principle of prairie establishment.

Conversely, restoration research methods often emphasize slower, staged-scale experimentation. Jon Bakker's restoration work, for example, utilizes small test plots that are monitored over multiple years before successful strategies are gradually scaled up. While this method produces highly informed ecological outcomes, the extended timeline can be difficult to reconcile within the context of a highly visible public landscape where stakeholder engagement and public momentum are important considerations.

This project therefore seeks a middle ground between ecological rigor and public implementation. By combining

phased experimentation with timely landscape establishment, the proposal allows the prairie to evolve through adaptive management while still creating a publicly legible and actively used landscape.

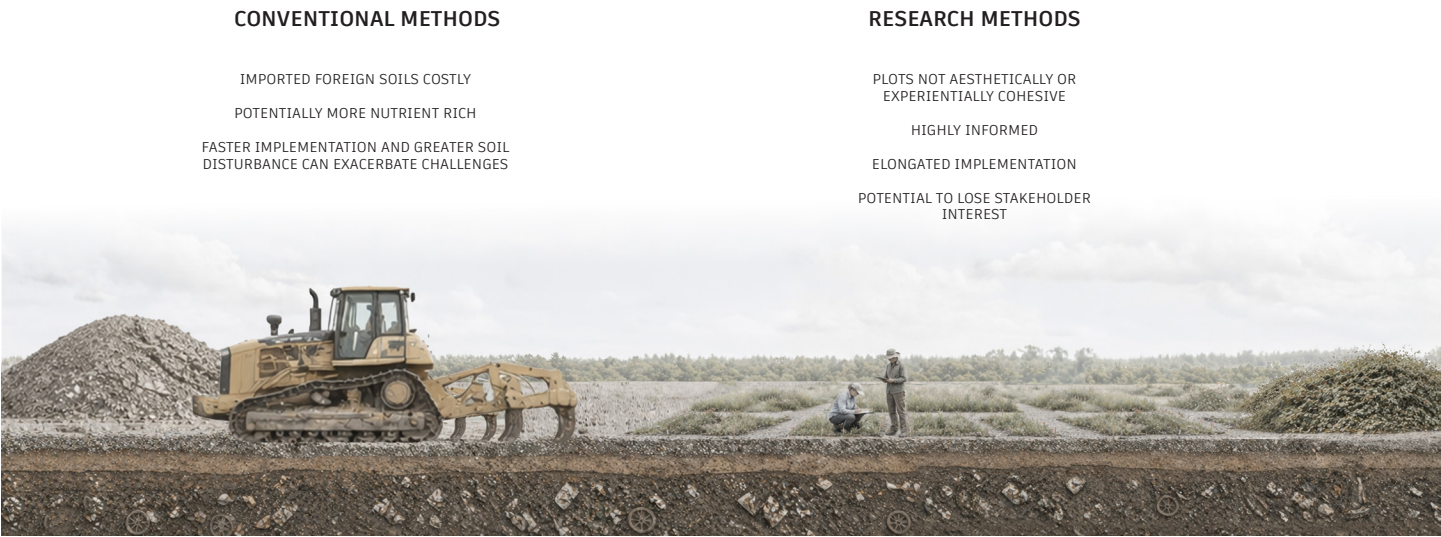


Figure 5.3 : Conventional vs. Research Methods for Prairie Establishment, by author, with use of ChatGPT, 2026

GUIDING FRAMEWORK



Figure 5.4 : Guiding framework for prairie establishment, by author with use of ChatGPT, 2026

It may sound counterintuitive, but successful prairie restoration is often guided by principles of “low and slow.” Unlike conventional landscape establishment, prairie systems generally do not benefit from nutrient-rich soils or intensive irrigation. Excess nutrients and water can accelerate the growth of aggressive, fast-establishing species, increasing competition and ultimately reducing biodiversity during early establishment. According to Restoration Specialist Jon Bakker, prairie establishment is often most successful in soils that are intentionally lean and relatively harsh, helping suppress dominant competitors while creating conditions that support a more diverse plant community. As Ben Vogt (2023) notes, “prairies are used to stress—they are built on it and thus are generally resilient and adaptable.”

Municipal codes can sometimes complicate these ecological objectives. For example, Seattle City Code requires a 10% compost amendment in new planting areas and 5% in turf areas. While intended to support plant health, elevated nutrient inputs can unintentionally favor aggressive species and suppress slower-establishing native plants, ultimately reducing long-term prairie diversity (Wood, personal communication, 2026).

Within prairie systems, stress is not treated as a condition to overcome, but as an ecological process that helps shape resilience, diversity, and long-term adaptability. Low fertility and drought conditions slow competitive dominance, allowing more diverse successional trajectories to emerge over time. For this reason, the project prioritizes low-input establishment strategies, using irrigation and soil amendments sparingly, if at all.

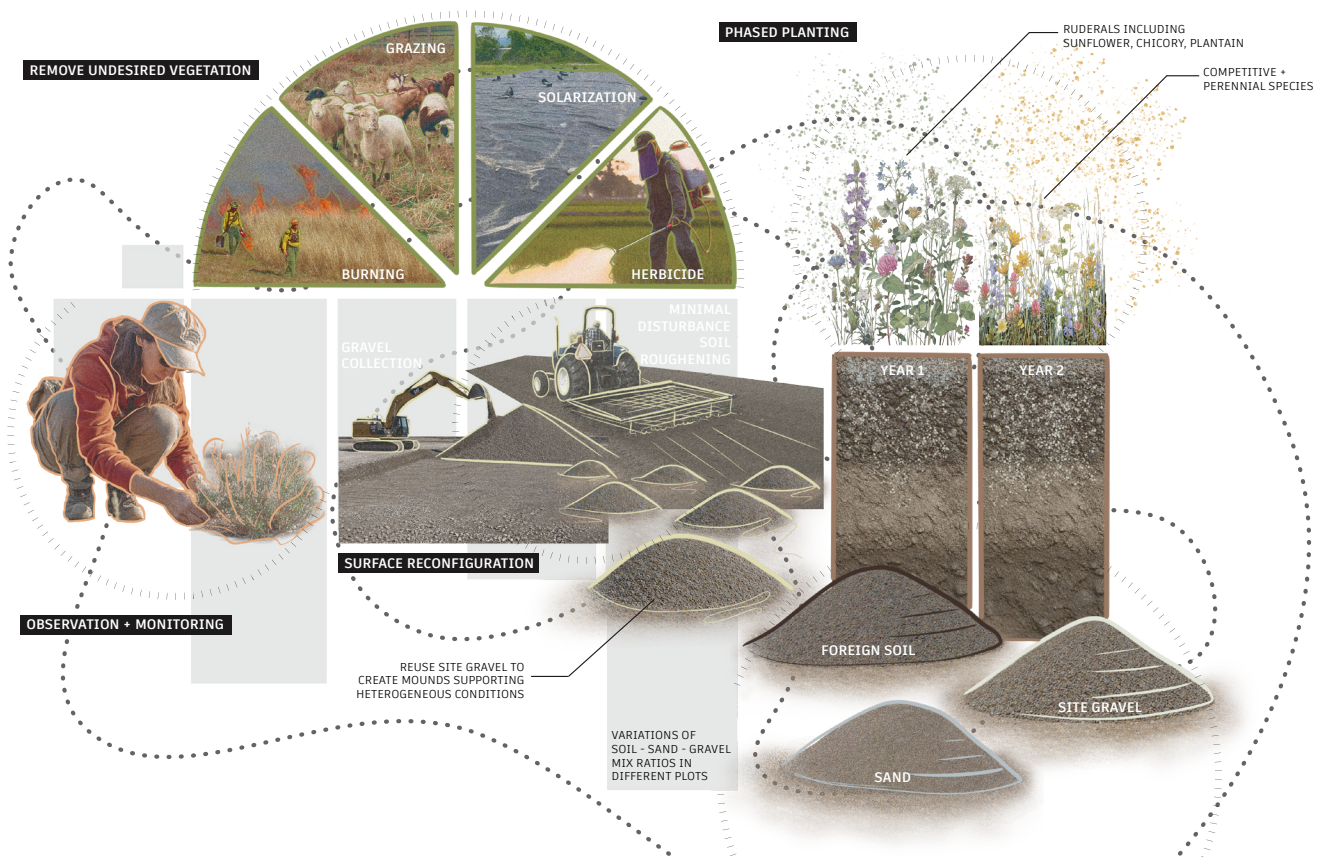


Figure 5.5 : Proposal for site preparation + Installation, by author, 2026

Regenerative stewardship is an ongoing process of observation, adaptation, and response. The evolution of this prairie landscape is not linear; it begins within highly disturbed urban soils and continually transforms over time through care, disturbance, and ecological succession. As vegetation structure, species diversity, and soil conditions shift, stewardship practices must evolve alongside them. Because prairies are dynamic systems shaped by disturbance, succession, and seasonal variability, their establishment and long-term stewardship must remain equally adaptive.

Even with careful planning, challenges in vegetation establishment are inevitable. Rather than being understood as failures, these moments become opportunities to learn from the site itself—to observe ecological responses,

understand shifting conditions, and refine stewardship strategies over time.

Operationally, this framework is organized through interconnected phases including soil and site preparation, planting and succession, water and resource management, disturbance through patch-burn grazing, and invasive species response. Rather than functioning as isolated steps, these phases operate as an iterative cycle in which early interventions shape long-term ecological trajectories, while ongoing observation and feedback continue to inform future actions. Interventions may repeat, overlap, or shift in sequence depending on seasonal timing, site conditions, and observed ecological response.

With biodiversity and ecological resilience as the desired outcomes, the site requires equally diverse and adaptive methods of establishment and stewardship.

OBSERVATION + MONITORING

At every stage of the process, observation and monitoring are essential components of regenerative stewardship, informing ongoing management decisions and future interventions. Assessing soil conditions, documenting undesired vegetation, and understanding plant reproductive cycles help determine the most effective timing and methods for intervention. Through continual observation, the site itself becomes a guide, shaping adaptive responses that evolve alongside changing ecological conditions.

REMOVING UNDESIRE VEGETATION

Undesired vegetation can be managed through a combination of grazing, prescribed fire, solarization, and targeted herbicide application. Grazing is most effective during spring and early summer, reducing biomass before seed set and limiting the spread of annual weeds. According to Restoration Specialist Cory Gardner, solarization combined with mowing has also proven highly effective for vegetation clearance, though its application is likely best suited to smaller phased areas due to logistical and spatial constraints. Prescribed fire, particularly late-season burns with higher fuel loads, can further reduce accumulated vegetation and suppress portions of the seed bank. While these methods are often effective for annual weeds, persistent perennials such as Himalayan blackberry and knotweed typically require more intensive manual or chemical intervention.

Where necessary, herbicide use can provide targeted control of aggressive perennial species. All restoration specialists consulted for this project emphasized that large-scale restoration and long-term weed management in contemporary urban conditions will likely require some use of glyphosate or other herbicides. Given the scale of invasive pressure present in many disturbed urban landscapes, they noted that complete avoidance of herbicide is often impractical both ecologically and economically.

There is significant concern and misinformation surrounding glyphosate use. Glyphosate is a non-selective systemic herbicide absorbed through plant foliage and translocated to the roots, disrupting amino acid synthesis and typically killing plants within 7–10 days. According to Smith-Fiola & Gill (2024), glyphosate binds tightly to soil particles and is rapidly broken down through microbial activity into relatively benign compounds. Its toxicity rating (15.3 on a 0–100 scale) is lower than many commonly used horticultural products, including insecticidal soap (19) and horticultural oil (27.5), and seeding can occur shortly after application (Vogt, 2023). Applications, however, should be carefully managed and avoided within 10–15 feet of water bodies.

Within this project, herbicide use is approached as a targeted and limited intervention rather than a blanket strategy. Grazing, burning, and solarization are prioritized to reduce overall biomass and seed bank pressure before selective herbicide application is considered. Woody perennials such as blackberry, for example, may be cut and treated directly at the stem, minimizing overall chemical use while increasing labor inputs. These methods are not applied uniformly, but adaptively in response to species behavior, accessibility, seasonal timing, and site conditions. Timing is especially critical, as interventions implemented after seed set may unintentionally reinforce, rather than suppress, undesired vegetation.

SOIL PREPARATION, DECOMPACTION, + SURFACE RECONFIGURATION

Existing surface gravel may be selectively removed and staged prior to soil decompaction efforts. Portions of the gravel can be reused to form mounding and varied surface conditions across the site. These topographic variations create heterogeneous microclimates, drainage conditions, and habitat niches while also referencing the region's Mima mound landforms.

Soil compaction can be addressed through a combination of mechanical and biological methods. Techniques such as broadforking or drag harrowing provide shallow decompaction without inverting the soil profile, improving aeration and infiltration while minimizing exposure of the buried weed seed bank. Pioneer species may also function as biological soil engineers during early establishment, using root systems to gradually increase soil porosity, break up compacted layers, and support microbial activity. In this way, vegetation itself becomes functional infrastructure for long-term soil remediation.

As soils are reconfigured, limited use of imported soils may be necessary to assist with early weed suppression and establishment. However, rather than relying on complete soil replacement, this project proposes testing varying ratios of imported soil, existing site gravel, and sand across phased plots throughout the site. These experimental gradients can help identify the most effective strategies for balancing weed suppression, drainage, soil health, and prairie establishment under differing site conditions.

PLANTING + SUCCESSIONAL ESTABLISHMENT

Discussions with restoration specialists suggest that successful prairie establishment is most effective when approached as a phased and adaptive process rather than a single seeding event. Instead of installing the full plant community at once, species are introduced strategically over time to manage competition, reduce weed pressure, and guide successional development. This approach mirrors natural disturbance cycles, where ruderal species initially colonize disturbed ground before longer-lived competitive and stress-tolerant species gradually establish.

Step 1: Forb-First Establishment (Autumn, Year 1)

The initial phase focuses on establishing a dense forb community, prioritizing ruderal and early-successional species seeded in autumn. Grasses are intentionally delayed during this stage to reduce early competition and allow forb species to establish more successfully, with the understanding that these species will gradually decline as perennial and longer-lived communities become established in subsequent years. In areas with particularly high weed pressure, aggressive or highly competitive species may be strategically introduced to occupy open niches and suppress undesired vegetation.

Seed-to-soil contact is essential during this phase and may be achieved through light raking, shallow disturbance, or trampling by grazers.

Step 2: Targeted Vegetation Suppression

Following germination, undesired vegetation is selectively managed through targeted interventions designed to maintain the competitive advantage of desired species while reducing overall weed pressure. Strategies may include selective herbicide application, mechanical removal of persistent perennial weeds, grazing, or localized burning and disturbance where appropriate. Timing is especially critical, as interventions must occur prior to seed set to prevent further reinforcement of undesired species.

Step 3: Grass + Structural Species Establishment (Autumn, Year 2+)

Progression into the next establishment phase is determined by ecological response rather than a fixed timeline. Indicators may include sufficient forb establishment, reduced dominance of invasive species, improved soil stability, and increased surface coverage. If these conditions are not achieved, earlier management cycles may be repeated or adjusted as needed.

Once early competition is stabilized, more competitive and longer-lived species, particularly grasses, are introduced to provide structural complexity, root mass, and long-term ecological stability. Delaying grass establishment allows for more targeted weed management during early phases while creating opportunities for greater species diversity to establish before competitive pressures intensify.

Step 4: Iterative Seeding + Adaptive Management

Following initial establishment, the prairie continues to evolve through ongoing disturbance, reseeding, and adaptive management. Reseeding is an ongoing process, with the first three years being especially critical, as this period largely shapes the trajectory of the emerging prairie before it develops greater ecological stability and its own internal seed bank. Seeding efforts may be followed by managed grazing to improve seed-to-soil contact and create favorable conditions for germination. Areas with poor establishment are monitored closely, and species composition may shift over time in response to observed ecological conditions, disturbance patterns, and plant performance.

CONSIDERATIONS WITHIN THIS FRAMEWORK

Solarization is only effective under sustained, high-radiation summer conditions, while prescribed fire requires sufficient fuel loads to reach temperatures capable of suppressing vegetation and impacting the seed bank.

Disturbance-based strategies also carry inherent risks. Repeated disturbance can unintentionally favor disturbance-adapted or invasive species if not followed by effective suppression. Similarly, pioneer species introduced for soil conditioning may persist longer than intended, potentially competing with later successional plant communities.

These phases should therefore be understood as iterative rather than linear. Cycles may repeat, overlap, or shift in sequence depending on site response. Outcomes are not fully prescribed. Species performance, climatic variability, and management timing will ultimately determine ecological trajectories.

INVASIVE + WEEDY SPECIES MANAGEMENT

Weed suppression will be one of the most significant challenges on this site and complete eradication of undesired vegetation is neither realistic nor necessarily desirable. Instead, management is approached through the lens of tolerance and defining acceptable levels of weedy pressure and strategically intervening to prevent compromising biodiversity.

A combination of targeted grazing, prescribed fire, mechanical removal, selective herbicide use, and successional seeding is employed to manage undesired species while supporting overall ecological function.

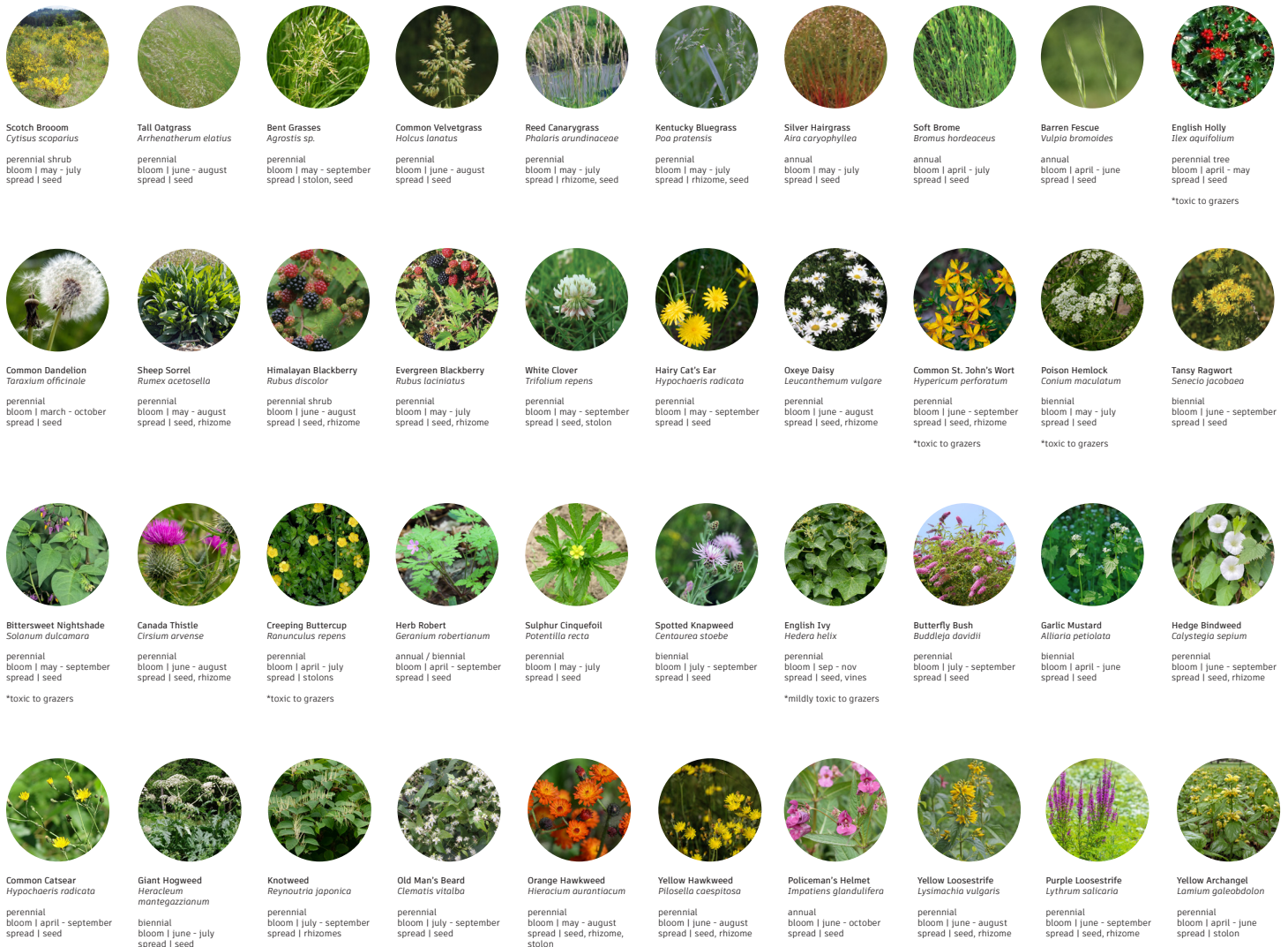


Figure 5.6 : Common Urban + Prairie Antagonists (Noland & Carver, 2011)

Conventional perspectives often assume that weeds provide little ecological value. However, this is not always the case (Rainer & West, 2015). Many weedy species persist because they produce abundant flowers, pollen, nectar, and seed, supporting pollinators and other wildlife while also facilitating their own spread.

Himalayan blackberry, for example, is highly invasive due to its aggressive growth and prolific fruiting, which attracts both wildlife and human activity. At the same time, it can provide habitat and protective cover for small animals. This is not to justify its presence, but to acknowledge the complexity of urban ecological systems. In highly altered landscapes, management is less about complete removal and more about strategic management and coexistence.

Grazing

Grazing is effective for managing annual weeds and suppressing perennial species prior to seed set. Goats, in particular, are well-suited for targeting woody and thorny species such as blackberry.

Burning

Prescribed fire is most effective for reducing annual weeds and accumulated biomass, and can help suppress portions of the surface seed bank. Its effectiveness depends on adequate fuel loads and proper timing.

Mechanical Removal

Mechanical methods should aim to minimize soil disturbance, as excessive disturbance can expose buried seed banks and exacerbate weed pressure.

- Annual weeds can be managed through cutting, mowing, or deadheading prior to seed set
- Regular stewardship (i.e. biweekly weeding) is particularly critical in the establishment stages (first 3 years) and can effectively reduce weedy pressure
- Persistent perennials require more careful removal, often including root extraction to prevent regrowth

Chemical Removal

Herbicide use is reserved as a targeted strategy for persistent perennial species. Application methods should minimize non-target impacts, such as applying herbicide directly to freshly cut stems reducing overall chemical use and harm to adjacent vegetation.

Weed management is ongoing due to continuous external inputs in the urban environment from bird and wind dispersal. Addressing weeds is especially critical in the first 3 years of landscape establishment, after which only periodic weeding may be necessary.

Additionally weed pressures shift across establishment phases with annual weeds likely dominating in early stages, and perennial weeds being more problematic at later stages.

WATER + RESOURCE INPUTS

Water is treated as a limited and strategic input rather than a continuous support system. Late-fall seeding typically aligns with seasonal rainfall and may require little to no supplemental irrigation, while spring seeding may necessitate temporary watering during early germination and establishment.

Beyond these initial phases, irrigation is intentionally minimized or avoided altogether. Prairie systems evolved within cycles of drought and disturbance, conditions that promote the development of deep, fibrous root systems and contribute to long-term ecological resilience. Excessive watering, particularly during summer months, can interrupt these processes by encouraging shallow rooting, increasing susceptibility to rot, and favoring fast-growing competitive species that reduce overall biodiversity.

Within this framework, stress is understood not as a limitation, but as an ecological asset. By limiting irrigation, plant communities are encouraged to adapt to site-specific conditions, resulting in landscapes that are more self-sufficient and better equipped to withstand climatic variability. Conversely, excessive or poorly timed irrigation can trigger germination of undesired species, reinforce competitive dominance, and reduce long-term drought tolerance and system resilience.

PRECEDENT | PADILLA BAY NATIONAL ESTUARINE RESEARCH RESERVE

Location: Mount Vernon, Washington

Designer: Padilla Bay National Estuarine Research Reserve

Year: 2023

Acreage: 15 acres

Padilla Bay's Research Reserve's findings in prairie establishment suggest that a combination of burning, solarization, and targeted herbicide application may be most effective at larger scales, particularly given the labor intensity of solarization across extensive sites. They also recommend a phased planting strategy, establishing forbs first, followed by selective grass suppression and subsequent grass seeding, to improve establishment success. Additionally, they emphasize the importance of incorporating annual species into the planting mix to function as nurse plants during early establishment.



Figure 5.7 : Padilla Bay Research prairie plots, photograph by author, 2026

The Padilla Bay National Estuarine Research Reserve is a restoration initiative focused on establishing a North Puget Sound prairie through a research-driven, phased approach. Using staged-scale restoration, site preparation and planting methods are tested in smaller plots, with the most successful strategies incrementally expanded across the 15-acre site.

The project evaluates multiple site preparation techniques, including burning, herbicide application, solarization, tilling, and drag harrowing. Seed mixes consist of 40–50 species, emphasizing high levels of plant diversity. In the first year, 45 plots measuring 30 by 30 feet were established. Solarization proved to be the most effective treatment; however, results suggest this outcome may have been influenced by suboptimal timing of other methods. Herbicide was applied after unwanted vegetation had gone to seed, reducing its effectiveness, while mowing prior to burning limited fuel loads and diminished the efficacy of prescribed fire.



Figure 5.8 : Emerging seedlings of prairie research plots, photograph by author, 2026

FRAMEWORK FOR CYCLES OF ONGOING STEWARDSHIP

Building on the principles of regenerative stewardship, working with natural processes becomes essential to restoring highly disturbed urban landscapes. Among these processes, cycles of disturbance, particularly grazing, fire, and rest, play a critical role in shaping resilient ecosystems. When applied intentionally, disturbance becomes a tool for regeneration, capable of enhancing long-term ecological function.

Effective implementation requires careful observation of climatic conditions and plant phenology, including periods of growth, dormancy, and seed set. Disturbances applied at the wrong time, such as burning or grazing before native species have set seed, can be counterproductive. Aligning these seasonal patterns with disturbance timing ensures stewardship actions support, rather than disrupt, ecological goals.

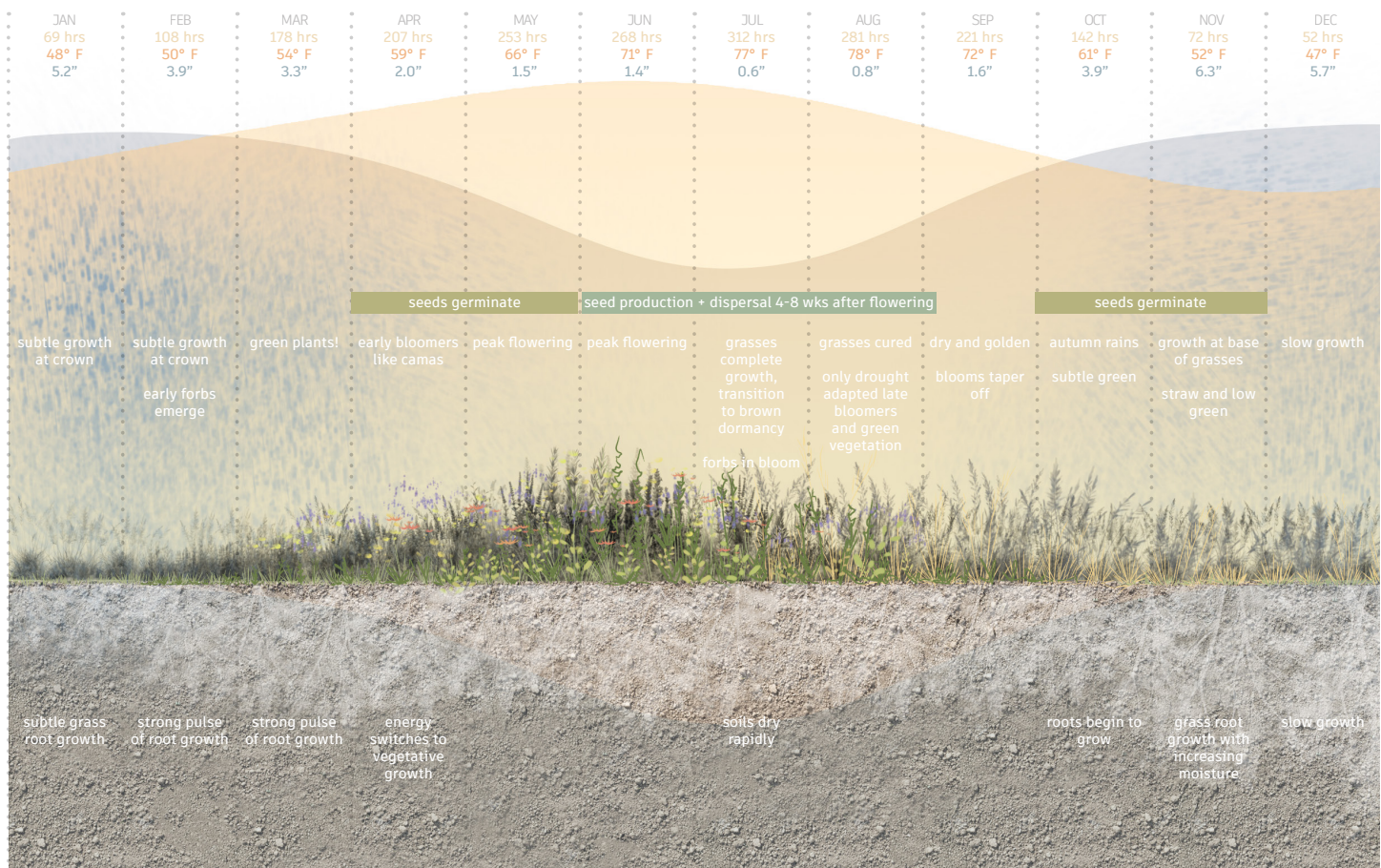


Figure 5.9 : Seasonal cycles of prairie landscapes, by author, 2026

The following stewardship framework is proposed to identify optimal periods for monitoring, adaptive decision-making, targeted weed management, grazing, planting, burning, seed collection, and harvesting. The framework also emphasizes periods such as spring deferment, when prairie systems are most biologically productive and disturbance should generally be minimized to support plant vigor, reproduction, and successional development.

At the same time, spring often produces the most abundant and nutrient-rich forage, meaning it may also serve as an appropriate period for carefully timed grazing depending on ecological objectives, management goals, or desired social and educational outcomes.

Within this framework, grazing events are seasonally flexible but implemented as short-duration, high-intensity interventions, typically lasting between one and five days depending on herd size and site conditions.

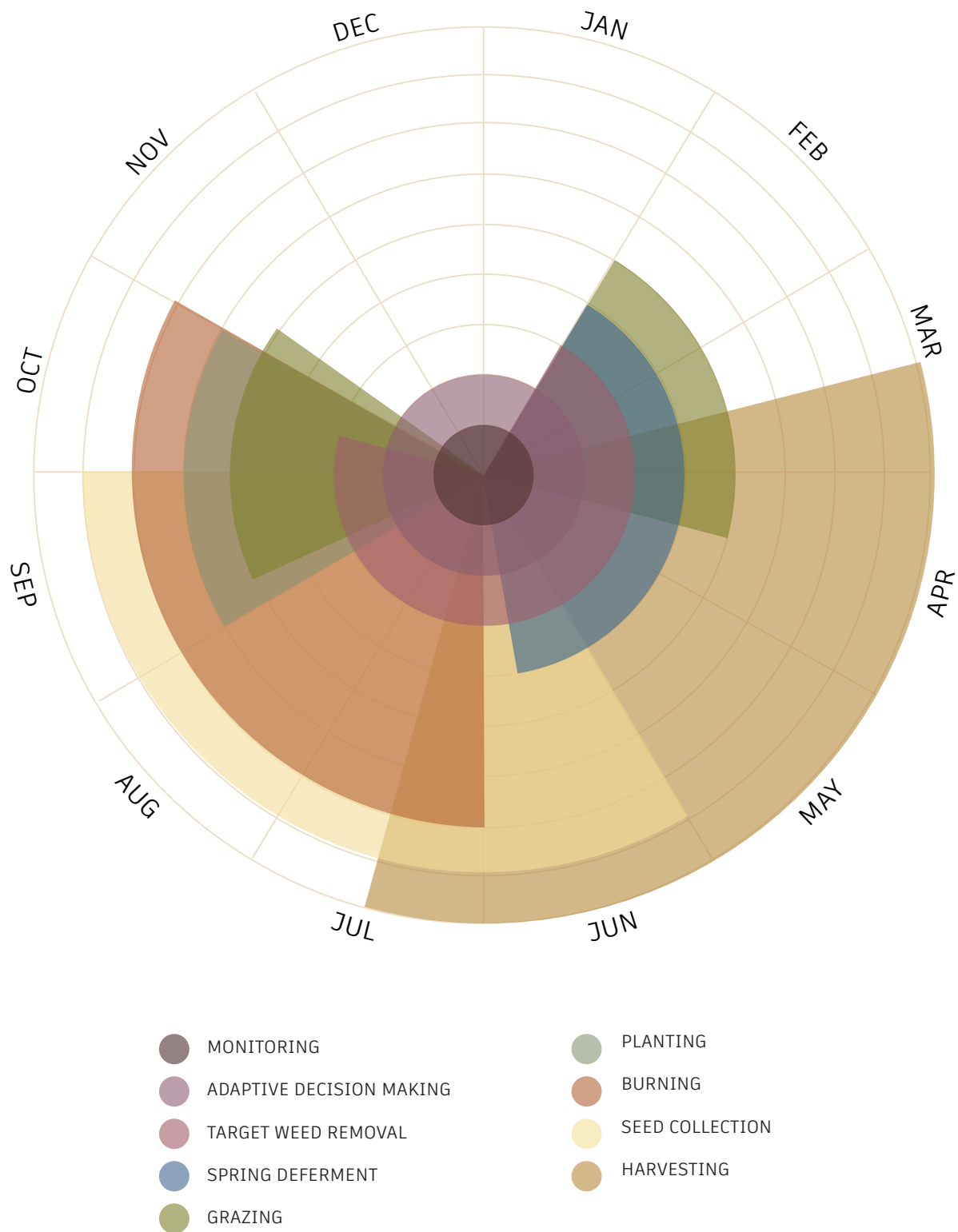


Figure 5.10 : Stewardship Calendar Framework, by author, 2026

During patch-burn cycles, selected areas of the site are burned and immediately reseeded. Following disturbance, non-native annual grasses are often among the first species to emerge, creating an opportunity to introduce grazers that selectively target these early grasses while simultaneously trampling seed into the soil and improving seed-to-soil contact.

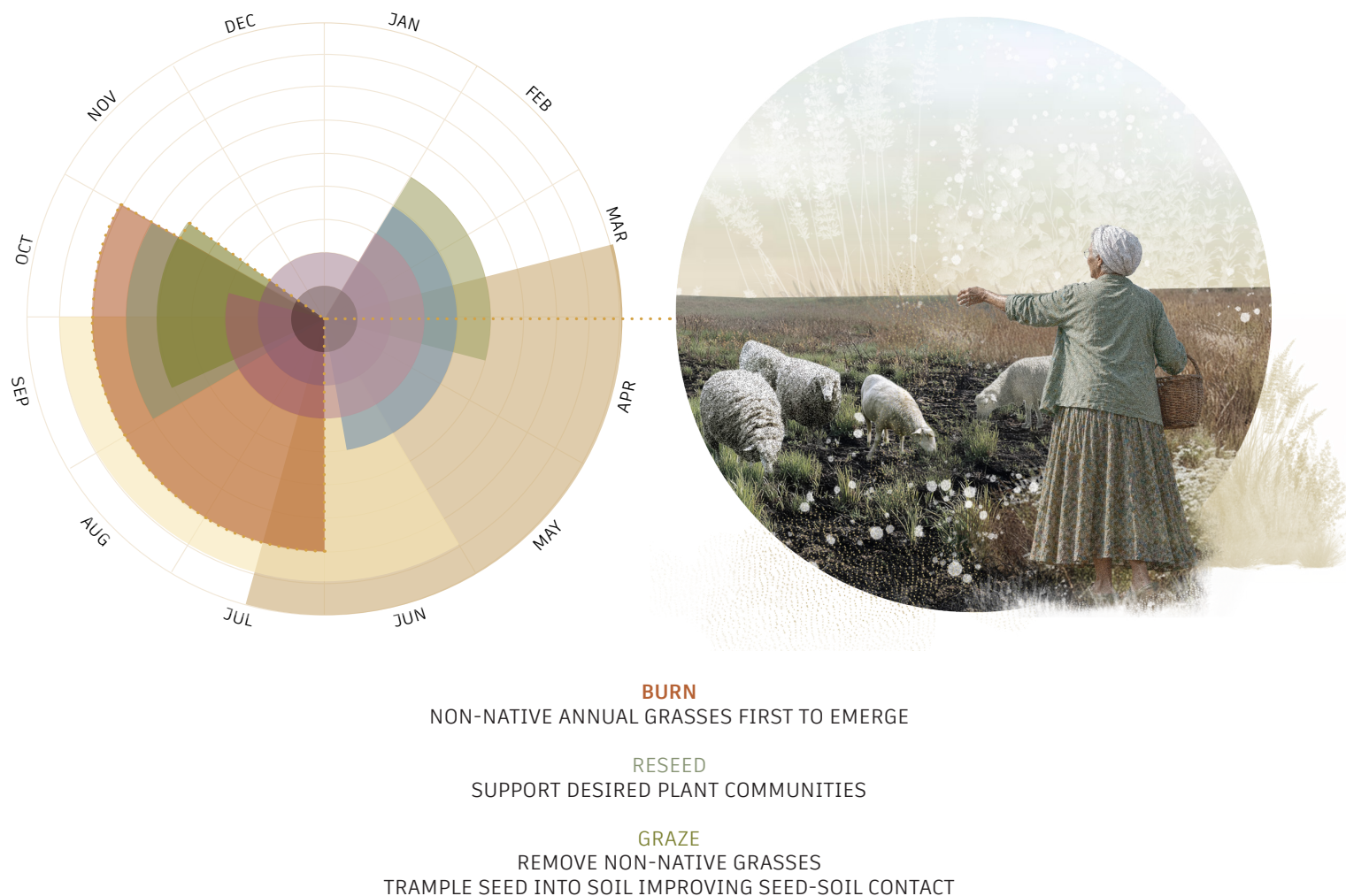


Figure 5.11 : Patch-Burn Cycle, by author, 2026

CONSIDERATIONS WITHIN THIS FRAMEWORK

Of course, this framework is not fixed and must continually adapt to changing ecological conditions over the lifetime of the landscape. During dry years, longer periods of rest and reduced disturbance may be prioritized to support plant recovery and resilience. In wetter years, grazing may occur for longer durations or extend into spring, including periods that would otherwise be deferred. Excessive thatch accumulation may indicate the need for burning, while declining biodiversity may signal the need for increased disturbance through grazing or fire to restore ecological heterogeneity.

Management responses should also shift according to weed type and site conditions. Persistent perennial weeds may require targeted herbicide application or mechanical removal prior to seed set, while annual weeds can often be managed through grazing, deadheading, or low-disturbance mechanical removal. Prior to prescribed burns, grazing or mowing should be minimized to maintain sufficient fuel loads for effective fire behavior. Seeding strategies may also be adjusted in response to weed pressure, with more competitive species strategically introduced in areas experiencing persistent invasion.

Within this framework, stewardship remains responsive, iterative, and guided by continual observation of ecological conditions and landscape performance.

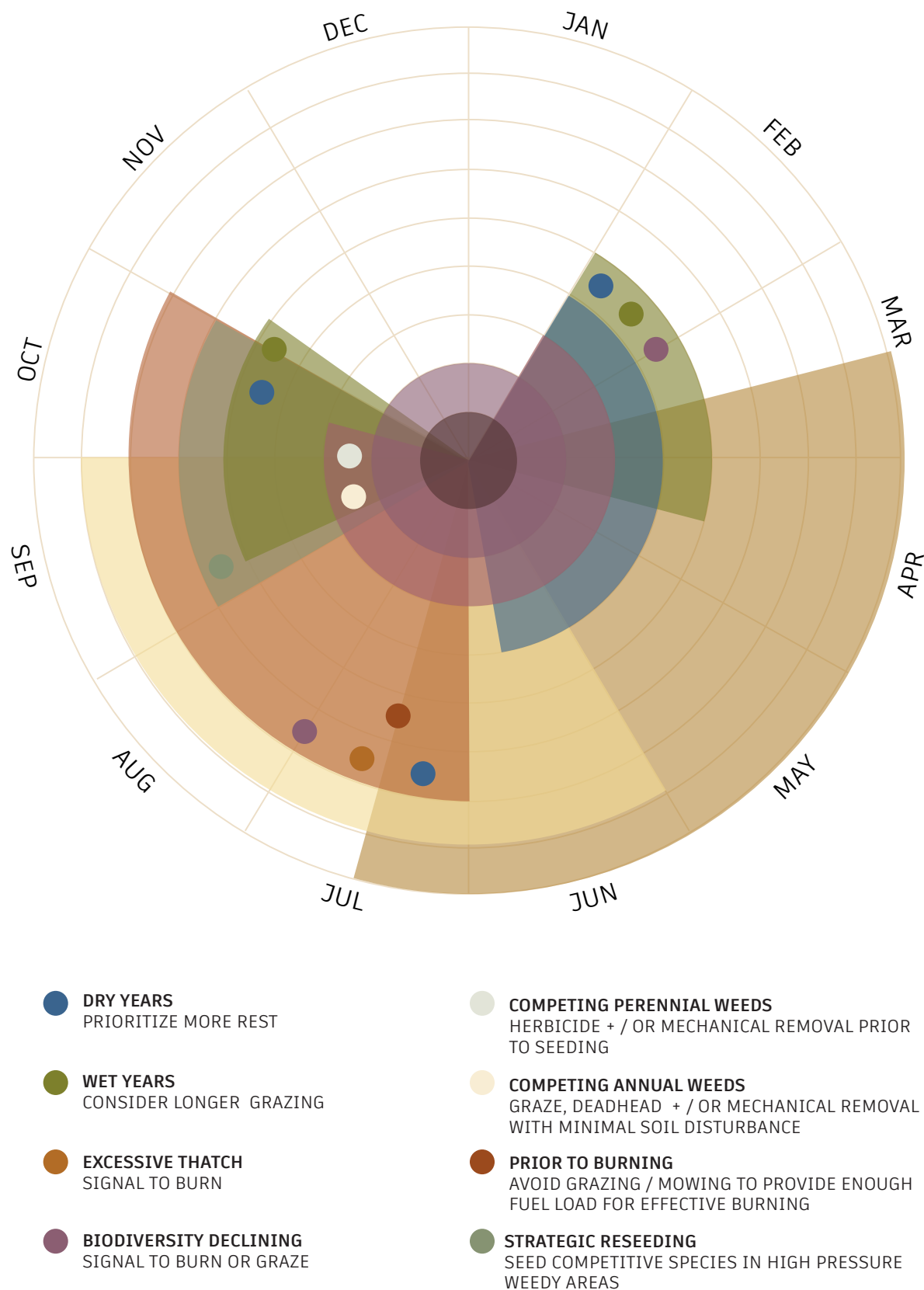


Figure 5.12 : Considerations and exceptions within this stewardship framework, by author, 2026

SUMMARY OF REGENERATIVE STEWARDSHIP

The Washington Park Arboretum is positioned as a site of research, experimentation, community engagement, and regenerative stewardship. Through diverse partnerships operating across multiple scales, the landscape becomes continually monitored, observed, studied, and cared for, informing adaptive decision-making throughout the lifecycle of the prairie. Stewardship is therefore not treated as a hidden maintenance practice, but as a visible and participatory process embedded within the public life of the landscape.

This framework creates opportunities for recurring community stewardship events and cultural rituals, including prescribed burns informed by Indigenous stewardship practices and traditional ecological knowledge, grazing events, planting and weeding efforts, seed collection and harvesting, and opportunities for study, learning, and research. As a highly visible urban public landscape, the site supports both active and passive engagement, allowing visitors to witness ecological processes unfold.

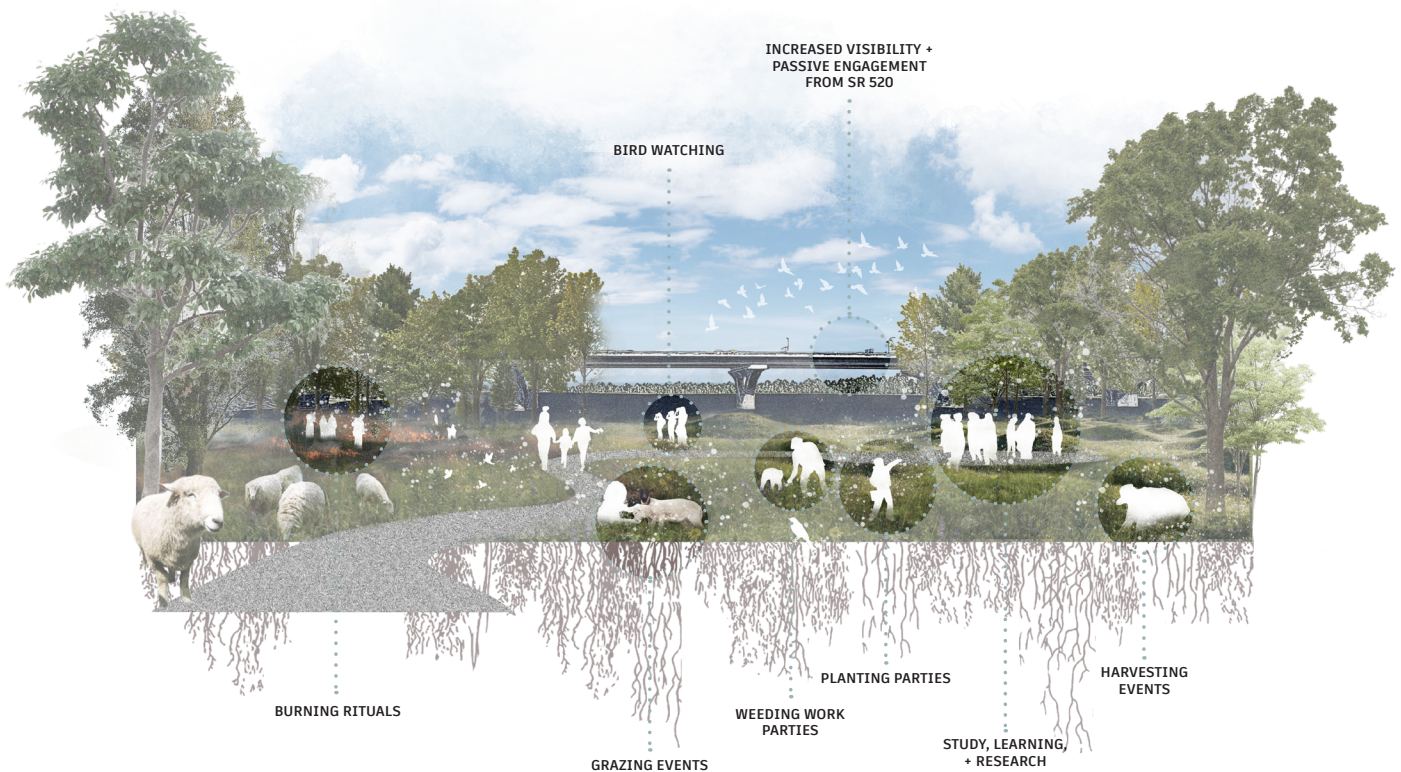


Figure 5.13 : Community Stewardship Events + Rituals, by author, 2026

The framework for site preparation, implementation, and long-term stewardship is intentionally iterative, adaptive, and responsive to changing ecological conditions. Through ongoing cycles of observation, disturbance, succession, and care, the project supports the regeneration of soil health, habitat complexity, and biodiversity while advancing research into prairie restoration within highly disturbed urban environments. At the same time, it cultivates reciprocal relationships between humans, more-than-humans, plants, land, and life, while fostering new cultural rituals surrounding collective stewardship and care.

As part of the greater arboretum collection, the prairie introduces a landscape typology that reflects the ecological identity of the region while exposing visitors to prairie systems that are now largely absent from the broader landscape. In this way, the project reframes the arboretum not only as a collection of plants, but as a collection of living ecological processes that shape the ongoing relationships between people, ecological processes, and the landscape.

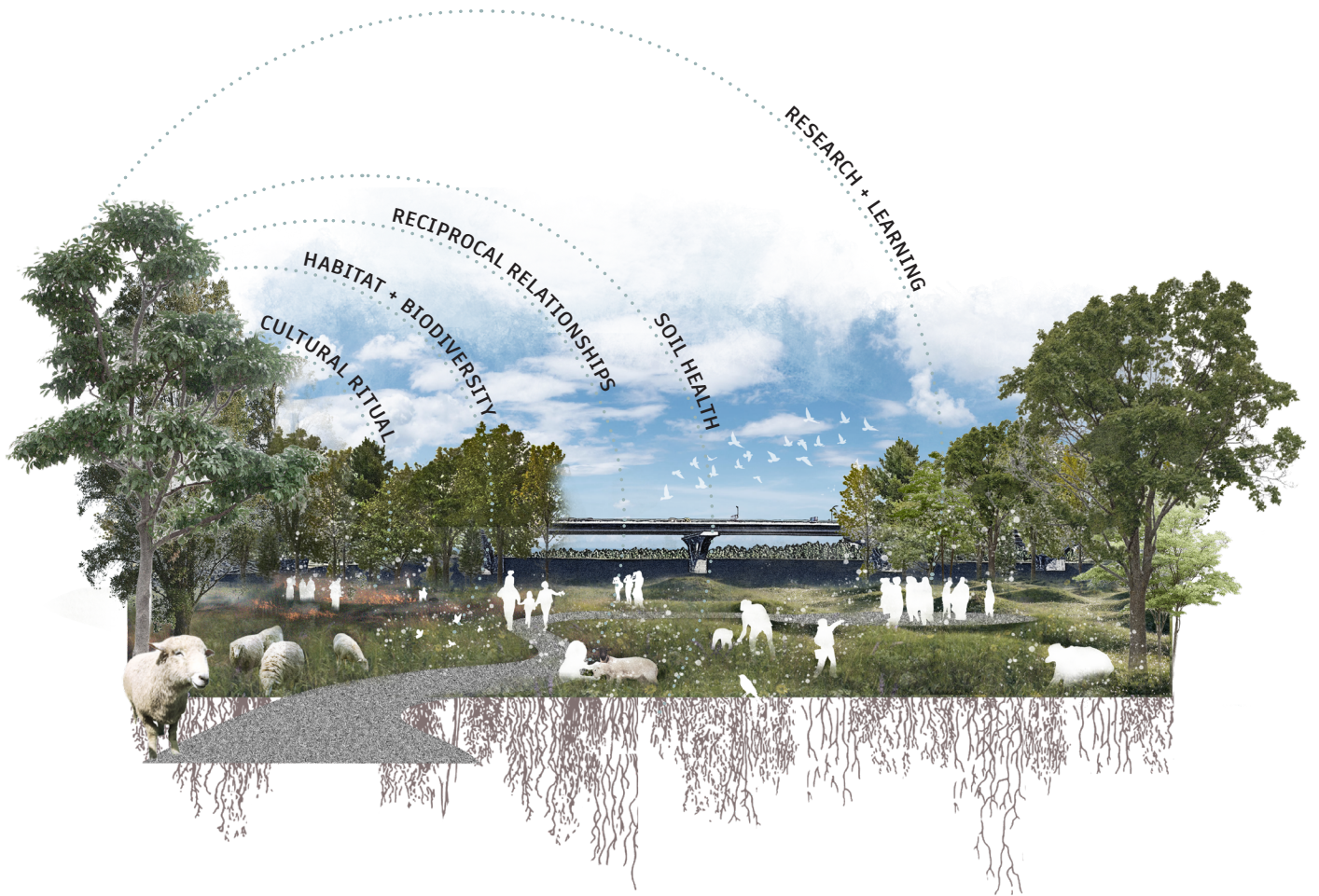


Figure 5.14 : Regenerative opportunities within the site, by author, 2026

06

REFLECTIONS + CONCLUSION





**CULTIVATE RECIPROCAL
RELATIONSHIPS**
between humans,
more-than-humans, plants, land,
and life.



**AMPLIFY FUNCTIONAL
BIODIVERSITY**
through both planting and
stewardship strategies.



**STRENGTHEN ECOLOGICAL
RESILIENCE**
in the face of climate change.

Figure 6.1 : Project Goals, by author, 2026

Prairies are among the most endangered and least protected ecosystems in the United States, largely due to colonization, land conversion, displacement, and the suppression of disturbance processes such as fire. At the same time, contemporary urban public landscapes are often ecologically simplified, resource-intensive, and maintained through highly standardized systems that prioritize control, uniformity, and aesthetics over ecological function and resilience. In the face of climate change, with hotter and drier summers increasingly shaping urban environments, these conventional approaches are becoming ecologically, socially, and economically unsustainable.

This thesis argues that prairies offer a regenerative framework for urban public landscapes by aligning ecological processes, disturbance regimes, and stewardship practices to support biodiversity, climate resilience, and reciprocal relationships between humans and more-than-humans. Adapted to drought, disturbance, and nutrient-poor soils, prairie ecosystems offer opportunities to amplify biodiversity, strengthen climate resilience, and cultivate reciprocal relationships between humans, more-than-humans, and the land itself. Situated within the Washington Park Arboretum's Montlake Peninsula, this research asks:

How can regenerative stewardship inform the design of urban prairiescapes to restore and sustain ecological and social function?

While grazing and fire have long played critical roles in maintaining prairie ecosystems, contemporary research and implementation remain limited within urban public landscapes. Existing grazing practices are often tied to livestock production or reactive vegetation management rather than intentionally designed systems that support ecological resilience, public engagement, and reciprocal stewardship. Similarly, few frameworks exist for integrating grazing and prescribed fire into highly visible urban public landscapes in ways that are operationally feasible, socially legible, and ecologically beneficial.

In response, this thesis develops a speculative framework for regenerative urban prairiescapes through the integration of ecological planting design, disturbance ecology, and regenerative stewardship. Drawing from literature reviews, interviews and consultations, spatial and qualitative analysis, and precedent studies, the project explores how ecological and social processes can collectively inform the long-term design, stewardship, and perception of public landscapes.

Through the lens of ecological planting design, this research investigates how native, emerging, and novel plant communities can be composed to support functional biodiversity across spatial and temporal scales. Rather than focusing solely on species selection, planting design is understood as the organization of relationships between species, disturbances, soils, climate, and human perception. Functional biodiversity becomes essential not only for ecological resilience, but also for cultivating landscapes that people can recognize, value, and meaningfully care for.

Through disturbance ecology, this thesis argues that biodiversity depends upon disturbance, and that if biodiversity is the goal, disturbance itself must become diversified. By comparing mowing, grazing, burning, and periods of rest, this research examines how different disturbance regimes shape ecological function, habitat heterogeneity, social engagement, and public perception. This investigation ultimately informs a patch-burn grazing framework that integrates rotational grazing and prescribed fire as regenerative design and stewardship strategies. Beyond ecological benefits, these disturbances create opportunities for cultural ritual, collective stewardship, education, and deeper public engagement with ecological processes. Because disturbance regimes such as fire have long been rooted in Indigenous land stewardship practices, this thesis calls for the inclusion of Indigenous voices as an essential part of these frameworks, recognizing and honoring the stewardship traditions from which this research draws inspiration.

Finally, through the lens of regenerative stewardship, this thesis positions stewardship not as maintenance, but as an adaptive and reciprocal relationship between humans and ecological systems. The project explores how landscapes can be designed to support long-term collaboration between institutions, community groups, indigenous groups, researchers, maintenance staff, and ecological processes themselves. Within this framework, stewardship becomes iterative, participatory, and regenerative, supporting not only the restoration of soils, vegetation, and habitat, but also the restoration of human relationships with land.

Heterogeneity, as a foundation for biodiversity and resilience, is cultivated through multiple interconnected strategies. Diversity is reinforced through varied stewardship methods, shifting spatial and temporal disturbance regimes, and the creation of heterogeneous microclimates supporting dryland, wetland, and varied topographic conditions. Biodiversity is further strengthened through diverse plant communities composed of native, novel, and emerging assemblages adapted to shifting climatic and urban conditions.

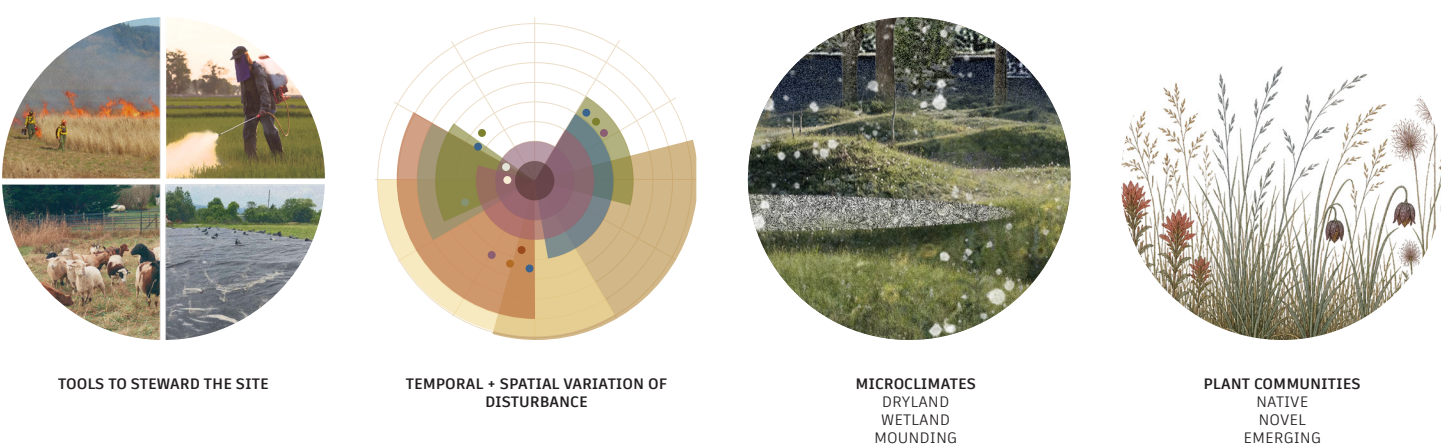


Figure 6.2 : Methods of heterogeneity to support biodiversity, by author, 2026

To support this framework, this research identifies the critical infrastructural systems needed to sustain regenerative stewardship, including fire-resilient materials and firebreaks, shelter and water systems supporting grazers and visitors, functional planting communities, gathering spaces, and, most importantly, engaged stewards.

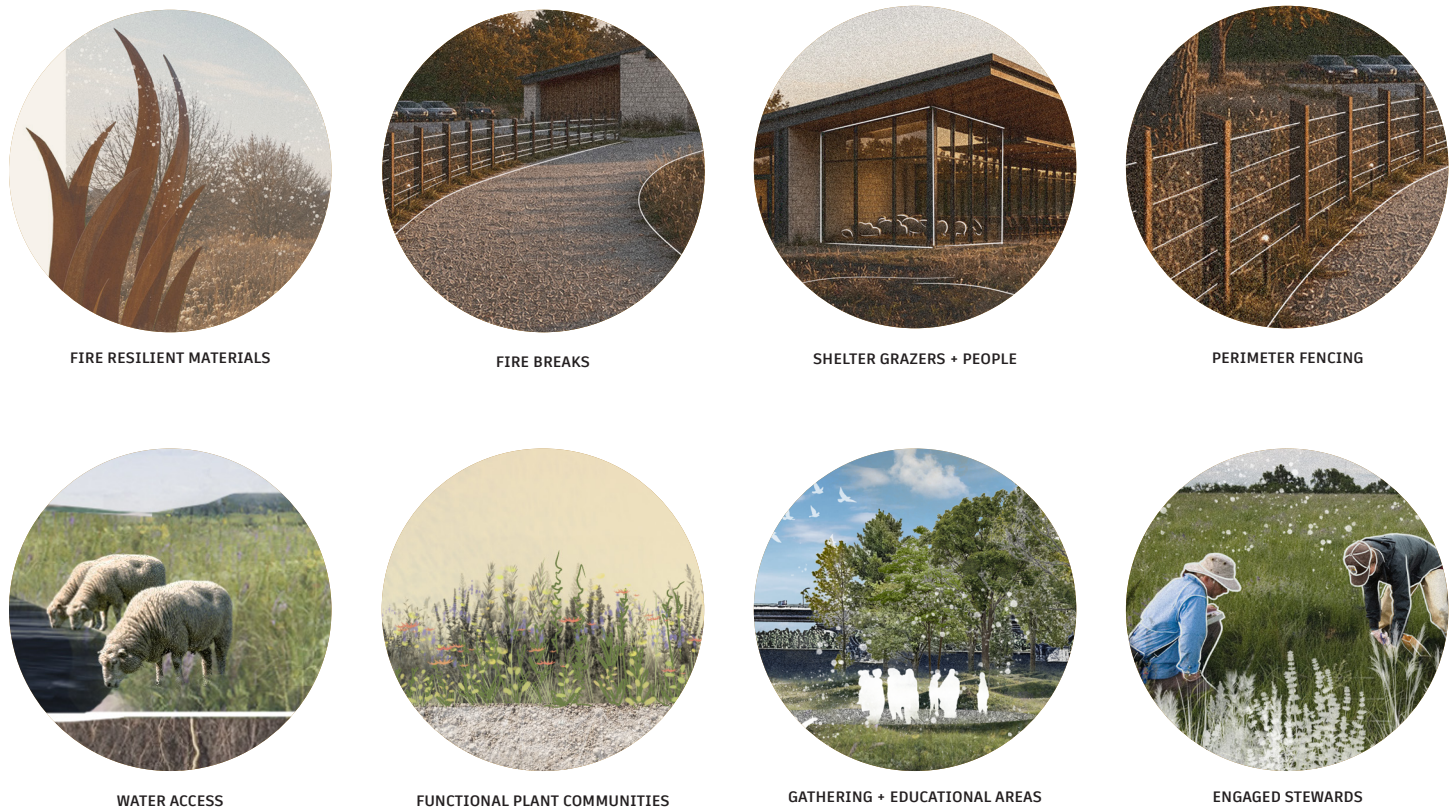


Figure 6.3 : Infrastructure needed to support proposed model of stewardship, by author, 2026

As a research institution, public landscape, and living collection, the Washington Park Arboretum is uniquely positioned to support this work. Through partnerships across the University of Washington, the City of Seattle, local organizations, and community participants, the Arboretum provides an ideal foundation for experimentation, education, and adaptive stewardship in the face of climate change.

Ultimately, this thesis proposes prairies as a regenerative framework for public landscapes capable of supporting biodiversity, climate resilience, cultural engagement, and reciprocal relationships between humans and more-than-humans. By aligning ecological processes with design and stewardship, this research advocates for public landscapes that are adaptive, regenerative, and ecologically grounded in place. In doing so, it reimagines stewardship as an ongoing relationship of care, reciprocity, and participation between humans and the living systems they inhabit.



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APPENDICES

APPENDIX A | PRECEDENTS

DUNE PENINSULA AT POINT DEFIANCE PARK

Location: Tacoma, Washington

Designer: Site Workshop

Year: 2019

Acreage: 11

This precedent demonstrates the transformation of a highly disturbed urban site into an urban prairie. The project reports a significant increase in bird, insect, and plant species, along with substantial reductions in water use and maintenance costs compared to conventional landscapes. Visitors also report a strong sense of place and well-being, attributed to its resemblance to regionally native landscapes. However, the site has experienced notable maintenance challenges, which have in turn affected the intended outcomes for plant biodiversity, highlighting the importance of a clear and organized management system for long-term project success.



Figure A.1 : Dune Peninsula designed by Site Workshop, Tacoma, Washington (Isett, 2019)

This project transformed a former Superfund site in Tacoma into a public recreational landscape that celebrates both the area's industrial and natural histories. The 11-acre Dune Peninsula project is part of the larger 46-acre waterfront redevelopment within the greater 760-acre Point Defiance Park. At its core, the site features a 5-acre native prairiescape. The designers emphasize that less than 3% of the regional prairies remain intact (Site Workshop, 2019).

The prairie provides valuable urban habitat for insects and birds while offering educational opportunities that promote awareness of conservation and alternative land management strategies (Site Workshop, 2019). These approaches demonstrate how low-maintenance, ecologically rich public landscapes can succeed in urban contexts. The project serves as an example for efforts to reclaim industrial sites as recreational destinations that support diverse and resilient ecologies.

During establishment, the prairie experienced stress from over-irrigation, ultimately highlighting the natural resilience of prairie ecosystems requiring much less water than conventional landscapes (Yocom, Wagenfeld, & Habtour, 2022).

The prairiescape achieves significant resource savings: approximately 300,000 gallons of water and \$3,800 in irrigation costs annually compared to conventional park landscapes. Socially, it offers visitors a strong sense of place and well-being, fostering meaningful connections between people and the natural environment. One ongoing challenge during the project's development was sourcing appropriate native seed mixes, as weather events can limit the availability of collected seed for planting (Yocom, Wagenfeld, & Habtour, 2022).

HAVEN KIERS

*Associate Professor of Landscape Architecture
UC Davis
Davis, California
Interview Date: 11 June 2025*

Haven Kiers is a researcher and associate professor in the Department of Human Ecology at UC Davis. She brings a unique perspective to the subject, combining her master's education in landscape architecture with her current research on sheep grazing on the UC Davis campus.

During our interview, Haven noted that public perception presents both challenges and opportunities. On one hand, her work is sometimes not taken seriously at the arboretum or municipal scale. On the other hand, one of the greatest surprises of her research has been witnessing the positive impact on the public, who report significant social benefits from seeing sheep grazing on campus. She expressed excitement about the multiple benefits that sheep provide to human landscapes, including grazing, wool, and social interaction, highlighting that "sheep want to be around people, and people want to be around them."

Haven discussed the practical logistical requirements for grazing sheep, including the labor involved in loading, unloading, and supervising them during the day. She also highlighted constraints imposed by animal rights policies and research guidelines, such as prohibitions against leaving sheep out overnight and restrictions on direct human interaction; sheep must be kept in a fenced enclosure.

She emphasized the difficulty of quantifying the benefits of sheep grazing, noting that few studies compare conventional mowing practices with grazing in urban settings and that labor analysis is inherently complex. Additionally, because her research focuses on the social benefits of grazing, human psychological benefits such as enjoyment, stress relief, or community engagement are particularly difficult to measure.

Haven described the practicality of deploying sheep in certain contexts, but clarified that grazing is not a universal replacement for mowing. She identified contexts in which sheep grazing is particularly beneficial, including enhancing mental health among students, fostering community engagement, managing difficult terrain or struggling vegetation, solar fields between panels, initial clearance of overgrown sites, and around glass greenhouses.

Haven also detailed sheep diet and grazing habits. Toxic plants, such as oleander, must be avoided, while bindweed and clover are preferred. She emphasized the importance of timing, noting that vegetation is more palatable when green and that soil moisture influences compaction risk, making winter grazing inadvisable. Spring is considered ideal due to the combination of green vegetation and improved soil conditions that mitigate compaction. She also observed that if sheep remain in one area for an extended period, they will eventually consume whatever vegetation is available.

Technological options, such as GPS collars that allow perimeter mapping on a computer, were also discussed. This approach, used at Jupiter Artland, can theoretically contain sheep without physical fencing. Haven noted that fencing remains one of the most labor-intensive aspects of sheep grazing, with the erection and removal of fences posing ongoing challenges. She suggested that the ideal fencing setup would simplify management through easily opened and closed sections and perimeter fencing. Bollards can also facilitate quick attachment and detachment.

Haven mentioned that online calculators and herd management tools can estimate the number of sheep required, grazing duration, and land requirements, depending on breed and supplemental feeding practices.

Finally, when asked about the most important features for designing grazing landscapes, Haven emphasized water access, fencing, and shade.

MATT WOOD

*Principal
Site Workshop
Seattle, Washington
Interview Date: 30 January 2026*

Matt Wood, a principal at Site Workshop, a local Seattle landscape architecture firm, shared extensive insights into the design, establishment, and management of native prairie landscapes in urban settings. Our conversation primarily focused on the design, implementation, and management of Site Workshop's prairie project, Dune Peninsula. His observations highlighted both ecological and social challenges, as well as strategies to navigate them.

Aesthetics and Public Perception

One of the biggest challenges with prairie landscapes is that people in positions of power often reject their aesthetic. However, community members, specifically those who visit Dune Peninsula, generally appreciate ecological landscapes, which was reflected in social surveys and the LAF Case Study. To address aesthetic concerns, designers sometimes create "prairie lite" landscapes, which capture the essence of a prairie but are ecologically simplified.

Agrostis pallens, a native grass species, is effective at discouraging weeds, making maintenance more manageable. Signage and small fences can provide cues for care, and visitors respond positively to seeing insects and birds. Matt noted that the need for signs to help people appreciate dormant landscapes reflects society's disconnection from natural seasonal cycles. Native prairies naturally turn brown by July, and managers face the challenge of helping the public appreciate these dormant phases. Interpretive elements, such as explanations of plant dormancy or the use of annual wildflowers for summer color, can enhance public understanding and enjoyment.

Planting, Soils, and Management

Matt discussed the importance of soil selection and planting strategies. In the Dune Peninsula project, soil was harvested from a nearby slope to avoid introducing a seed bank. Test plots with different seed mixes and amendments revealed that slower-growing plots, rather than those with the most robust growth, support greater biodiversity, because fast-growing species can outcompete slower-growing species.

Municipal codes can complicate restoration. For example, city regulations require 10% compost in planting beds, which promotes productivity but can outcompete desired species and favor weeds. Turf requirements, by contrast, require only 5% compost, but city compost may contain micro- and macroplastics. Matt highlighted that young code reviewers often prioritize checking boxes over ecological outcomes, and that an emphasis on productivity (more moisture and nutrients) conflicts with prairie restoration. Wetter landscapes tend to be less diverse because competitive species dominate.

He also discussed the challenges of contractor involvement, noting that giving too much control to contractors can undermine restoration or experimental planting efforts. For example, he highlighted an incident in which the contractor sold off the stored soil that was intended for use, which complicated the process of soil selection.

Matt emphasized that managing the site's existing seed bank is one of the biggest challenges in planning ecological plantings, which is why imported soils are sometimes preferable. Ideally, soil could be laid out and left to suppress unwanted seeds before planting, but public expectations and project timelines often make this impractical.

Seed, Genetics, and Establishment

Matt emphasized that seeding density requires careful balance: if seeds are too dense, slower-growing species are outcompeted; if too sparse, weeds can dominate. For the Dune Peninsula project, seed was sourced from a local supplier to ensure quality and preserve regional genetics. However, he noted that climate change and extreme weather events can threaten the success of strictly local genetics. He stressed that native plants must be actively

planted to ensure regeneration, but recommended finding a balance that incorporates novel plant communities, providing ecological “insurance” to improve the long-term success of the landscape.

The Dune Peninsula project, built in 2019 just before the pandemic, illustrates the importance of ongoing management. Lack of weeding and maintenance resulted in few of the originally planted species surviving. Despite this, some rare birds and insects continue to use the site, emphasizing the ecological value of these landscapes and novel plant communities.

Weeds and Plant Dynamics

Matt highlighted the importance of recognizing novel plant communities. Many weeds persist because they produce abundant seeds, which attract birds and insects. He argued that management should be case-by-case rather than zero-tolerance. Annual weeds thrive for 1–2 seasons and respond to disturbance, while perennial weeds pose a long-term threat.

Invasive grasses are particularly challenging: they are competitive, difficult to identify, and can prevent forbs from regenerating. Without periodic disturbance, grasses dominate. Summer drought is a natural control mechanism, and irrigation should generally be limited after the first year.

Design, Delivery, and Stewardship

Matt emphasized that successful prairie landscapes require rethinking how we design, deliver, and manage them. Ideally, knowledgeable teams would install, manage, or train the next manager to read shifting dynamics and intervene appropriately. Relationships with plants are essential, yet current economic and industry structures do not support such care. He noted that Seattle Parks tends to favor lawns and low-diversity plantings, which makes achieving diverse prairies difficult.

He also advocated for “embracing slowness,” reducing productivity pressures, adding stress to slow growth, and allowing ecological processes to unfold naturally. Sandy soils can help slow growth and reduce maintenance. Management strategies must consider site-specific conditions. For example, wetter landscapes like Burke Meadow are more porous and challenging to manage but provide unique opportunities for community engagement and ecological education. Volunteers and ongoing human stewardship are critical, and prairies are an expression of the relationship between humans and the land.

Challenges in Plant Sourcing

Matt noted that sourcing native plants for public landscapes is increasingly difficult. Only a few nurseries grow plants at scale, and some are closing, making long-term planning uncertain. People are essential to prairie landscapes, not only for planting and maintenance but also for seed collection and ongoing stewardship.

Conclusion

Matt’s insights underscore that creating resilient, biodiverse prairie landscapes in urban settings requires careful planning, ecological knowledge, ongoing human involvement, and adaptive management. Without trained and committed people, restoration goals are extremely difficult to achieve.

JASON HENRY + RHYS VAN BEMMEL

Jason Henry | Principal

Rhys Van Bommel | Project Manager

Berger Partnership

Seattle, Washington

Interview date: 12 February 2026

Jason Henry and Rhys van Bommel of Berger Partnership, a local landscape architecture firm, were interviewed to provide historical, ecological, and design context for the arboretum prairie project that serves as the primary case study for this thesis. This interview was particularly valuable for clarifying the site's long-term vision and the institutional, ecological, and cultural considerations shaping the proposed prairie landscape.

They discussed the long-standing desire for open space within the arboretum, which contrasts with the dense canopy of its tree collections. This project introduces a new landscape typology that expands the scope of the arboretum's collections. The project site is located just north of the oak collection, creating a strong ecological and spatial connection to regional Garry oak landscapes, which support prairie understories.

The site encompasses approximately 22 acres, with an estimated 10 acres identified as suitable for prairie restoration. Native plants are relatively rare within the arboretum, making this site a unique opportunity to expand the institution's living collections. Community engagement efforts revealed interest from the Muckleshoot Tribe in bringing children to the site to share cultural stories and ecological knowledge. The nearby Center for Urban Horticulture also conducts test plots, and the prairie site could support ongoing research and experimentation.

Jason discussed fire management from a practical standpoint within a complex urban context. Historically, fire was used primarily to suppress woody encroachment. Today, however, burning can leave soil exposed and vulnerable, creating both challenges and opportunities for weed establishment. He noted that contemporary burns must be approached differently, as fire can sometimes favor annual grasses.

The site has a layered and challenging history. Between the 1890s and 1940s, it functioned as a landfill that was later loosely capped. In the 1960s, it became home to the "ramps to nowhere," remnants of an abandoned highway project. The area later supported a large homeless encampment and informal structures.

Jason noted that the adjacent boulevard, designed by the Olmsted Brothers, is a registered landmark, and the peninsula itself is manmade, created during excavation for the State Route 520 project, which resulted in the formation of several artificial islands.

Regarding soil strategy, Jason expressed a preference for building soil in place rather than importing it. Strategies discussed included grinding existing trees to generate organic matter and improve soil structure.

The site's ownership is unique and complex. It is currently owned by the Washington State Department of Transportation, though ownership is expected to transfer to Seattle Parks and Recreation. The plant collections within the arboretum are owned and managed by the University of Washington.

Looking ahead, the team anticipates design and permitting to occur over the next four years, with construction potentially beginning around 2030. A major ecological goal for the site is to daylight an existing creek, currently confined to a pipe, thereby restoring hydrology by rewatering the arboretum creek. The proposed landscape integrates a mosaic of habitats, including riparian corridors, wet prairie, vernal pools, dry prairie, and Garry oak systems. The site also supports significant kayak and water-based recreation, presenting additional design opportunities.

Cues for care were emphasized as essential for public acceptance and long-term success. Strategies include maintaining visible edges, such as mowing the first 10 feet of prairie adjacent to paths, and providing interpretive signage to communicate intent. Jason and Rhys noted that public perception of native landscapes has shifted

significantly over the past decade, making this approach more viable today than in the past.

Although the project timeline poses challenges given its long duration, both interviewees expressed enthusiasm about the arboretum's strong institutional buy-in, which they identified as critical to the project's success. They also discussed the importance of designing for wildlife, including habitat support and the potential reintroduction of western gray squirrels, reinforcing the prairie's role as both an ecological and cultural landscape.

JOSH FARMER

Owner and Operator
The Goat Lady

Duvall, Washington

Interview date: 19 February 2026



Figure B.1 : Josh of *The Goat Lady*, with his herd of sheep + goats, photograph by author, 2026

I searched for sheep herders in Seattle and came across Josh who runs and operates *The Goat Lady*. I presume the name is *The Goat Lady* rather than *The Goat Man* because there is typically one (intact) male goat for every 50 female goats in his herd.

Josh, originally from Berlin, has a degree in Photogrammetry from University of Heidelberg. He said, “*I’m a math geek, and now I’m a goat herder.*”

Josh maintains a herd of about 200 goats and sheep, which he rents out to commercial and residential sites. He no longer works with municipalities because he mentioned they are notoriously a bit difficult to work with.

Herd Composition + Grazing Strategy

The majority of his job sites contain invasive Himalayan blackberry, which goats are preferred over sheep. However, every site with blackberry also contains a significant amount of grass, so he typically mixes sheep with goats.

This particular job site was unusual in that it was mostly grass rather than blackberry. On this site, he was using 34 goats and 7 sheep.

He uses Katahdin Hair Sheep because they browse blackberry similarly to goats and shed naturally like dogs, eliminating the need for wool processing. Wool processing is labor-intensive and difficult to manage, and wool would otherwise become tangled in blackberry thickets.

Grazing Duration, Strategy, + Cost

The first plot was a chain-link-fenced residential backyard, approximately 0.3 acres. He kept the goats and sheep on this plot for about 1.5 days, then moved them to an adjacent area outside the fence for another 1.5 days. On smaller job sites like this one, after grazing, he finishes with an electric trimmer. Because the animals are “on the clock,” it would take them longer to begin preferring blackberry stems and brown grasses. Instead, he lets them complete most of the work, finishes mechanically for aesthetic reasons, and then moves them to the next plot.



Figure B.2 : Sheep + goats at work, photograph by author, 2026

This approach keeps vegetation at about 4–6 inches in height. If grazing occurs any lower, he noted the animals may be exposed to parasites in the soil.

This three-day job cost approximately \$1,600. In contrast, hiring a landscaping company would cost \$2,500–\$3,000. The goats and sheep are both a more economical option, and much cuter he notes.

He operates in crews between 20 and 40, and this herd of 40 animals fits into a single trailer for him to deliver with ease to the small job site.



Figure B.3 : Josh and his sheep + goats at work, photographs by author, 2026

He also has a project that is 105 acres, where land is being developed and salmon streams are surrounded by blackberry. The goal is to clear the entire site, and he plans to bring 100 goats to remain there for the entire season.

He mentioned it's not uncommon for goats to be used to clear brush around sites like pipelines. When discussing the arboretum site, he said that 10 acres would take a long time to graze. If speed is the priority, one could bring in 200 animals for a couple of days, or 40 goats and sheep for a couple of weeks. However, his preferred approach is to use mobile fencing, graze about 10 animals in a small plot, and carry out rotational grazing.

Seasonal Constraints + Shelter

This was Josh's first job of the year. Josh does not graze during the rainy season. When asked why, he said, "Do you like working in the rain? Me neither. They don't either." Most of the properties he works on do not have sheltering infrastructure, so he avoids grazing during wet periods.

When discussing shelters, he emphasized that shelters should be portable, such as a calf hut from a dairy. A calf hut is a large igloo-style structure that can shelter five to six goats and be rolled from one location to another.

Fencing + Containment

He uses a 3-foot-tall electric mesh fence. He noted that goats, with their ambitious spirit, require approximately 10 times the electrical charge typically used for a horse to effectively contain them. He noted the animals can feel the vibration and generally avoid it.

Regarding the arboretum site, he mentioned if rotational grazing is intended to be a permanent feature of the site, he recommends installing a chain-link fence would be the most practical solution.



Figure B.4 : Sheep + Goats of *The Goat Lady*, photographs by author, 2026



Figure B.5 : Fergie, the goat, photograph by author, 2026

Animal Handling + Safety

Both male and female goats have horns, but he trims the horns when the goats are young. This prevents them from getting stuck in fencing and becoming vulnerable to predators such as coyotes.

The only sites where he will not bring goats are areas with large amounts of downed logs, unless the property

owner wants him to cut them. Goats will climb onto the logs and can escape easily.

He stated that there are virtually no places goats cannot be used, except near poisonous plants, specifically rhododendrons or anything in the rhododendron family. When goats first encounter rhododendrons, they will run toward them. His method is to give them three leaves, allow them to become sick and vomit, administer vitamin B12, and then they recover and learn to avoid the plant. On some job sites, he does not fence rhododendrons out and has observed the mother goats pushing their babies away from the plants.

When asked about the dangers of urban pollutants or pollutants in stormwater retention ponds, he said it was not a concern for him, nor has it seemed to be an issue.

Several of his goats were pregnant and typically have an average of two babies, sometimes three. He mentioned that Nigerian goats can have up to five. He selects the weaker babies to sell so that the mother can raise one strong offspring, and the babies join the herd within about 10 days of birth.

Soil Compaction + Environmental Considerations

When asked about soil compaction, Josh said he does not worry about it. He avoids grazing during the rainy season and the animals do not weigh enough or stay long enough in one place to cause compaction. He emphasized that his grazing strategy relies on short-duration grazing which does not cause issues of compaction.

Human–Animal Connection

Josh emphasized how goats are much cuter than lawnmowers. He shared an experience about an army veteran experiencing PTSD who helped him assist in the birth of a goat. He observed that the man visibly immediately relaxed and stopped shaking during the experience.

He also spoke about his son, who has been living in Ukraine for three years, and about consulting with people there. He discussed how many people are experiencing shell shock and with how therapy being prohibitively expensive, people's interactions with goats have been helping them cope through war-stricken times.

Business Model, Travel + Scheduling

Josh discussed how profitable the business can be. An apprentice he trained who was 22 years old and without a college degree or debt, started his own operation and made \$150,000 in his first year. Josh stated that a flock of about 40 animals generates approximately \$18,000 per month. He said, *"As soon as you string two or three crews together, all of a sudden you've got something. Which allows us to go to the Olympics."* He had just returned from a 1.5-week trip to Milan to attend the Winter Olympics.

When asked how he is able to leave for extended periods, he explained that it is all about scheduling. When traveling, he schedules jobs at HOA stormwater retention ponds, which provide water and are enclosed by large chain-link fences. He brings a bale of hay for supplemental feed and can leave the goats there for a couple of weeks.

During the operating season, this schedule results in him working 7 days a week for only a few hours per day. Josh described helping a woman in Northern Germany who now manages a flock of 1,000 sheep on an environmentally sensitive island. The government pays her €140,000 per year, and she supplements this income by selling wool and meat.

Herd Calling

To call his herd, Josh uses a vocal call and claps his hands three times. When asked what his call was, he joked, “*I don’t know you that well,*” and then demonstrated. The entire herd looked up at once and ran toward him. He explained that all herders have their own call, similar to cattle herders. The animals respond only to familiar calls, which also helps prevent theft.

Origins of the Business

Josh got started in the business after buying property in Duvall that was overgrown with blackberry. He bought two goats with the intention of letting them clear the site and then rehoming them. He tethered them to a stake and moved them daily. By the time the job was finished, he had grown attached and decided to keep them and expand the herd. He began with a Ford van, removing the seats so he could transport about 20 goats at a time.

Experience + Knowledge Sharing

When asked about competition, he said there may be only four other goat herders in the state, and there is very little competition.

Drawing on 19 years of experience, he can look at a site and estimate within about two hours how much his crew will consume in a 24-hour period. He said, “*It’s not rocket science—it’s just paying attention.*”

He also meets with veterinary students from Washington State University every year, teaching them how to treat animals without relying on a medicine cabinet. He treats lice using salt only, without the use of other chemicals.

CORY GARDNER

*Restoration Specialist
Padilla Bay National Estuarine Research Reserve
Washington Department of Ecology
Mount Vernon, Washington
Interview date: 23 March 2026*

I met with Cory Gardner, the restoration specialist at Padilla Bay National Estuarine Research Reserve, who is carrying out prairie restoration research funded by the Bipartisan Infrastructure Bill. Cory has been working at Padilla Bay for a little over five years, and the prairie restoration project has been ongoing for three years, with two more years of available funding.

Cory emphasized that prairie restoration is highly site-specific, making it unclear how transferable their research is to other locations.

When I arrived at the site, it was very muddy with standing water. This is notable because North Sound prairies are typically more forb-dominant, which may be a result of these wetter conditions compared to South Sound prairies.



Figure B.6 : Padilla Bay National Estuarine Research Reserve prairie plots, Photograph by author, 2026

Why Prairies

When asked why they are researching prairies, Cory emphasized that it is because they are extremely endangered with only about 3% in the state of Washington remaining, and even less in the North Sound. From the site, we

could see oil refineries across the bay, which Cory noted used to be a vast camas meadow.

Local tribes no longer have access to culturally important plants or prairies. What remains is largely confined to small islands in the bay, which require private boats to access. Padilla Bay aims to create a prairie that is accessible to the public, allowing the community to engage with and learn about these landscapes.

Their long-term goal is to collaborate with the Samish Tribe in a co-management model, where tribal members can harvest camas and carry out cultural burning practices.

Site History

The property was originally an old-growth forest, later logged and converted into a cattle farm under the Brazeale family. The family eventually donated the land to the state to become a nature reserve.

When the project began, the site did not have any native plants on site. Cory noted that this can actually make restoration easier, as it allows for a “tabula rasa” approach where all non-native vegetation can be removed.

Methods

They are using staged-scale restoration, a method developed by Jonathan Bakker of the University of Washington. This approach begins with small test plots to trial different treatments, then scales up based on observed success.

At Padilla Bay, this began with 45 plots, each 30' x 30'. Based on outcomes, they scale up to plots of approximately 100' x 100', and eventually to the full 15-acre site. This allows for informed, proactive adaptive management rather than reactive decision-making.

Each treatment is replicated five times and randomly distributed across the site. They tested three primary methods for site preparation, including burning, herbicide, and solarization, as well as two soil preparation methods, including tilling and drag harrowing. Cory noted that the site has a shallow clay layer, limiting water infiltration. As a result, drag harrowing, which only disturbs the surface, was less effective, and tilling is likely the better method at this site.

They have not conducted post-treatment burning, focusing instead on site preparation treatments.



Figure B.7 : Aerial of Padilla Bay National Estuarine Research Reserve prairie plots (Google, 2025)

Burning

After mowing, plots were burned in early October and seeded shortly after. This timing was constrained by burn bans, which are typically lifted during wetter months. As a result, much of the vegetation was still green, limiting burn effectiveness. Cory noted that, in hindsight, they should not have mowed beforehand, as more dry biomass would have produced a hotter, more effective fire.

Solarization

In the first year, solarization was ineffective due to the thin plastic that tore easily. In the second year, they used repurposed billboard vinyl, which proved more durable and easier to manage due to its smaller size.

Solarization was ultimately the most effective treatment, though it depends heavily on sufficiently hot summer conditions. The longer the tarps remain in place, the more effective the treatment. However, it is also the most difficult method to scale. They plan to solarize future plots in two-acre increments, depending on material availability.

Herbicide

Herbicide treatments were largely ineffective, likely due to poor timing. Applications were made in early spring and late fall, after many plants had already gone to seed.

Cory noted that glyphosate is one of the more environmentally benign herbicides and that there is significant misinformation surrounding its use. Cory emphasized that restoration without herbicides is extremely difficult. A major challenge is communicating this to the public. Part of their research aims to reduce herbicide use, both due to chemical concerns and the labor-intensive nature of application.

Seed Sourcing

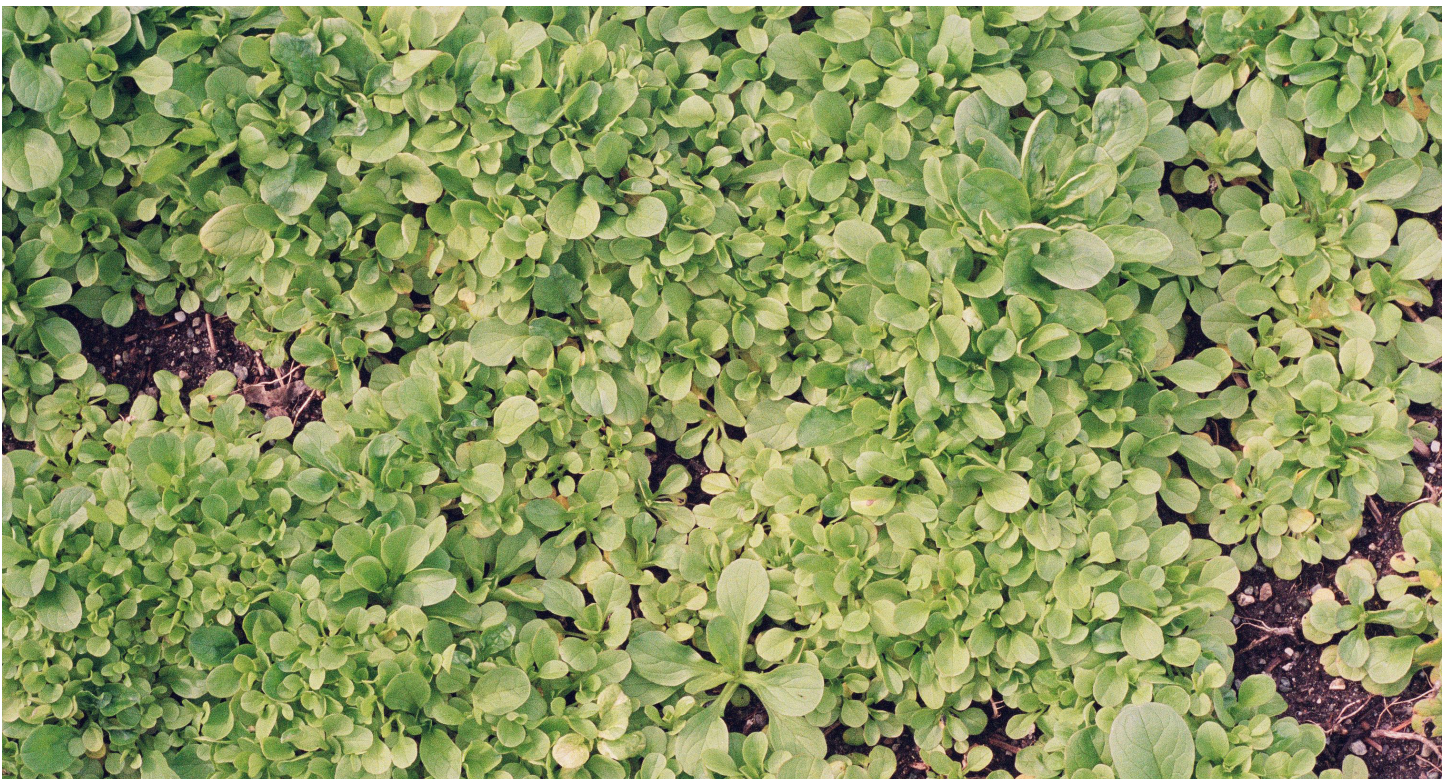


Figure B.8 : Emerging seedlings in cultivated beds at Padilla Bay National Estuarine Research Reserve, photograph by author, 2026

They noted the difficulty of sourcing seed, with only four or five suppliers available, and limited assurance of regionally specific genetics.

Their seed is sourced from across Western Washington and northern Oregon, supplemented by species propagated on-site, particularly species that are difficult to source in bulk or typically sold as small bulbs. Cory is currently growing around 20 species in small garden beds, as it is more cost-effective and allows for the production of larger, more resilient bulbs.



Figure B.9 : Emerging camas in cultivated beds at Padilla Bay National Estuarine Research Reserve, photograph by author, 2026

Within test plots, they experimented with different seed mixes:

- 50% grasses / 50% forbs
- 60% grasses / 40% forbs
- 80% grasses / 20% forbs
- 98% forbs / 2% grasses

They ultimately chose to scale up the 98% forb / 2% grass mix. Each mix contains approximately 40–50 species.

Cory suggested an alternative strategy to seed 100% forbs initially, apply grass-specific herbicide in year one, then introduce native grasses in year two. This approach targets non-native grasses, the most aggressive competitors, without harming the native forbs.

When asked about distinguishing meadows from prairies based on forb-to-grass ratios, Cory noted they had not encountered this distinction and tend to use the terms interchangeably.

Cory also noted regional differences: North Sound prairies tend to be more forb-dominant, while South Sound prairies are more grass-dominant. At Padilla Bay, situated in the North Sound, a more forb-dominant mix was considered more appropriate.

Some seeds failed to germinate, possibly due to improper storage by suppliers. However, in year two, 7 of 8 annual species and 9 of 10 grass species successfully established.

Successful species include *Plectritis congesta* (seablush), *Gilia capitata* (blue thimble flower), and native annual lupine.

Cory emphasized how easy annuals are to establish and questioned why they are not used more in designed landscapes. They observed high pollinator activity in annual plots and suggested their use as a “nursery crop” to support perennial establishment.

Assisted Species Migration

They have not focused heavily on assisted migration, prioritizing the establishment of target species instead and focusing on sourcing the desired species at all.

Cory noted that assisted migration is controversial. Some advocate strongly for preserving local genetics, while others see value in introducing broader genetic variation. Within the same species and across seed zones, assisted migration may be more acceptable.

Seed zone specificity ultimately depends on nursery practices— some suppliers provide detailed provenance, while others do not.

Monitoring and Scaling Up

Their monitoring combines quantitative metrics with practitioner intuition. Methods include:

- Point intercept sampling (percent cover)
- Species inventories (richness and diversity)
- Year-round photo monitoring
- Weekly soil moisture monitoring

Cory noted that point intercept can miss species, while visual estimates often better capture overall plant cover. Cory emphasized that practitioners can often visually identify ineffective treatments without formal data.

As they scale up, they may incorporate adjustments that may not be considered scientifically rigorous but improve practical outcomes.

One surprising finding was how visually distinct treatments are. Cory noted they can easily identify treatments simply by looking at plots.

Prairie Establishment

Test plots are significantly behind nearby island prairies in establishment and blooming. While island prairies were in full bloom, Padilla Bay remained largely a mudflat.

A key partner is the Eco Studies Institute, with which they collaborated on restoration work on nearby remnant prairie islands. Cory noted that the manual removal of Scotch broom was labor-intensive but highly effective, revealing a viable prairie seed bank that regenerated quickly.

Prairie Protection and Funding

We discussed restoration at Joint Base Lewis-McChord, where ecologists reportedly must wear bomb vests

while working. Cory highlighted a major funding gap: estuarine restoration receives funding due to regulatory frameworks, while prairie restoration lacks comparable mechanisms.

At Joint Base Lewis-McChord, restoration is funded as mitigation for environmental damage. In areas near the Mima Mounds, visitors note that ongoing artillery noise significantly impacts the experience.

Cory noted that Padilla Bay is unusual in that they were given flexibility and funding to pursue their prairie restoration research.

Grazing Potential

When asked about grazing, Cory said they were unable to find a practical solution. Temporary fencing is costly and difficult to justify for very short grazing durations.

Suggestions for My Thesis

Cory suggested treating the arboretum as a test plot. By varying treatments across the site rather than applying a uniform approach, it becomes possible to observe how different strategies perform over time.

Potential for Community Engagement

Cory emphasized the value of prairies for community engagement. Unlike forest restoration, which may take 50–100 years to visibly mature, prairies establish quickly, often within one to two years. This rapid feedback keeps people engaged and motivated to participate.

SARAH HAMMAN

Director of Science
Ecostudies Institute
Olympia, Washington
Interview date: 3 April 2026

Sarah is the Director of Science with the Ecostudies Institute, where she oversees and helps guide management of some of the remnant prairies in the Puget Sound as well as private lands managed for conservation purposes.

EcoStudies Current Work

Sarah is currently working toward publication on high-intensity rotational grazing with spring deferment and native seeding in the fall to support the establishment and maintenance of native plant communities in rotationally grazed lands. This work is expected to be published this year in *Rangeland Ecology and Management*.

The research is focused in Southwest Washington across Thurston, Lewis, and Grays Harbor counties, primarily within the Chehalis Basin, because that is where funding is currently available.

The Ecostudies Institute is 100% grant-funded and is currently supported by the Washington Coast Restoration Resiliency Initiative, a state-funded program through the Recreation and Conservation Office. In some ways, their work is limited by the scope of available grants, however, they also have the opportunity, contingent on securing funding, to expand and pursue additional projects that align with their goals. Most of their work focuses on prairies and oaklands.

This work has been ongoing for four to five years, and they have recently secured an additional four years of funding. A key component of this phase is identifying private landowners interested in conservation, many of whom are actively seeking involvement. They have set a general threshold of about 20 acres for participation, targeting lands that are not currently being grazed or actively managed. These sites are often pastures or abandoned pastureland, recently acquired or inherited properties, or lands that have lacked active management for extended periods.

Many of these pastures are dominated by non-native species, and in some cases, highly invasive species such as scotch broom, tansy ragwort, and other pasture grasses. Landowners are often interested in reintroducing animals as a management strategy.

Ecostudies partners with several organizations including WSU Extension, Natural Resources Conservation Services, U.S. Fish and Wildlife Service, Expansion for Natural Lands Management, Quamash EcoResearch, the Washington Department of Veterans Affairs, and ranchers, to identify landowners and promote both conservation and production goals.

Ecostudies Institute conducts vegetation and avian monitoring, while Quamash EcoResearch conducts pollinator monitoring to track progress toward conservation goals over time. Ecostudies also helps coordinate grazing management alongside restoration actions such as removing noxious weeds and planting or seeding native species.

Burning

Burning is typically conducted on a three- to five-year rotation. Sarah noted that patch burning has been used extensively in other parts of the country, particularly in the Southwest and Southeast. However, it has not been widely implemented in this region, as private land burning with her work has only occurred a few times, and only once in combination with grazing.

Burn frequency varies depending on site conditions. The three- to five-year cycle is largely based on goals of advancing native diversity, limiting shrub and Douglas fir encroachment, and creating conditions that allow native seeds to establish.

Even on sites that have been burned four times over the past 20 years, native seeding is still routinely implemented to enhance the seed bank, as most sites continue to experience significant weed pressure.

Burning is often paired with additional treatments, including seeding and post-burn herbicide or other invasive management tools, to reduce competitive pressures.

Burning can occur as early as July and extend into September or October, depending on when seasonal rains begin and when burn bans are in place.

Grazing

Grazing strategies are highly dependent on both ecological goals and rancher needs. Often, grazing occurs in the year following a burn due to increased vegetative growth.

Across all sites, there is a strong emphasis on maintaining spring deferment, allowing native vegetation to grow, flower, and set seed. Without this, grazing can be counterproductive and suppress the native plant community.

Site conditions, particularly moisture and nutrient availability, can limit grazing opportunities. For example, in very dry conditions, vegetation may senesce early, making post-spring grazing less viable.

Spring represents the most productive forage period, which creates a challenge. Spring deferment requires ranchers willing to accept lower short-term productivity and move animals across multiple sites. This level of flexibility of moving animals in and out for short durations (often a couple of weeks), is both logistically complex and costly.

Timing is critical, especially following burns. If animals return too soon, they may consume plants that are just resprouting. Grazing must be carefully timed to allow plant recovery.

Grazing and burning are avoided during late spring and summer when plants are flowering, to ensure successful reproduction.

Most sites are grazed annually but not continuously. Animals are typically present for days to weeks at a time, rather than months. Grazing is used as a targeted tool to meet specific ecological objectives. Low- to moderate-intensity grazing typically involves short-duration, highly targeted applications.

Grazing strategies are tailored to specific conservation goals. For example, at one site managed for Oregon spotted frog habitat, 30–40 animals may graze a few acres for only five days before being moved. This occurs in the fall to reduce reed canary grass to an appropriate height for frog breeding in February, while also crushing accumulated thatch.

Some sites are grazed to promote camas production and create open conditions for seeding. Heavier fall grazing can expose bare ground, facilitating native seed establishment and reducing competition from grasses.

A major logistical constraint across all sites is fencing. Perimeter fencing is essential, as livestock owners will not bring animals without it. Internal paddocks are often created using electric fencing, typically provided by ranchers.

Providing fencing infrastructure would be a significant incentive for rancher participation. Sarah recommended establishing at least a couple of paddocks to promote biodiversity.

Livestock operations also require a certain level of site productivity to be viable, which can limit participation on

lower-productivity sites.

Seed Mix

Seed mixes often include non-native pasture grasses, as the goal is not to create exclusively native systems, which is both unrealistic and also not sufficiently productive for grazing.

Native prairies can support wildlife such as deer and elk across large landscapes, but smaller sites require higher productivity to sustain livestock operations.

Native grasses tend to be low-yielding and bunch-forming, leaving significant areas of open ground. While this structure benefits pollinators and ground-nesting birds, it is not ideal for high-productivity grazing systems.

As a result, all grazed sites include a mix of forage grasses. Non-native forbs are also incorporated, alongside primarily native forbs, including species like red clover, which provide high-quality forage and are also nitrogen fixing.

Certain native species, such as lupines, can be toxic to livestock, particularly pregnant cows, and may cause fetal deformities. As a result, many landowners prefer to avoid grazing on sites where lupine is present.

Invasive Species Management

Effective management of invasive species presents ongoing challenges. For example, burning must be extremely hot to kill scotch broom, otherwise, it will resprout. Achieving this level of intensity requires precise timing and enough fuel, which can be constrained by burn bans.

Burning and grazing are not effective control methods for blackberry. Both blackberry and scotch broom are typically followed up with herbicide treatments.

Fire is sometimes used intentionally to stimulate a flush from the seed bank. Scotch broom seeds can persist in the soil for over 60 years, meaning that sites with a long history of scotch broom may contain decades' worth of viable seed.

In some cases, they will burn to open the canopy and encourage seed germination, then follow with a second burn or herbicide application before the undesired plants reach maturity.

Herbicides

When asked about glyphosate use, Sarah noted that application depends on the presence of native or sensitive species. Glyphosate is non-selective and will kill all vegetation it contacts.

As an alternative, they sometimes use Garlon, which targets woody and broadleaf species but may also impact native grasses such as fescues.

RAY LARSON

*Associate Director and Curator of Living Collections
University of Washington Botanic Garden
Seattle, Washington
Interview date: 6 April 2026*

Ray described South Puget Sound prairies as a unique landscape type that is not well represented locally without traveling a significant distance. He noted that tribes have been receptive to the overall plan at the Arboretum, which is encouraging. He also referenced his UW thesis from approximately 20 years ago on pre-European-American vegetation in Seattle, emphasizing that very few areas today retain the character of precolonial ecologies.

Merging of Arboretum Management

The site currently referred to as the North Entry is being renamed the Montlake Peninsula. The Center for Urban Horticulture and the Arboretum are in the process of being merged into a single entity becoming the Seattle Botanic Gardens, bringing both sites under one umbrella. While “North Entry” is still used, the name shift reflects a broader redefinition of the site’s position in the Botanic Gardens at large.

Site History

Ray emphasized that this site represents a rare opportunity to work with a sizeable parcel of land within a dense urban context. The site was part of the Arboretum approximately 60 years ago and has since undergone significant transformations, including changes from the lowering of Lake Washington and early Olmsted planning efforts.

Originally planted as part of the Arboretum, the site’s plant collections were relocated following freeway construction. After the lake was lowered, portions of the site were used as landfill, later converted into gardens, and eventually cleared during highway construction. The site has since been cleared again due to recent construction activity.

Project Goals + Potential

Ray mentioned that they are considering not only restoration of the site but also the site’s surroundings. This will require hydrological considerations and substantial earthwork due to the artificial nature of the existing conditions.

As the Arboretum approaches its 100-year anniversary, this project is a primary focus, drawing significant institutional attention. It is also seen as an opportunity to reintroduce the site to the broader public due to its visibility and prominence.

Much of the Arboretum is currently difficult to access or navigate, particularly via public transportation. This site is one of the closest points to the University of Washington light rail station, presenting a key access advantage.

Existing facilities are limited in their ability to support visitors, lacking adequate restrooms, parking, and bicycle infrastructure. This creates an opportunity to incorporate these amenities into future development.

Given the site’s open character and minimal tree cover, it presents an opportunity for a significant welcome center that integrates landscape, education, and visitor services, encouraging longer stays and deeper engagement.

Site Access

Construction is scheduled to begin in 2031, at which point the existing parking lot is expected to be vacated. While early completion is unlikely, additional delays remain possible.

Coordination with WSDOT has been challenging, particularly in relation to disrupted wayfinding and difficulties redirecting visitors during ongoing construction.

Opportunities for Material Reuse

The site is currently covered by a large swath of gravel. There is potential to reuse this material within the prairie soil system, as regional prairies are typically associated with glacial outwash—soils characterized by greater gravel content.

Management

Ray emphasized that active management, such as burning or mowing, will be essential. As an urban site, it will experience significant weed and plant pressure due to surrounding inputs, which will influence meadow size and design.

He identified an opportunity to educate the public about traditional land management practices and alternative approaches. Prescribed burning, in particular, requires careful and intentional implementation. Previous controlled burn efforts, such as at Burke Meadow, have had mixed success.

He mentioned mowing has been more successful in comparable landscapes. Ray suggested incorporating azaleatrial plots to test management strategies, noting strong interest in the learning component to evaluate techniques, understand trade-offs, and identify best practices.

While precedents can inform decision-making, he emphasized that the site's unique ecological conditions limit their applicability. Small demonstration plots could be scaled up based on findings.

Julie Larson, a UW researcher, is currently researching seed-based restoration methods as an alternative to plugs or live stakes, and similar trials could be implemented at the Center for Urban Horticulture.

Turf Management

Because the Arboretum is owned by Seattle Parks, the city is responsible for mowing and trail maintenance. There is a shared understanding that some areas should prioritize habitat and pollinators, while others remain more manicured.

The emergence of the European chafer beetle has influenced turf management practices. Grass is being maintained at a greater height, as taller turf reduces beetle establishment.

This reflects a broader shift toward lower-input management strategies that reduce labor while maintaining acceptable aesthetics. Areas outside primary public zones are allowed to grow longer.

The city does not use pesticides or herbicides in turf management, instead relying on aeration, overseeding, and limited fertilization—significantly less intensive than the adjacent golf course practices.

Signage has been effective in communicating these approaches to the public, with minimal resistance. UW Grounds management, by contrast, tends to follow a more traditional golf course turf model.

Most turf areas in the Arboretum are not irrigated and are allowed to go dormant in summer, with the exception of turf along Azalea Way. This seasonal browning is accepted as standard practice and is a helpful precedent for informing public and institutional acceptance of dormant landscapes.

Talk of Grazing on Campus

Previous discussions at the UW Farm explored introducing chickens, but regulatory barriers proved prohibitive in a public setting.

Ray noted that the primary challenge with grazing is not the act itself, but logistical considerations such as animal housing and whether animals would be permanent or temporary.

Key concerns include humane treatment, predator protection, and preventing public harassment. While these challenges are conceivably solvable, permanent infrastructure such as a barn may not be accepted or feasible within city or university constraints.

Additional considerations include ensuring that on-site vegetation is non-toxic to grazing animals and that animals are protected, particularly during nighttime hours.

Electric Fencing

Because the land is city-owned, implementation is subject to regulatory constraints. However, electric fencing may be feasible if designed with safety in mind, for example, by placing it within a secondary barrier or ensuring voltage levels are not harmful to humans. Clear signage and visibility would be essential.

Public Relations

Ray expressed excitement about the idea of sheep grazing as an opportunity for public relations and community engagement. Christina Owen, the Director of the Arboretum, was mentioned as someone likely to be particularly supportive of this approach.

Timing

Planning efforts for this site have slowed due to Arboretum reorganization but are expected to regain momentum within the next year, making this thesis project a timely moment for engagement and planning.

Focus Forward

Ray emphasized the importance of addressing urban-specific constraints, particularly soil preparation, weed pressure, and ongoing management.

Unlike remnant prairies, where management focuses on removing invasive species or encroaching Douglas fir, this site functions more as a blank slate. As such, careful attention must be given to site preparation and long-term management strategies.

Design considerations may include windbreaks to reduce seed propagation by wind and determining appropriate plot sizes. He mentioned a 20x40 demonstration plot may be viable but relatively small.

He encouraged a focus on the unique challenges of urban prairie systems and recommended studying local precedents, such as Bloedel Reserve, to evaluate successes and limitations.

The Burke Meadow was discussed as an example of a highly constructed system requiring significant effort to develop appropriate soil conditions. Comparing challenges across projects may yield useful insights.

He also encouraged further investigation into site history to understand existing conditions while leveraging the opportunity presented by the site's relatively open, tree-free state.

Assisted Species Migration

The Arboretum's recently released climate adaptation plan includes consideration of tree species from Oregon and Northern California. Ray suggested looking to the Willamette Valley to compare species compositions and assess potential applicability.

This aligns with broader questions about current versus future climatic conditions. He noted that ecological transitions begin around Grants Pass, Oregon.

Additional Notes

Kern Ewing, a long-time professor at the University of Washington, researched prairie restoration systems, focusing on soil preparation. He noted that this site would not appropriately support tree growth due to shallow soils over a capped landfill.

Ewing authored an article on Union Bay Natural Area in *Glacier Magazine* for the Washington Native Plant Society approximately 10 years ago which he mentioned may be helpful in informing this project.

JULIE LARSON

Assistant Professor

Rachel A. Woods Professorship in Restoration

University of Washington School of Environmental and Forest Services

Seattle, Washington

Interview date: 17 April 2026

Laying the Foundation for an Ecosystem

Julie framed the foundation of an ecosystem as everything that comes out of a careful site assessment. This includes understanding the soils that are already present, such as their texture, fertility, level of compaction, and hydrology. At the Arboretum, she noted that this could mean needing to decompact soils, alter the topography, or bring in fill soil depending on existing conditions. If the soil is highly compacted, using a decompactor may be necessary to create conditions that allow plants to establish.

At a site like UBNA, she suggested that the first step might be spending a couple of years working to reduce the weed seed bank before planting anything. In contrast, if fill soil is brought in, there may be fewer weed seeds present, which could allow for more immediate seeding. In many cases, practitioners will simply seed directly into the landscape, but this decision ultimately depends on site conditions.

Soil Composition and the Reuse of Gravel

When thinking about whether to reuse existing gravel on site, Julie emphasized that it depends on how much gravel is actually present, which requires physically investigating the soil. The goal is to create a soil profile that includes organic matter, nutrients, and sufficient water-holding capacity. Gravel can be beneficial in that it improves drainage, which aligns with the conditions of many prairie systems.

However, if gravel is too dominant and not balanced with organic matter, it can create overly harsh conditions that limit plant establishment by reducing moisture retention and increasing compaction. There may also be a cost incentive to reuse gravel already on site, but this needs to be weighed against its impact on soil function and plant success.

Weed Seed Bank Management

Julie described weed seed bank management as one of the most significant early challenges in establishing a prairie system. There are several approaches, including encouraging weeds to germinate and then killing them, burying the seed bank, or removing the top layer of soil entirely and replacing it. In some dryland restoration contexts, practitioners use pre-emergent herbicides that target germinating seedlings. Solarization is also a commonly used strategy.

She referenced a project at Magnuson Park, associated where they were restoring prairie over a former lawn with a significant weed seed bank. In that case, they added a two to three inch layer of sand over the soil and seeded native species into the sand, which helped address weed pressure.

She also spoke to the role of annual species, which can establish quickly, produce large amounts of seed, and then die back each year, contributing biomass and helping to build soil organic matter over time. She noted that mowing is not effective for perennial grasses that resprout from rhizomes, while annual weeds present a different challenge because of persistent seed banks, requiring more strategic and creative approaches.

Phased Planting + Successional Strategies

When discussing phased planting strategies, Julie emphasized that the best approach depends heavily on the severity of the weed problem. One consistent recommendation she offered was to plan for seeding over multiple years as a form of bet hedging, since weather variability and unforeseen challenges can significantly affect outcomes in any given year.

She expressed interest in experimenting with a more explicitly successional approach, starting with ruderal species that are adapted to colonize disturbed and harsh conditions, and then introducing more competitive perennial species later. This approach mirrors how ecosystems naturally recover after disturbance, where early colonizers establish first and begin to modify the environment.

She noted that some species, such as camas, can take many years to establish from seed, which further supports the idea of working across longer timeframes. Ultimately, she reiterated that everything is context dependent, and strategies need to be tailored to specific site conditions.

Succession as a Design Framework

Julie encouraged thinking about natural succession as a primary guiding principle for design. By considering how ecosystems recover after disturbance, it becomes possible to develop planting and management strategies that align more closely with ecological processes. This approach provides a strong conceptual framework for decision-making and helps ground the design in observed patterns of ecosystem development.

Irrigation + Establishment

Julie noted that hydroseeding is typically used on steep slopes to stabilize soils, but is not commonly used in prairie restoration otherwise. She noted that a built irrigation system may not be necessary considering our level of precipitation. However, she acknowledged that during periods of multiple dry years, even a small amount of supplemental water can significantly improve establishment.

She gave the example of the Burke Meadow, where irrigation was left on throughout the summer and resulted in a field dominated by lupine. She also pointed out that seeds generally establish between January and May, when rainfall is sufficient to support early growth.

Soil conditions play an important role here as well, since well-draining soils will dry out more quickly, while soils with greater water-holding capacity can sustain plants for longer periods without additional water.

Designing with Microclimates and Heterogeneity

Rather than relying on irrigation, Julie suggested focusing on designing landscapes that incorporate heterogeneity and microclimates. She emphasized that there is a great deal to learn from traditional ecological knowledge in terms of how landscapes can be shaped to support varying conditions.

This might include using coarse woody debris to create areas that retain moisture, or shaping topography to produce a range of wetter and drier zones within the site. Creating this kind of variability can help buffer the system against environmental fluctuations and improve overall resilience.

Stewardship Over Time

A key takeaway from the conversation was that even with thoughtful upfront design and site preparation, ecosystems require ongoing stewardship. Long-term management should be considered an integral part of

the project rather than an afterthought. Sustaining these systems over time depends on continued human involvement in a way that is intentional and responsive to changing conditions.

Core Takeaways

Overall, Julie emphasized the importance of starting with a deep understanding of site conditions, particularly soils, and addressing the weed seed bank early in the process. She highlighted the value of using succession as a guiding framework, seeding over multiple years as a resilience strategy, and designing for heterogeneity rather than relying on intensive inputs like irrigation. Above all, she underscored that these systems are dynamic and context dependent, and that long-term stewardship is essential to their success.

JON BAKKER

Professor

University of Washington School of Environmental and Forest Services

Seattle, Washington

Interview date: 22 April 2026

Key Takeaways

Be experimental in how you test everything. Success is exceptionally site-specific, and no single method translates universally across landscapes. A minimum of three years of monitoring each plot is preferred before scaling up, as some species take multiple years to emerge or establish.

Prairies require intensive, ongoing management. They depend on people, disturbance, and ideally fire, and must be managed in perpetuity—there is no point at which you step away from them. Continued relationships between people and the landscape are essential to long-term success.

Establishment strategies should combine both seed and plugs. Different species respond better to different methods, and using both increases overall success and diversity.

Management timing should remain flexible rather than fixed to a strict calendar. Decisions should respond to site conditions, weather patterns, weed pressure, litter accumulation, and shifts in plant diversity.

Site Context + Experimental Framework

Jon's work focused on western Washington prairies—sites that were historically prairie but had been cultivated for over a century and were therefore highly degraded. From 2009 to 2014, they worked across four sites: two within two miles of each other on Whidbey Island, and two within ten miles of each other near Olympia. Despite proximity, each site had distinct soil conditions and weed communities.

All sites were dominated primarily by non-native grasses. They implemented a highly controlled experimental framework, testing multiple site preparation methods across small plots (approximately 25–40 m²), with seven treatment types and five plots per treatment. Each plot was seeded with one of three diverse seed mixes, each containing roughly two dozen species.

Treatments included:

- Herbicide application over two years
- Followed by repeated spot spraying
- No soil disturbance
- Prescribed fire
- Herbicide followed prescribed fire
- Herbicide
- Plowing
- Solarization

After identifying preferred treatments, they scaled plots incrementally (40 → 400 → 4,000 m²), adjusting methods as needed.

Site-Specific Adaptation + Treatment Outcomes

Outcomes varied significantly by site. The most effective treatment at one location was herbicide application

without soil disturbance, followed by seeding with the highest possible species diversity. However, this approach did not translate directly to other sites.

At one site dominated by weedy forbs, they shifted to a broadleaf-specific herbicide, initially planting grasses and introducing forbs later. At another site, glyphosate proved most appropriate.

Ultimately, each site required a tailored combination of preparation and seeding strategies. The key takeaway is that prairie establishment is inherently adaptive, and management approaches must respond to existing site conditions.

Monitoring + Establishment Timelines

While two years of observation may provide some insight, three years is strongly preferred before making decisions about scaling. Some species in their seed mixes did not germinate until two years after sowing, meaning early evaluation can misrepresent long-term outcomes.

Certain species establish extremely slowly. For example, camas required approximately seven years before flowering. These delayed timelines reinforce the importance of long-term monitoring and patience in prairie systems.

Planting Strategy + Competitive Dynamics

Planting strategies are always site-specific. Ruderal species are generally not highly competitive, while bunchgrasses, though not dominant above ground, can be highly competitive below ground.

Weed pressure is also highly dependent on life form. Species like blackberry and ivy can be comparatively easier to manage through mowing or manual removal. In contrast, managing non-native grasses and forbs that occupy similar ecological niches as target prairie species presents a much greater challenge.

Disturbance, Fire, and Burn Cycles

Disturbance is essential to prairie function. They aim for a three-year burn cycle, or burning portions of the site on a rotating basis every three years. Ideally, burns occur in August or early September, prior to fall rains, when conditions are driest.

Burning alone is not sufficient for weed control. Non-native species are often the first to regenerate following fire. Their most effective strategy involved burning, waiting approximately two weeks for regrowth (largely non-native), applying glyphosate, and then immediately broadcasting native seed. This sequence proved effective for suppressing non-native species while promoting native establishment.

Annuals + Role of Disturbance

Annual species declined significantly after approximately two years as perennials became established. Maintaining annual species likely requires more frequent disturbance regimes.

Grazing may play an important role in creating and maintaining habitat conditions suitable for annuals, particularly by increasing disturbance frequency and reducing dominant perennial cover.

Soil Conditions + Nutrient Management

Importing soil is neither necessary nor desirable in many cases. Many prairie species perform best in low-nutrient conditions. High nutrient levels favor non-native grasses and weedy species that are adapted to fertile

environments.

If designing a system, the goal would be to maintain nutrient-poor, relatively harsh soil conditions to reduce competition from non-native species and support prairie-adapted plants.

Seeding Techniques + Combined Planting

Seed-to-soil contact is important, and they typically lightly harrow seed into the soil following broadcast seeding.

A combined approach using both seed and plugs is most effective. Species such as fescue, yarrow, and Oregon sunshine establish readily from seed, while others, such as camas, Castilleja, and delphinium, are more successfully introduced as plugs.

Ecological Functions + Species Interactions

Hemiparasitic species such as golden paintbrush play an important role in maintaining biodiversity. By parasitizing dominant species, those they encounter most frequently, they help reduce competitive exclusion and allow a greater diversity of species to persist.

Long-Term Management + Labor Realities

Prairie landscapes may ultimately be more economical than conventional ornamental landscapes, but only if consistent management is maintained. A lapse in funding or maintenance for even two to three years can result in rapid reinvasion by species such as blackberry, Scotch broom, or Douglas-fir, effectively undoing previous progress.

A major challenge is that prairies are cultural landscapes requiring perpetual care, which is difficult to sustain within funding structures that prioritize new projects over long-term maintenance.

Case Example: Glacial Heritage

At Glacial Heritage Preserve, the site was almost entirely dominated by Scotch broom in the 1990s. It required approximately 20 years of consistent, repeated effort, including weekly work parties, to bring the species under control. Today, scotch broom is sufficiently reduced that it can be managed primarily through fire.

Experimental Precedent: UBNA Gravel Mounds

An experimental project at UBNA transformed a former gravel parking lot by constructing mounds and planting prairie species. Decades later, species such as camas and potentilla continue to persist on these low-nutrient gravel mounds. This demonstrates the long-term viability of prairie species in harsh, low-resource conditions and reinforces the potential of designing intentionally constrained soil environments.

Livestock + Historic Analogs

Livestock grazing does not directly replicate historical conditions in these prairies. While elk were present, there is no recent history of large bison herds. However, grazing can still function as a useful disturbance tool, particularly for maintaining certain habitat conditions, even if it is not a direct ecological analogue.

Seeding in Perpetuity

Whether ongoing seeding is necessary depends largely on how the seed bank develops over time. This includes both native and non-native species, and management must account for both in long-term strategies.