Clawson-Youngs Reports 2026:

Environmental Studies Through Various Lenses

Reports Authored by Clawson-Youngs Recipients

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Contents

Foreword

Several years ago, Alicia Kinne-Clawson and Michael Clawson kindly created the Bill Youngs Endowment at Eastern Washington University. The first project under the endowment is known as the Clawson-Youngs Environmental Studies Award. To qualify undergraduate and graduate students in any field on campus submit a proposal for research on a theme in environmental studies. This booklet consists of the reports written by each of the award-winning students on their project results.

- J. William T. “Bill” Youngs

Preface

The projects gathered in this report demonstrate the extraordinary breadth and vitality of contemporary environmental scholarship. Their subjects range from coral reefs in the Caribbean to prairie restoration in eastern Washington, from groundwater contamination to renewable energy, from Indigenous fishing traditions to immigrant experiences of belonging. Yet despite this diversity, several powerful themes connect these studies and reveal a shared vision of the relationship between people and the natural world.

First, these projects remind us that environmental issues are never simply environmental issues. They are simultaneously scientific, historical, cultural, educational, and ethical questions. Whether examining coral disease in Montserrat, PFAS contamination in the West Plains aquifer, or groundwater decline in the Spokane River watershed, these researchers show that the health of ecosystems and the well-being of human communities are deeply intertwined. Nature and society cannot be separated; each shapes the other.

A second theme running through these studies is environmental justice. Monique Baxter's work demonstrates that the environmental inequalities visible in Spokane today often follow the boundaries established by discriminatory housing practices decades ago. Environmental burdens are not distributed equally, and the landscape itself can preserve the legacy of historical injustice.

Similar concerns emerge in Mason Brickett's examination of Indigenous reef net fishing and Beck Walsmith's exploration of cell-cultured salmon. Both projects ask who benefits from environmental change and technological innovation, and whose voices are excluded from the conversation. They remind us that environmental policy is also about questions of sovereignty, cultural identity, and access to traditional resources.

The importance of Indigenous knowledge and traditional ecological understanding forms another important thread linking these projects. Indigenous reef net fishing practices reflect generations of environmental observation and stewardship, while educational initiatives intentionally incorporate Indigenous perspectives into environmental learning. Together, these studies challenge the assumption that modern science alone holds the answers to contemporary environmental problems. Instead, they point toward partnerships between scientific research and traditional knowledge as a pathway toward more effective and more equitable environmental management.

Stewardship and restoration also stand at the center of this body of work. Rather than dwelling solely on environmental decline, many of these projects focus on renewal and recovery. Emma Bartholomew investigates probiotic bacteria that may improve coral resilience against Stony Coral Tissue Loss Disease, contributing to future efforts to protect and restore vulnerable reef ecosystems. Emerson Slanga examines PFAS contamination in the West Plains aquifer, using spatial analysis to identify contaminant sources and movement patterns that can inform groundwater remediation and public health protection. Yaelle Reeve's work on pollinator islands contributes practical knowledge for restoring the endangered Palouse Prairie, while Jessica Clemons and Ashlynn Huttenmaier transform restoration and watershed science into opportunities for young students to become active participants in environmental learning. Together, these projects demonstrate that restoration is not simply an ecological process but also a scientific, educational, and community endeavor.

Education itself emerges as one of the most powerful tools for environmental change. Through inquiry, investigation, and place-based learning, students are encouraged not merely to study environmental problems but to participate in solving them. The goal is not simply knowledge but stewardship, preparing future citizens to think critically about their relationship with the natural world and their responsibilities within it.

Community engagement represents another defining characteristic of these projects. Prairie restoration efforts rely upon volunteers and public participation. Renewable energy studies incorporate interviews and local experience. Scientific research is increasingly paired with outreach and collaboration. These projects suggest that successful environmental solutions cannot be imposed from above but must be built through partnerships among researchers, communities, and institutions.

Several studies also highlight the importance of culture, identity, and belonging in shaping environmental relationships. Andrey Kendys shows how outdoor traditions help Slavic immigrant families maintain cultural identity and strengthen family bonds, while Nara Shin explores how immigrants and refugees rebuild connections to place following displacement. Myra Miller examines the Rattlesnake Flats Wind Energy Project near Ritzville through the lens of her family's connection to a local wind-turbine farm, demonstrating how renewable energy can support environmental sustainability while strengthening rural communities through economic development and responsible land stewardship. Together, these projects remind us that

landscapes are more than physical environments. They are also places of memory, tradition, innovation, and meaning.

The importance of place itself is a recurring theme throughout the report. The Salish Sea, the Palouse Prairie, the Spokane watershed, Montserrat, and the West Plains are not simply locations where research occurred. They are active participants in the stories being told. The projects demonstrate the power of place-based research to illuminate global questions about sustainability, migration, biodiversity, and environmental change.

Another striking feature of these studies is their interdisciplinary character. Biology intersects with art, history with geography, social work with ecology, and engineering with economics. Phoebe Milatz's watercolor paintings inspired by her work in Montserrat exemplify this blending of disciplines, using art to communicate scientific and conservation themes to broader audiences. The environmental challenges of the twenty-first century are complex, and these projects suggest that they will require equally complex and collaborative solutions.

Perhaps most importantly, these projects convey a sense of cautious optimism. Coral reefs may become more resilient through microbial research. Prairies can be restored. Communities can rebuild belonging after displacement. Renewable energy can support both sustainability and economic development. Even studies that confront contamination, injustice, or ecological decline point toward possibilities for restoration, adaptation, and resilience.

Taken together, these projects offer a compelling vision of environmental scholarship for our time: interdisciplinary in method, collaborative in spirit, grounded in community, and attentive to questions of justice and inclusion. They remind us that environmental stewardship is not solely the work of scientists or policymakers. It is the shared responsibility of educators, artists, historians, communities, and citizens.

Ultimately, the lesson that emerges from this collection is both simple and profound: the future of environmental sustainability depends upon the relationships we build—between people and nature, between cultures and communities, and between knowledge and action. These projects offer inspiring examples of what becomes possible when those relationships are strengthened and sustained.

Project Summaries

Emma Bartholomew investigates probiotic bacteria associated with coral health in Montserrat. Focusing on a potential treatment for Stony Coral Tissue Loss Disease (a rapidly spreading disease that destroys living tissue of the coral it infects), she analyzes microbial communities from multiple coral species and reef sites. Her findings suggest beneficial bacteria are naturally widespread and may support future efforts to improve coral resilience.

Monique Baxter explores the relationship between Spokane's documented housing discrimination and present-day environmental inequalities. Using geospatial analysis, she finds that environmental hazards are concentrated in historically redlined neighborhoods, while covenant-protected areas are generally less exposed. Her work demonstrates the lasting environmental impacts of discriminatory housing policies.

Mason Brickett analyzes the history and ecological significance of Indigenous reef net fishing in the Salish Sea, near the San Juan Islands. His research highlights sustainability, sophisticated environmental knowledge, and cultural importance. He also examines how industrial fishing, legal restrictions, overfishing, and loss of access disrupts traditional practices, illustrating the environmental and cultural consequences of colonization and modernization.

Jessica Clemons created a K–5 environmental education curriculum based on the EWU Prairie Restoration Project. A key component of the project is an Environmental Education Literacy Library of children's books, integrating science, literacy, Indigenous knowledge, and sustainability. The lessons use the 5E instructional model (Engage, Explore, Explain, Elaborate, Evaluate) and place-based learning to teach ecology and restoration. The curriculum encourages students to become active stewards of their environment while strengthening academic skills.

Ashlynn Huttenmaier developed a K–5 science curriculum that focuses on groundwater depletion in the Spokane River watershed. Using inquiry-based learning and the 5E model (Engage, Explore, Explain, Elaborate, and Evaluate), her students investigate river levels, groundwater systems, and human impacts. The curriculum promotes environmental stewardship while building critical thinking, data analysis, and problem-solving skills.

Andrey Kendys studies outdoor traditions among Slavic immigrant families. Participants describe nature-based activities as important cultural practices that promote health, family bonding, and environmental awareness. Although immigration and modern lifestyles create challenges, families continue to value outdoor experiences as a means of preserving cultural identity and passing traditions to future generations.

Based on her research in Montserrat, where she combined biology and art, Phoebe Milatz uses watercolor paintings inspired by tropical landscapes and wildlife to communicate scientific and conservation themes through creative expression. Her work demonstrates how art can effectively engage audiences with environmental issues while deepening appreciation for biodiversity.

Myra Miller, who has a personal connection to renewable energy through a wind-turbine farm that sits on her family's farmland, investigates the Rattlesnake Flats Wind Energy Project near Ritzville. Through site visits, interviews, and research, she examines renewable energy production, economic benefits, and operational challenges. Her findings emphasize that successful wind energy depends on teamwork, maintenance, and planning, and that it contributes to sustainability and rural economic development.

Yaelle Reeve studies how the size of native wildflower plantings, known as pollinator islands, affects native plant establishment and pollinator communities within the endangered Palouse Prairie. Through restoration experiments and community engagement, such as the "Plant the Prairie" event, where 72 volunteers helped plant 1,400 native plants, the project seeks practical guidance for prairie restoration. Findings contribute to conservation efforts aimed at supporting biodiversity and pollinator health in the region.

Nara Shin explores how immigrants and refugees understand land, identity, and belonging after displacement. Her interviews reveal that migration disrupts place-based identities, but participants rebuild belonging through people-based relationships, cultural traditions, and community engagement. The research highlights resilience and suggests that social work should consider the environmental and cultural dimensions of migration experiences.

Emerson Slanga examines PFAS contamination (often called “forever chemicals”) in the West Plains aquifer by integrating new groundwater data from Fairchild Air Force Base with EPA and EWU datasets using ArcGIS Pro. This study maps contaminant distribution, identifies likely sources, and shows how geological features influence PFAS movement, providing valuable information for future monitoring, remediation efforts, public health protection, and hydrogeologic modeling in the West Plains region.

Beck Walsmith examines how cell-cultured salmon (salmon grown using cells in a controlled environment, as opposed to naturally raised) might affect Indigenous communities in the Pacific Northwest. The study argues that laboratory-grown salmon could conflict with Indigenous worldviews, food sovereignty, and ecological values. It also raises concerns about commercialization, genetic ownership, and the exclusion of Indigenous perspectives from emerging food technologies.

Emma Bartholomew

Distribution and Natural Abundance of a Bacterial Probiotic in Montserrat's Coral

SCTLD (Stony Coral Tissue Loss Disease) was discovered in Northern Florida in 2014 and has spread to the Greater Caribbean by 2022 [1]. Although the causative agent(s) of SCTLD are currently unknown, it is suspected that the pathogen(s) are bacterial because of the disease's response to antibiotic treatment, which target bacteria [2]. SCTLD can be spread via direct contact or waterborne, symptoms of the disease include white lesions, bleached margins, and rapid tissue loss [3]. Little is known about why some coral species are more susceptible to SCTLD than others, but environmental factors such as increased sedimentation, increased temperature [4], and the coral-associated microbiome may play a role [4,5], and this will be the focus of the proposed research on Montserrat, a British Overseas Territory in the Caribbean Sea.

Montserrat is a small island in the Caribbean that has been heavily affected by volcanism, such as Soufriere Hills, the island's largest and most active volcano. The Soufriere Hills eruptions have been active as recently as 2012, with pyroclastic flow and ash causing damage to the landscape and potentially affecting the reefs' health around the island. As a result of these eruptions the shipping port in the island's old capital, Plymouth, became too difficult and dangerous to access; so a new port is currently being built in Little Bay, near the acting capital, Brades. As part of the new port construction, the shore and near-shore habitats were dredged, further disturbing the sediment near the coral reef. Dredging and sediment deposits are known to negatively affect the health of coral reefs by disturbing their surface and mucus layers and potentially infecting them with SCTLD [4].

SCTLD is a relatively new coral disease without an identification of what the pathogen(s) are causing it, thus making treatment difficult to develop and implement[2]. The current treatment for SCTLD is an amoxicillin antibiotic paste that is applied directly to the coral but treating with

a broad-spectrum antibiotic has consequences that can negatively affect the coral microbiome and entire reef ecosystem. Treating with common antibiotics can lead to antibiotic resistance that impacts the entire ecosystem and render that treatment no longer effective [6]. A potential treatment has been investigated using the coral-associated bacterial strain *Pseudoalteromonas* sp. McH1-7, which produces the antibiotic compound korormicin [6]. While current research on probiotic bacteria to prevent and treat SCTLD is promising, the natural prevalence, distribution, and abundance of this potential probiotic within the whole coral-associated microbiome is not well understood. My research will address this gap by providing a potential pathway to improve coral health and survivability in the face of disease.

Objectives

My objectives for this study are to, 1) characterize the natural microbiome of the Montserrat corals in relation to SCTLD state and environmental parameters, and 2) quantify the prevalence, distribution, and abundance of the probiotic candidate *Pseudoalteromonas* sp. McH1-7 strain associated with Montserrat corals.

H1: The coral microbiome will exhibit intra- and inter-specific variation and be significantly different among the sampled bay locations and coral species, and these microbiome differences will correlate with SCTLD infection status and environmental parameters.

H2: The candidate probiotic bacterium *Pseudoalteromonas* sp. McH1-7 strain will be widely distributed across Montserrat reefs and present in the coral microbiomes of other species besides the *Montastraea cavernosa* from which it was isolated.

Procedure and Rationale

In January 2026, I collected coral mucus swabs and water swabs from 18 different corals, representing seven coral species across four reef sites around the island. Briefly, sterile

rayon-tipped swabs were preloaded into sterile 1.5mL tubes. Once underwater, the tube was inverted and the swab was removed, allowing the water's surface tension to keep the open tube dry. To swab the coral, the coral was gently poked and rubbed for 10 seconds while twirling the swab to collect the mucus secretion [4]. To collect a microbiome sample from the surrounding water, the swab was swirled in the water one meter from the sampled coral in a circle for 10 seconds [4]. Samples were kept on ice in the field until returning to the lab where Zymo DNA/RNA Shield Buffer was added to the swabs in the collection tubes [7].

Genomic data was extracted using the Qiagen DNeasy Blood and Tissue Kit according to the manufacturer's protocol for Gram-positive bacteria with lysozyme. To characterize the bacterial community composition, we used polymerase chain reaction (PCR) amplification and sequencing of the 16S rRNA gene using the primers 515F (barcoded) and 926R [8–10]. Following the Earth Microbiome Project's 16S Illumina Amplicon Protocol [11]. After confirming amplification with gel electrophoresis, PCR amplicons were sequenced at the Dan Farber Cancer Institute at Harvard University. Statistical analysis of the sequences was performed with Qiime2. Alpha and Beta Diversity measures will be Faith's Phylogenetic Diversity (PD) and Unweighted UniFrac, respectively. To compare Faith's PD across sites, species, sample type (coral/water), and in relation to SCTLD status (yes/no), I used Kruskal-Wallis, a non-parametric version of ANOVA. I tested correlations between Faith's PD and continuous water quality parameters (e.g. temperature, pH, dissolved oxygen) using Spearman's correlation. To compare Unifrac distance (i.e. community composition) across corals, I used PERMANOVA and tested for the categorical variables described above. To set the alpha rarefication sampling depth we used 200 bases

Results

After rarefying the data, we created alpha and beta diversity metrics. There was no statistical differences between the Faith-pd of any species of coral. There was significance

between water and coral species, Elliptical Star Coral (p= 0.029049), Mountain Star Coral (p= 0.028460), and Pillar Coral (p= 0.028460). Using the same Kruskal-Wallis faith-pd I investigated the diversity within the four sites and there was no statistical difference ($p < .28$). Moving to the beta diversity metric, the four sites, all of them had significant differences ($p<0.013$), except Woodlands Bay Natural Reef and Woodlands Bay Reef Balls with a p value of 0.073. Using another pairwise PERMANOVA unweighted-unifrac I compared the coral species, none were significantly different from any species or water ($p<0.102$). Although, a pairwise PERMANOVA unweighted-unifrac of water and coral combined we got a p-value of 0.035. Lastly, I created a taxa bar plot to compare the bacteria in both coral mucus and water samples. Through this bar plot the family Pseudoalteromonadaceae was present in all seven species of coral (Fig 1 and 2).

Conclusion

Through my results, we were able to determine that the Pseudoalteromonas family was present in all seven species across vastly different reefs. This suggests that the potential probiotic can potentially be more widespread and lead to higher success rate with probiotic treatments against SCTLD.

Figures

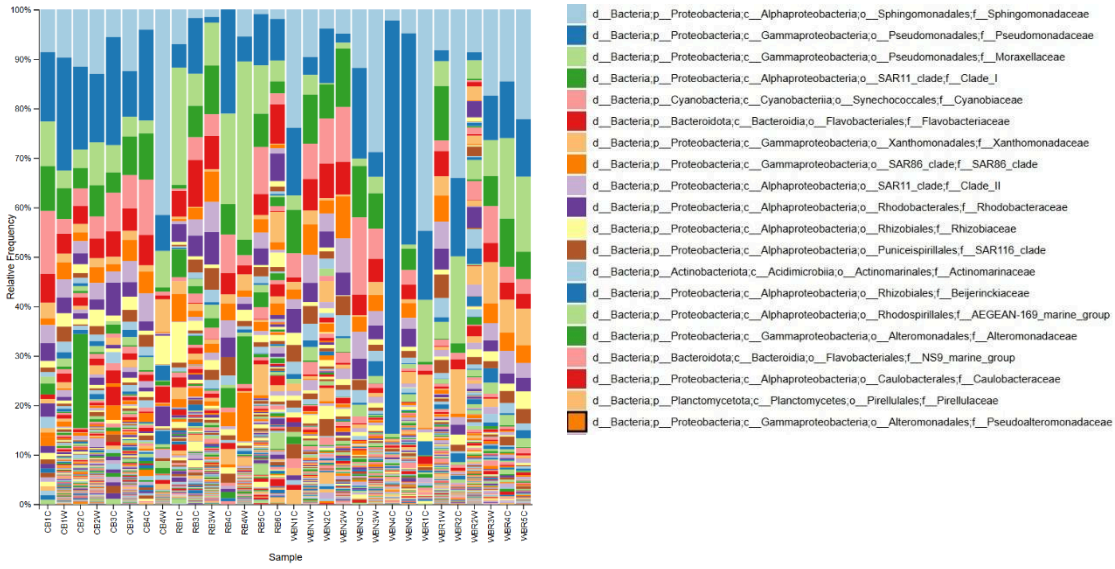

Fig 1: Taxa bar plot showing the relative abundances (frequency) of bacterial families in coral and water samples, with the 20 most abundant bacterial families on average indicated in the legend. The first letters of the sample IDs indicate the reef location (CB= Carr's Bay, RB= Rendezvous Bay, WBN= Woodlands Bay Natural Reef, WBR= Woodlands Bay Restored Reef), and the last letter of the sample IDs indicates whether the sample is from coral (C) or water (W).

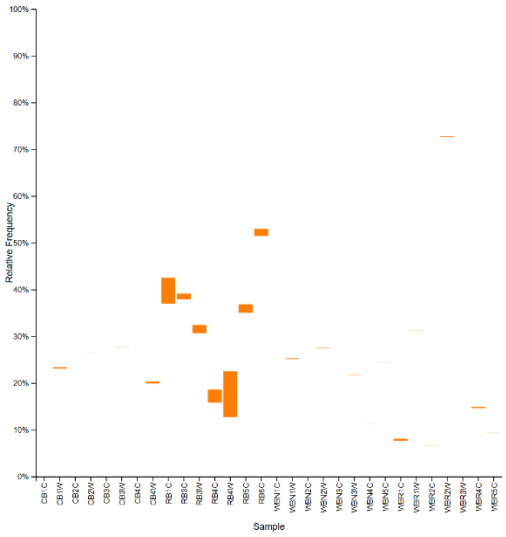

Fig 2: Relative abundance of Pseudoalteromonadaceae shown on taxa bar plot.

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Landscapes of Exclusion: Mapping Racial Boundaries and Environmental Burdens

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Abstract:

Inspired by the author's work with the mapping team for the Eastern Washington University Racial Covenants Project, this project uses additional GIS layers to reveal the enduring imprint of historic racial exclusion on today's urban landscape. Spokane, Washington's landscape, like many other urban areas across the country, bears the imprint of racial exclusion through mechanisms such as restrictive covenants and red-lining. These neighborhoods frequently experience limited access to tree cover and are more likely to be situated near heat islands. This project examines how racial covenants and red-lining contributed to Spokane's long-term environmental injustice. Using digitized property records, historic zoning maps, and GIS spatial analysis, this project demonstrates that historically red-lined neighborhoods are more likely to be situated near brownfield and Superfund sites. Spatial joins and pairwise comparisons show expected and unexpected relationships between the spatial layers. The findings call for reparative planning and targeted remediation that centers historical accountability. This work contributes to cultural resource management and environmental anthropology by offering a model for integrating historical documentation with ecological data to inform policy and public engagement.

Introduction:

Racially restrictive covenants emerged in the early twentieth century as one of the most powerful tools for drawing racial boundaries onto the American landscape (Rothstein 2017). Written directly into property deeds, these covenants prohibited the sale, lease, or occupation of homes by people of color, rationalized as an effort to preserve the "neighborhood stability." They were not fringe practices or isolated prejudices; they were mainstream instruments of urban development, endorsed by real estate boards, neighborhood associations, and local governments across the country. At the same time, the federal government was building its own architecture of segregation. In 1933, the Home Owners' Loan Corporation (HOLC) began producing residential security maps that graded neighborhoods from "Best" to "Hazardous," using criteria that explicitly tied a community's value to its racial composition. Areas where people of color lived were shaded as areas too risky for investment. Together, covenants and HOLC maps formed a mutually reinforcing system: private contracts that excluded, and federal assessments that justified those exclusions as objective financial truths.

The scale and reach of these policies only became fully visible once researchers began systematically uncovering the documents that enforced them. In Washington State, the Racial Covenants Project has been identifying, digitizing, and mapping thousands of deeds containing racially restrictive language. These clauses, which were often buried deep within property documents and hidden from public view, were foundational to the state's development.

Their work shows that the patterns long recognized at the national level were also firmly rooted in Eastern Washington cities, including Spokane. By tracing these covenants parcel by parcel, many of them quietly embedded in property deeds where their racial intent could remain obscured, the researchers have revealed how federal policy, real estate practices, and local development choices came together to shape neighborhoods, deciding who was permitted to

belong in which neighborhoods. A condition that did not exist prior to these choices. Although the Racial Covenants data set was originally created to meet the requirements of State House Bill 1335, its value extends far beyond individual awareness. It provides a powerful foundation for research that examines how these historic boundaries intersect with other spatial patterns, from red-lining to environmental risk. This documentary record allows us to see Spokane not as an exception, but as a city shaped by the same racialized housing systems that structured urban development across the United States.

A growing body of scholarship shows that the spatial logics of historic red-lining continue to shape present-day environmental burdens and community health (Linde 2023; Nardone 2020). Research from Gonzaga University's Climate Center demonstrates that even within Spokane, extreme heat is not evenly distributed; the hottest neighborhoods today are those that experienced decades of disinvestment and exclusion (Henning et al. 2023). Yet far less attention has been paid to how racial covenants fit into this broader environmental story. When examined alongside HOLC maps, covenants reveal a parallel geography of exclusion, one that confined marginalized communities to areas with fewer public investments and greater exposure to industrial zoning, pollution, and hazardous facilities (Nardone 2020; Linde 2023). These patterns persist: the neighborhoods once marked as undesirable or "risky" now contain disproportionate numbers of brownfields and Superfund sites, illustrating how environmental harm continues to follow the same historical lines of racial exclusion. This project extends that scholarship by examining how all four spatial layers—racial covenants, HOLC grades, brownfields, and Superfund sites—interact across Spokane's landscape, revealing the ways historic housing discrimination and contemporary environmental burdens remain deeply intertwined.

Methods:

Using historic plat maps and parcel layers the properties were first digitized and converted into polygons, then incorporated into the project's base layer to enable parcel spatial comparison. Historic HOLC Residential Security Maps downloaded from Maps of Inequity and aligned with contemporary spatial data to produce standardized Grade A–D polygons for Spokane. Environmental hazard datasets (Superfund sites and brownfields) were standardized and projected into a shared coordinate system to ensure compatibility across layers. All spatial datasets were then cleaned, clipped to the study area (City of Spokane), and joined using overlay operations to generate counts and spatial relationships among covenants, HOLC grades, and environmental hazards. Finally, pairwise comparisons were conducted across all combinations of layers to identify patterns of overlap, divergence, and unexpected spatial relationships within Spokane's historical and environmental landscape.

Discussion:

Pairwise comparisons across all spatial layers revealed a blend of expected and unexpected relationships between Spokane's historic housing discrimination and present-day environmental burdens. As anticipated, environmental hazards were concentrated in historically disinvested areas: **34% of brownfield sites and 25% of Superfund sites fell within HOLC Grade D** neighborhoods (Figure 1), particularly in the Northeast and East Central districts, mirroring broader patterns of urban heat exposure and reduced tree canopy. As anticipated, brownfield and Superfund sites did not appear within parcels marked by racial restrictive covenants, reflecting how these areas were historically insulated from industrial land uses (Figure 2). More surprising, however, was the distribution of the covenants themselves. Rather than clustering in the "best" Grade A or "still desirable" Grade B areas, **half of all covenanted parcels appeared in Grade C neighborhoods**, and one full covenanted addition was located within a Grade D area(Figure 3). In contrast, **Grade A areas contained only 2% of covenanted**

parcels, far fewer than national patterns would predict. These mismatches suggest that Spokane's covenant geography was shaped less by HOLC grading and more by the timing of subdivision development: many A/B-area covenants predated the 1930s HOLC survey, while later mid-century developments in C-graded areas adopted covenants even as federal red-lining practices were taking shape. Together, these findings highlight how Spokane's layered systems of exclusion, covenants, red-lining, and industrial sighting interacted in uneven and locally specific ways to produce the city's contemporary environmental landscape.

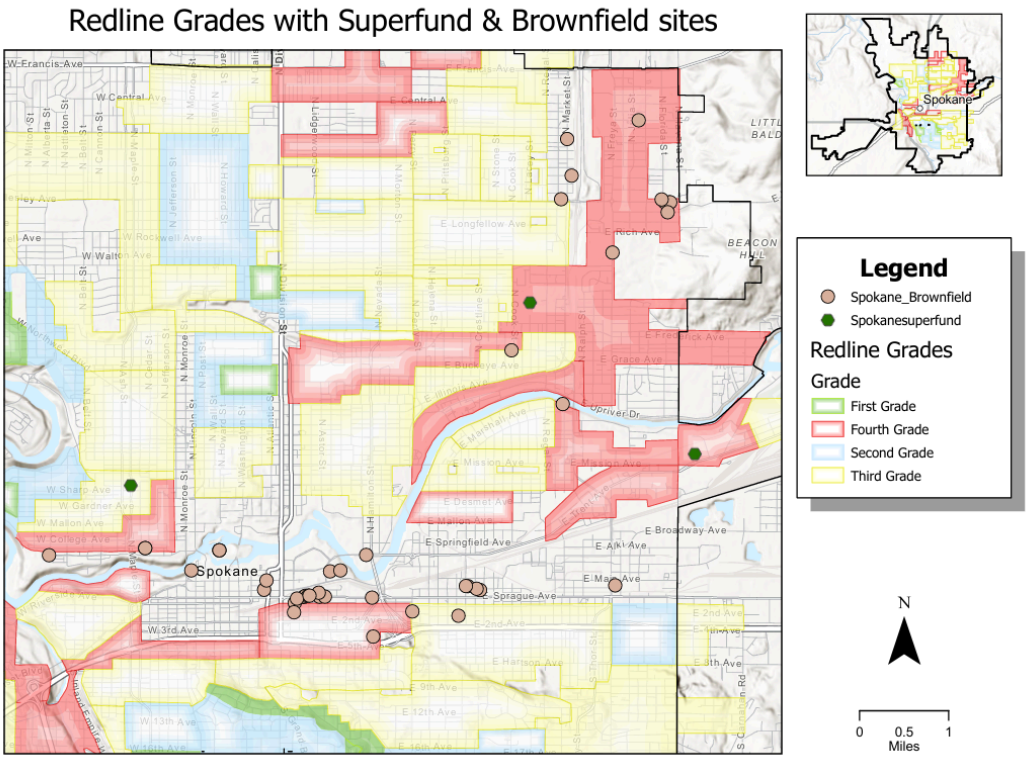

Figure 1: HOLC redlined neighborhoods (1939) and current Superfund and brownfield sites

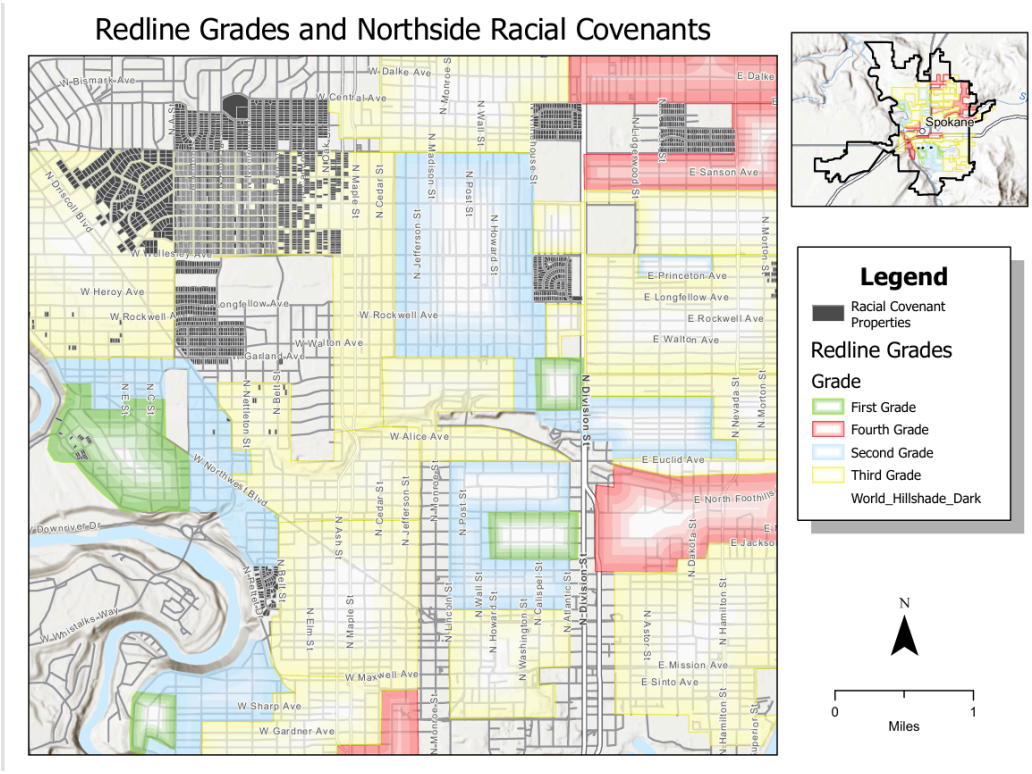

Figure 2: North side Racial Covenant Properties note lack of environmental burden sites and clustering near the Third Grade (C)

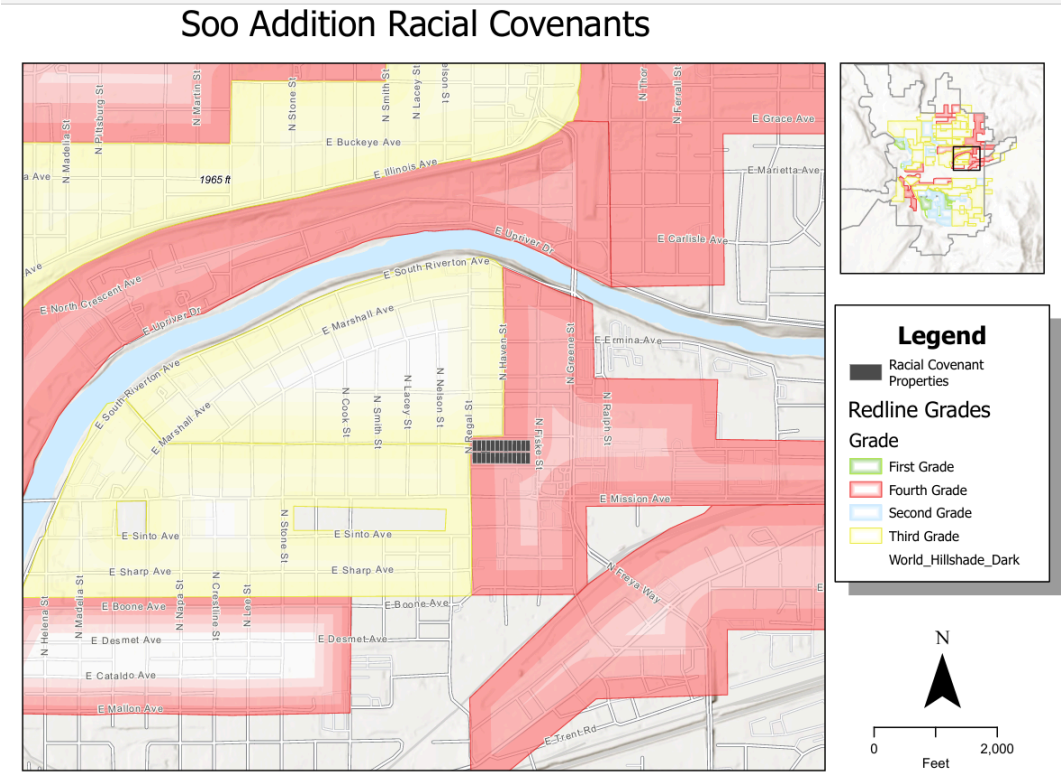

Figure 3: Soo Addition Racial covenants intersected with Fourth Grade (D) HOLC maps. Platted in 1905, the Soo Addition did not add racial covenants until 1949.

Conclusion:

Brownfield sites in Spokane are concentrated in historically D-graded neighborhoods, particularly in the Northeast and East Central areas, reflecting long-standing patterns also seen in studies of heat islands and tree-canopy loss. Parcels with racial restrictive covenants remain spatially distinct from both brownfield and Superfund sites, underscoring how covenanted areas were insulated from industrial land uses. These covenanted parcels appear most frequently in C-graded neighborhoods, a pattern likely shaped by the timing of post-HOLC development rather than the grading system alone.

The Racial Covenants Project database offers value far beyond fulfilling the requirements of the Washington State house bill 1335; it provides not only a foundation for reparations but also a data set that informs communities, scholars, and planners to trace how exclusion was built into the landscape and how its legacies continue to shape opportunity. Many communities in Eastern Washington carry their own distinct story of racialized spatial history, and this data set opens the door for those stories to be documented, understood, and addressed.

Outcomes:

The outcomes of this project reach beyond the immediate poster and map I produced. The Racial Covenants Project, funded to meet the requirements of State House Bill 1335, became both a foundation and an inspiration for my own work. Cartographic data, originally created to meet a legal mandate, has already grown into something larger: a resource that can be taken up by students, researchers, and communities to deepen the dialogue about exclusion, land, and memory. Through the support of the Clawson–Young Award, I was able to carry this work first to Albuquerque to present at the Society for Applied Anthropology, where Spokane's local histories entered a national conversation about race and environmental justice. I then returned

home to share the project at the EWU Student Symposium, connecting with people who recognized these streets and stories in their own lives. These opportunities affirmed that when community-rooted data is made accessible, it can travel, resonate, and spark the broader conversations needed to understand and challenge the landscapes of exclusion that still shape our present.

Acknowledgements:

I want to first acknowledge Dr. Larry Cebula, whose leadership on the Racial Covenants Project and his generosity in sharing the project's data created the conditions that allowed my personal research to take shape. My thanks extend as well to Dr. Brian Buchanan, whose advice and encouragement helped open the door for my involvement.

I also want to acknowledge fellow members of the Racial Covenants Project cartographic team—Dr. Stacy Warren, Logan Camporeale, and Rachel Low—whose patience with me as I developed the GIS skills needed for this mapping effort, along with their commitment to historic accuracy, helped ensure a strong and reliable covenanted-properties layer.

As I continue to recognize the many people who made this project possible, I also want to honor the meticulous research and careful archival work that shaped this collective endeavor long before I joined. This project rests on the efforts of many hands, and I am grateful for the trust, mentorship, and shared commitment that allowed me to contribute to a much larger story. Finally, I want to thank Dr. Julia Smith for her thoughtful editing feedback.

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Mason Brickett

From Stewardship to Restriction: The History of Reef Net Fishing in the Salish Sea

The Salish Sea was once a bountiful ecosystem with a wide variety of sea life that fed animal and human inhabitants alike. The salmon runs were harvested by tribes far inland from the sea, relying on the yearly salmon runs to fill food stores for the winter. Similarly, salmon are the primary food source of the bears that share the land, which rely on the fish for bulking season.

Reef net fishing is the culmination of generations' worth of trial and exploration of technology by native people in order to sustainably feed the tribes of the Salish Sea and keep them well stocked for the harsh winters, all while navigating the cold and dark waters that surround the rocky shoals.

The idea behind reef net fishing is simple. Use a net between canoes to catch fish as they migrate with the flow of the strait. In practice, reef fishing is a complex system of craftsmanship and moving parts. A large net is strung between two canoes, traditionally woven from willow bark and forming an approximately 40 ft square. Trailing behind this net is a series of lines acting to both hold down the net and to assist in funneling the salmon into it. Large rocks sourced along the beaches and cliff edges of the islands function as anchors for the system, and after retrieval, they are shaped and secured by hand before being strategically angled at the bottom of the sound, oriented towards the flow of fish.

Just being near the fish migration would not be enough, however. Native tribes had to meticulously map the natural bottlenecks and straits that would allow for a high enough concentration of salmon in order to harvest an amount that would provide through the harsh winters. The locations are called “sxwáləṯ” by the natives, and generally face south, where the ebb of the tide would draw in the swarms of salmon. The locations were archived by various shoreline waypoints and markers that would orient the nets in line with the salmon runs.

The anchor stones would be cut loose at the end of the fishing season, and while some attempts were made to reuse them, generally the common practice was to leave them at the ocean floor, where after generations, formed the skeleton of an artificial reef, teeming with sea life over centuries of fishing expeditions. These reefs rapidly became home to their own ecosystem of coastal flora and fauna, greatly enhancing the surrounding environment for both the wildlife, and the generation of native fishers that would follow. The catch could easily be sorted, and unwanted fish would still be in good condition and could be set loose back into the environment without harm.

We can make a rough estimation on the switch from traditional methods to reef net fishing based on the bones found along the various gathering places of native tribes. Around 1800-2000 years ago, many of the sites shifted away from having a mix of various fish towards containing primarily sockeye salmon, the primary catch for reef nets. While the process was refined over generations, the main catch never really changed. Sockeye salmon are notoriously hard to catch due to their speed, muscle, and slippery exterior, but regularly travel through the same channels year after year to and from their spawning pools inland. While the introduction of modern fishing equipment and ever shrinking territorial waters shifted some groups to attempt chinook and coho salmon in shallower waters.

While the fish was traditionally cleaned and sun-dried to prepare for winter, as the West industrialized, more and more native fishers were forced to sell their catch to canneries, at around 10 cents a pound. These trips could usually net around $2000 a day, split between the crew of 6-12. While this was a tidy profit, especially for the native tribes, the salmon were heavily undervalued, and the native tribes were mistreated and exploited.

The native crews really started to feel the squeeze of encroaching westernization in the late 1890s, with the introduction of permanent fish nettings that spanned many of the traditional channels frequented by the native tribes. Overfishing quickly depleted the straits of the once bountiful streams of salmon, and legal battle after legal battle shut out native tribes from their ancestral fishing grounds. By the 1930s, Native participation had been nearly eliminated.

By the great depression, salmon runs were heavily depleted, and many fishing operations went bankrupt. This offered a glimmer of hope for the native tribes, now free to fish throughout their traditional grounds, albeit with minimal yields compared to the turn of the century. Reef nets numbered in the hundreds at the turn of the 20th century, with catches numbering in the thousands. As of 2021, only 3 traditional reef net sites are still active, rarely reaching 500 salmon. Steep drops in salmon were linked to a shift in migratory patterns and a steep decline in fishing interests throughout the Salish Sea. While the ecology of the sea is slowly recovering from decades of overfishing and runoff from the factories that lined its shores, the salmon may never reach the same level of population enjoyed by the tribes for thousands of years.

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From Prairie to Classroom Teaching Environmental Stewardship through EWU's Restoration Project

By: Jessica Clemons

Introduction

The purpose of this project was to develop a comprehensive set of lesson plans connected directly to the Eastern Washington University Prairie Restoration Project in Cheney, Washington. The project focused on creative grade-level science and sustainability lessons for Kindergarten through Fifth Grade while integrating literacy, environmental stewardship, Indigenous history, and community engagement. Each lesson was aligned with Washington State Science Learning Standards (NGSS-aligned), Environmental and Sustainability Education (ESE) standards, and literacy integration using carefully selected children's literature from a self-created Environmental Education Literacy Library that was developed throughout the course of the project.

The EWU Prairie Restoration Project (located on the EWU campus) served as the foundation for the instructional work of these lessons. The restoration project is rebuilding sections of the endangered Palouse Prairie ecosystem while supporting biodiversity, native plant restoration, pollinator recovery, soil health research, and community partnerships. Less than one percent of the original Palouse Prairie remains, this project provided an authentic local connection for environmental education and sustainability learning.

The overall goal of this project was to create meaningful, place-based educational materials that will connect students to their local environment while encouraging stewardship, inquiry, and ecological understanding. The lesson plans were intentionally designed to help students understand how restoration science, Indigenous stewardship, and sustainability practices are connected to their own communities and daily lives.

Project Development

The first phase of the project was focused on developing my Environmental Education Literacy Library. The literacy library included children's literature connected to environmental science topics such as seeds, pollinators, insects, habitats, plats, soil systems, restoration ecology, biodiversity, climate change, and Indigenous stewardship. Each text was carefully curated to fit with the NGSS disciplinary core ideas, crosscutting concepts, Environmental & Sustainability Education standards, and inquiry-based learning activities.

Books were carefully selected to support literacy and science instruction while encouraging outdoor learning, observation, and environmental stewardship. Examples of literacy integration included titles such as *From Seed to Plant* by Gail Gibbons, *Flight of the Honeybee* by Raymond Huber, and *The Prairie That Nature Built* by Marybeth Lorbiecki. The literacy library became my foundation for creating the larger interdisciplinary lesson sequence.

Lesson Plan Development

The next stage of the project involved designing complete lesson plans for Kindergarten through Fifth Grade. Each lesson was connected directly to the EWU Prairie Restoration Project, these lessons included:

- Learning Targets
- Washington State Science Standards
- Environmental & Sustainability Education standards
- Literacy Integration
- Vertical Grade-Level lesson expansion ideas
- 5E Instructional Model Components
    - Engage, Explore, Explain, Elaborate, Evaluate

The lessons followed a progression of environmental understanding across grade levels:

Beginning with Kindergarten, Students explored how seeds grow and how native prairie seeds are collected and planted during the efforts at EWU. Students learned that seeds are the beginning of prairie ecosystem and investigated what plants need to survive.

First Grade moves into students studying bees and pollinators while learning how prairie flowers support biodiversity. Lessons connected directly to the pollinator habitats being restored at the EWU prairie site.

Second Grade then transitions into investigating insects found in prairie ecosystems and exploring how insects support pollination, decomposition, and ecosystem health. Students examined how restoring prairie plants also restores insect habitats.

Third Grade students explore prairie habitats, food webs, and biodiversity while studying how the EWU Prairie Restoration Project rebuilds habitat systems for wildlife and pollinators. Students created prairie habitat models and analyzed ecosystem relationships.

Fourth Grade students begin to investigate native prairie plants and plant adaptations. Lessons focused on how native plants survive drought, wind, and changing seasonal conditions while supporting restoration efforts in Eastern Washington.

Fifth Grade studied soil systems, decomposition, nutrient cycling, and environmental restoration practices. Lessons connected directly to EWU research involving soil health, biochar, and prairie restoration success.

Throughout these lessons the students will explore Indigenous stewardship practices and the cultural significance of the Palouse Prairie ecosystem. Lessons emphasized the importance of Tribal ecological knowledge, environmental stewardship, and restoration partnerships connected to the EWU prairie project.

Educational Impact

This project demonstrated how place-based environmental education can strengthen both science learning and student engagement. By connecting lessons directly to a local restoration effort, students can see how science is used in real-world environmental problem solving.

The integration of literacy and science also supported interdisciplinary learning. Students were encouraged to ask questions, observe their environment, collect data, and analyze ecosystems, and connect classroom learning to their local community. The use of children's literature helped make complex environmental topics more accessible and developmentally appropriate for elementary learners.

The project also emphasized environmental stewardship and sustainability. Students explored how restoration science protects biodiversity, improves ecosystems, and supports long-term environmental health. Through activities that connect to the EWU prairie site, students developed a stronger understanding of how local actions can positively impact the environment.

Another important outcome of the project was the inclusion of Indigenous history and stewardship. Lessons connected students to the historical and cultural significance of the Palouse Prairie while recognizing Indigenous relationships to the land and traditional ecological knowledge.

Personal Reflection

One of the most meaningful aspects of this project was creating educational materials that connect students directly to their local environment. The EWU Prairie Restoration Project provided an authentic and engaging opportunity to teach science, sustainability, literacy, and stewardship through real-world environmental restoration.

This project also strengthened my understanding of interdisciplinary teaching and place-based learning. By combining literacy, science, inquiry, and environmental education, students can build deeper connections to the content while developing critical thinking and problem-solving skills.

As a future educator myself, this project reinforced the importance of creating engaging and meaningful curriculum that helps students understand their role in caring for the environment. It also demonstrated how local partnerships and restoration projects can become powerful educational tools within elementary classrooms.

The completed lesson plans and literacy library will continue to serve as educational resources that can be expanded and adapted for future classrooms, community partnerships, and sustainability education initiatives.

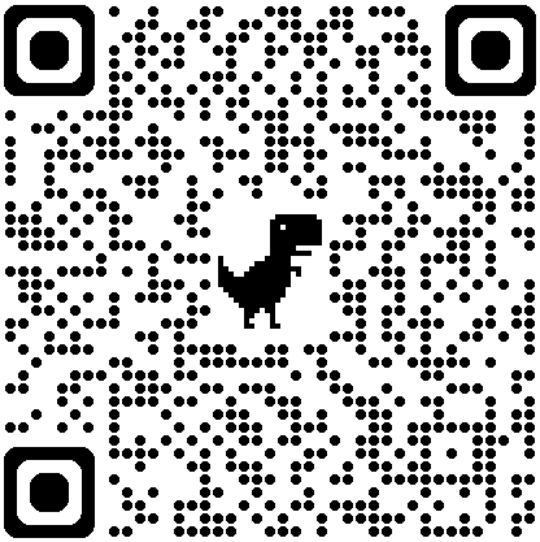
Conclusion

The From Prairie to Classroom Teaching Environmental Stewardship through EWU's Restoration Project successfully created a comprehensive environmental education curriculum connected directly to the restoration work occurring at Eastern Washington University. Through literacy integration, inquiry-based science

instruction, environmental stewardship, and community engagement, the project supports both academic learning and sustainability education.

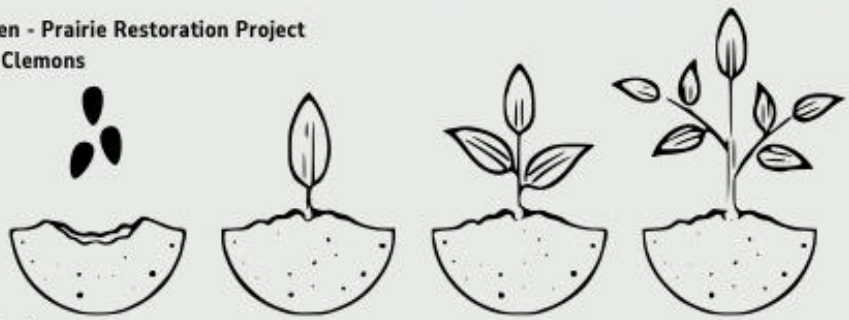
The project demonstrates the value of place-based environmental learning and highlights the importance of protecting and restoring the endangered Palouse Prairie ecosystem. Most importantly, the project will encourage students to see themselves as active participants in caring for their environment and community.

Literacy Library Link:



ALL ABOUT SEEDS

Kindergarten - Prairie Restoration Project
By: Jessica Clemons



Lesson objectives:

Students will identify seeds, observe seed growth and connect native seeds to the EWU prairie restoration project.

Resources:

Seeds, Soil, cups, magnifiers, prairie photos, literacy books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)
1. K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.
2. K-ESS3-1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.

Environmental & Sustainability Education (ESE)
1. Standard 1: Ecological, Social, and Economic Systems
2. Standard 2: The Natural and Built Environment

Engage:

Teacher begins to explain how EWU students collect and grow native seeds for Prairie Restoration. Students have the opportunity to visit the seed garden.

Explore:

Students can sort, observe, and plant native prairie seeds

Explain:

Teacher explains how how EWU students have collected and grown native seeds for the prairie restoration project. This is where a Native History lesson on the area would be additional lessons and benefits to students.

Elaborate:

Students compare prairie seeds to garden seeds and begin to discuss why local eeds matter.

Evaluate:

Students are able to sketch all the stages of seeds growth and explain plant needs

Expansion Into Upper Grades:

This lesson can expand into first grade by introducing how pollinators help flowers produce seeds. In second grade, students can connect seeds to insects and ecosystem relationships. By third grade, students can explore how native prairie plants create habitats and support biodiversity within the EWU Prairie Restoration Project.

Environmental Literacy Library Connection:

1. From Seed to Plant by Gail Gibbons
2. It Starts With a Seed by Laura Knowles
3. A Seed Was Planted by Toulla Palazeti
4. Little Acorn - Scholastic Reader

POLLINATORS

First Grade - Prairie Restoration Project
By: Jessica Clemons

Lesson objectives:

Students understand how pollinators help plants reproduce.

Resources:

Flower models, cotton balls, pollinator visuals, literacy books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)
1. 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Environmental & Sustainability Education (ESE)
1. Standard 1: Ecological, Social, and Economic Systems
2. Standard 3: Sustainability & Civic Responsibility

Engage:

Teacher reads Flight of the Honey Bee and introduces EWU prairie flowers used for pollinators.

Explore:

Students simulate pollination between prairie wildflowers used in EWU seed mixes.

Explain:

Teacher explains how pollinators support prairie restoration.

Elaborate:

Students design "pocket prairie" pollinator gardens inspired by EWU's restoration goals.

Evaluate:

Students explain pollination through drawings and role-play.

Expansion Into Upper Grades:

This lesson can expand into second grade by studying insect body structures and how insects survive in prairie ecosystems. In third grade, students can investigate pollinators as part of prairie food webs and habitats. By fourth grade, students can analyze how prairie plants adapt to attract pollinators.

Environmental Literacy Library Connection:

1. If Bees Disappeared by Lily Williams
2. Flight of the Honey Bee by Raymond Huber
3. Honeybee by Cadance Fleming
4. Oscar's Tower of Flowers by Lauren Tobia

INSECTS

Second Grade - Prairie Restoration Project
By: Jessica Clemons

Lesson objectives:

Students will classify insects and explain insect roles in prairie systems.

Resources:

Magnifiers, journals, insect charts, literacy books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)
1. 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.
2. 2-LS2-1: Plan and conduct an investigation to determine if plants need sunlight and water to grow.

Environmental & Sustainability Education (ESE)
1. Standard 1: Ecological, Social, and Economic Systems
2. Standard 2: The Natural and Built Environment

Engage:

Teacher introduces prairie insects found at the EWU restoration site.

Explore:

Students investigate insects outdoors using magnifiers.

Explain:

Teacher explains how prairie restoration supports insect biodiversity.

Elaborate:

Students classify insects by movement and ecosystem function.

Evaluate:

Students label insect diagrams and explain insect roles.

Expansion Into Upper Grades:

This lesson can expand into third grade by exploring how insects depend on habitats for food and shelter. In fourth grade, students can study plant and insect relationships such as pollination and biodiversity. By fifth grade, students can investigate how insects and decomposers support healthy prairie soil systems.

Environmental Literacy Library Connection:

1. Ladybugs by Mia Posada
2. Don't Bug the Insects by Ben Richmond
3. Creep and Flutter by Jim Arnosky
4. Creep, Leap, Crunch by Jody Jensen Shaffer and Christopher Silas Neal

ALL ABOUT HABITATS

Third Grade - Prairie Restoration Project
By: Jessica Clemons

Lesson objectives:

Students will understand how habitats support living organisms and how prairie restoration helps rebuild ecosystems and biodiversity within the EWU Prairie Restoration Project.

Resources:

Habitat maps, animal cards, journals, and Literacy Books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)
1. 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
2. 3-LS2-1: Construct an argument that some animals form groups that help members survive.

Environmental & Sustainability Education (ESE)
1. Standard 1: Ecological, Social, and Economic Systems
2. Standard 3: Sustainability & Civic Responsibility

Engage:

The teacher will introduce the lesson by reading Out on the Prairie and showing students photos of the EWU Prairie Restoration Project in Cheney, Washington. Students will discuss what they notice about prairie habitats and share ideas about what animals and plants need to survive.

Explore:

Students will investigate prairie habitat stations with maps, plants, and animal cards while recording observations in science journals. Students may also explore outdoor areas around the school to identify habitat features.

Explain:

The teacher will explain how prairie plants and animals depend on one another within an ecosystem using food web visuals and discussion. Students will learn how the EWU Prairie Restoration Project restores habitats for wildlife and pollinators.

Elaborate:

Students will work in groups to design a healthy prairie habitat that includes food, water, shelter, and native plants. Students will explain how their habitat supports biodiversity and connects to prairie restoration.

Evaluate:

Students will create a labeled prairie habitat drawing and explain how living things depend on one another in the ecosystem. The teacher will assess understanding through student explanations, drawings, and discussion.

Expansion Into Upper Grades:

This lesson can expand into fourth grade by focusing on how native prairie plants survive within specific habitats. In fifth grade, students can examine how soil health supports habitats and biodiversity. Older students may further explore ecosystem restoration and climate resiliency connected to the EWU Prairie Restoration Project.

Environmental Literacy Library Connection:

1. The Prairie That Nature Built by Marybeth Lorbiecki
2. Home by Isabelle Simler
3. Birds Build Nests by Yvonne Winer
4. Common Critters by Pat Brisson
5. Out on the Prairie by Donna Bateman

PLANTS

Fourth Grade - Prairie Restoration Project
By: Jessica Clemons

Lesson objectives:

Students will identify native prairie plants and explain plant adaptations

Resources:

Native plant samples, journals and Literacy Books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)

- 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-ESS2-1: Make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Environmental & Sustainability Education (ESE)

- ESE Standard 1: Ecological, Social, and Economic Systems
- ESE Standard 2: The Natural and Built Environment

Engage:

The teacher will introduce native prairie plants by reading The Tree That Would Not Die and showing examples of plants found in the EWU Prairie Restoration Project. Students will discuss how plants survive in different environments and why native plants are important to prairie ecosystems.

Explore:

Students will observe prairie plant samples, photos, or outdoor plants and record details about leaves, stems, roots, and flowers in their science journals. Students will compare native prairie plants to non-native plants and identify differences in structure and appearance.

Explain:

The teacher will explain how native prairie plants have adaptations that help them survive drought, wind, and seasonal weather in Eastern Washington. Students will learn how the EWU Prairie Restoration Project uses native plants to restore habitats and support biodiversity.

Elaborate:

Students will design a prairie restoration planting plan using native plants that would support pollinators and wildlife. Students will explain how their selected plants help create healthy prairie ecosystems.

Evaluate:

Students will create a labeled diagram of a native prairie plant and describe at least two adaptations that help it survive. The teacher will assess understanding through student explanations, diagrams, and class discussion.

Expansion Into Upper Grades:

This lesson can expand into fifth grade by connecting plant growth to soil nutrients, decomposition, and water systems. Middle school students could further investigate prairie restoration planning, native plant survival, and climate impacts on ecosystems using EWU restoration research.

Environmental Literacy Library Connection:

1. The Tree That Would Not Die by Ellen Levine
2. Nell Plants a Tree by Anne Wynter
3. Wildflowers Around the Year by Hope Ruden
4. The Reason for a Flower by Ruth Heller

SOIL

Fifth Grade - Prairie Restoration Project
By: Jessica Clemons

Lesson objectives:

Students will explain how soil supports prairie ecosystems and restoration

Resources:

Soil samples, jars, magnifiers and Literacy Books

Standards:

Washington State Science Learning Standards (NGSS-Aligned)
- 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.

Environmental & Sustainability Education (ESE)
- ESE Standard 1: Ecological, Social, and Economic Systems
- ESE Standard 3: Sustainability & Civic Responsibility

Engage:

The teacher will introduce soil systems by reading The Street Beneath My Feet and showing photos of soil and restoration work from the EWU Prairie Restoration Project. Students will discuss what soil is made of and why healthy soil is important for prairie ecosystems.

Explore:

Students will investigate soil samples using magnifying glasses and record observations about texture, color, roots, rocks, and living organisms. Students will compare healthy prairie soil to compacted or dry soil and discuss differences they notice.

Explain:

The teacher will explain how soil supports plant growth, stores water, and provides nutrients for prairie ecosystems. Students will learn how EWU researchers study soil health and use restoration practices such as native planting and biochar to improve prairie restoration success.

Elaborate:

Students will work in groups to create a model showing how soil, plants, water, insects, and decomposers are connected in a prairie ecosystem. Students will explain how healthy soil supports biodiversity and restoration efforts at EWU.

Evaluate:

Students will create a labeled soil diagram or short written explanation describing how soil supports life in prairie ecosystems. The teacher will assess student understanding through discussions, observations, and student explanations of soil connections within the ecosystem.

Expansion Into Upper Grades:

This lesson can expand into middle school science through studies of soil chemistry, erosion, groundwater systems, and climate resiliency. Students may also investigate EWU research involving biochar, soil restoration, and environmental sustainability practices.

Environmental Literacy Library Connection:

1. The Street Beneath My Feet by Charlotte Gauillain
2. Up in the Garden and Down in the Dirt by Kate Messner
3. Poo Pile on the Prairie by Amy Hevron
4. Moth and Wasp, Soil and Ocean by Sigrid Schmalzer

NATIVE HISTORY

Prairie Restoration Project
K-5
By: Jessica Clemons

Lesson objectives:

Students will explain Indigenous stewardship and prairie restoration practices

Resources:

Prairie maps, restoration photo & Literacy Library Books

Standards:

Since Time Immemorial / Washington State Social Studies / Science Standards
- Since Time Immemorial: Students understand and recognize Indigenous peoples' relationship to the land, natural resources, culture, and stewardship practices connected to Washington State.
- ESS3.C: Human Impacts on Earth Systems — Human activities in agriculture, industry, and everyday life have major effects on land, vegetation, streams, oceans, air, and even outer space.
- ESS3.D: Global Climate Change — Climate describes patterns of typical weather conditions over different scales and variations may result from natural and human-caused factors.

Environmental & Sustainability Education (ESE)
- ESE Standard 1: Ecological, Social, and Economic Systems
- ESE Standard 3: Sustainability & Civic Responsibility

Engage:

The teacher will introduce the lesson by reading We Are Water Protectors and showing students photos of the EWU Prairie Restoration Project and the Palouse Prairie landscape. Students will discuss how Indigenous peoples have cared for the land and natural resources for generations.

Explore:

Students will explore maps, photos, and examples of native prairie plants used by Indigenous communities for food, medicine, and daily life. Students will observe how the prairie ecosystem supports both people and wildlife.

Explain:

The teacher will explain how Indigenous stewardship practices helped maintain healthy prairie ecosystems long before modern restoration efforts began. Students will learn how EWU partners with Native communities to support prairie restoration and environmental stewardship.

Elaborate:

Students will create a reflection, drawing, or class discussion connecting stewardship practices to caring for the environment today. Students will discuss how prairie restoration protects both ecosystems and cultural history.

Evaluate:

Students will demonstrate understanding by explaining one way Indigenous peoples cared for the prairie and one way people can continue stewardship today. The teacher will assess student understanding through discussion, writing, artwork, or presentations.

Expansion Into Upper Grades:

This lesson can expand across grade levels by deepening student understanding of Indigenous stewardship, land restoration, and environmental justice. Older students can further investigate Tribal ecological knowledge, historical land use changes, and community partnerships connected to the EWU Prairie Restoration Project.

Environmental Literacy Library Connection:

1. We Are Water Protectors by Carole Lindstrom
2. Creekfinding: A True Story by Jacqueline Briggs Martin
3. Footprint by Phil Cummings & Sally Soweol Han
4. Does Earth Feel? by Marc Majewski

Where Did The Water Go?

An Investigative Unit on Groundwater Decline in the Spokane River

Watershed Ashlynn Huttenmaier

Winning the Clawson-Youngs award has provided me with an extraordinary opportunity to design a project that blends both scientific inquiry and environmental stewardship for elementary students in Eastern Washington. My project is an investigative unit for K-5 centered on declining groundwater levels in the Spokane River watershed. Many science curricula address water conservation or drought in a broad and generalized way, with very few offering a cohesive sequence that students can investigate. My goal is to get people, especially students, aware of this problem and get more of these hands-on units out there. In the end my project aims to help students make sense of the environmental changes occurring in their own community. This project fills that gap.

Identifying a Meaningful Local Phenomenon

My very first step in this process was designing a project that was anchored in a phenomenon. I had to keep in mind that the phenomenon needed to be scientifically rich, locally relevant, and was able to be observable for K-5 students. The Spokane River, a defining feature of the region, provided the perfect context and checked all the boxes. In recent years, this particular river has experienced a notable change in the water level throughout the seasons, specifically during the summer. Because the aquifer and the river are directly connected, groundwater depletion directly affects the river's flow. In

addition, this phenomenon is visible to anyone who walks along the riverbank in July or August. Students in the Spokane Valley region have more than likely seen the exposed rocks, lower waterlines, and slower flow. This familiarity makes the phenomenon meaningful for the students and accessible for grades K-5.

Based on all the above, the driving question for this unit becomes: “Why does the Spokane River’s water level drop in the summer, and what does this tell us about groundwater in our region?”

The question is designed to be open-ended, rooted in observable change, and aligned with the Next Generation Science Standards (NGSS). This driving question encourages students to investigate the patterns they see, consider the idea of cause and effect, and explore how human activity impacts water levels.

Designing an Investigative Unit

I designed the unit for K-5 classrooms, with adaptations for different grade levels. To ensure that lessons were mutually coherent and students were getting the inquiry needed for science, I structured the unit using the 5E model. The 5E model is an investigative unit meant for students to have a chance for hands-on learning, in place of the traditional lecture based learning. The 5E model includes these stages: Engage, Explore, Explain, Elaborate, and Evaluate. Each stage is meant to build towards a deeper understanding of the phenomenon. Within the different stages students are going to ask questions, work with data, construct explanations, and engage in arguments based on evidence. This unit can also be used to incorporate literacy and math.

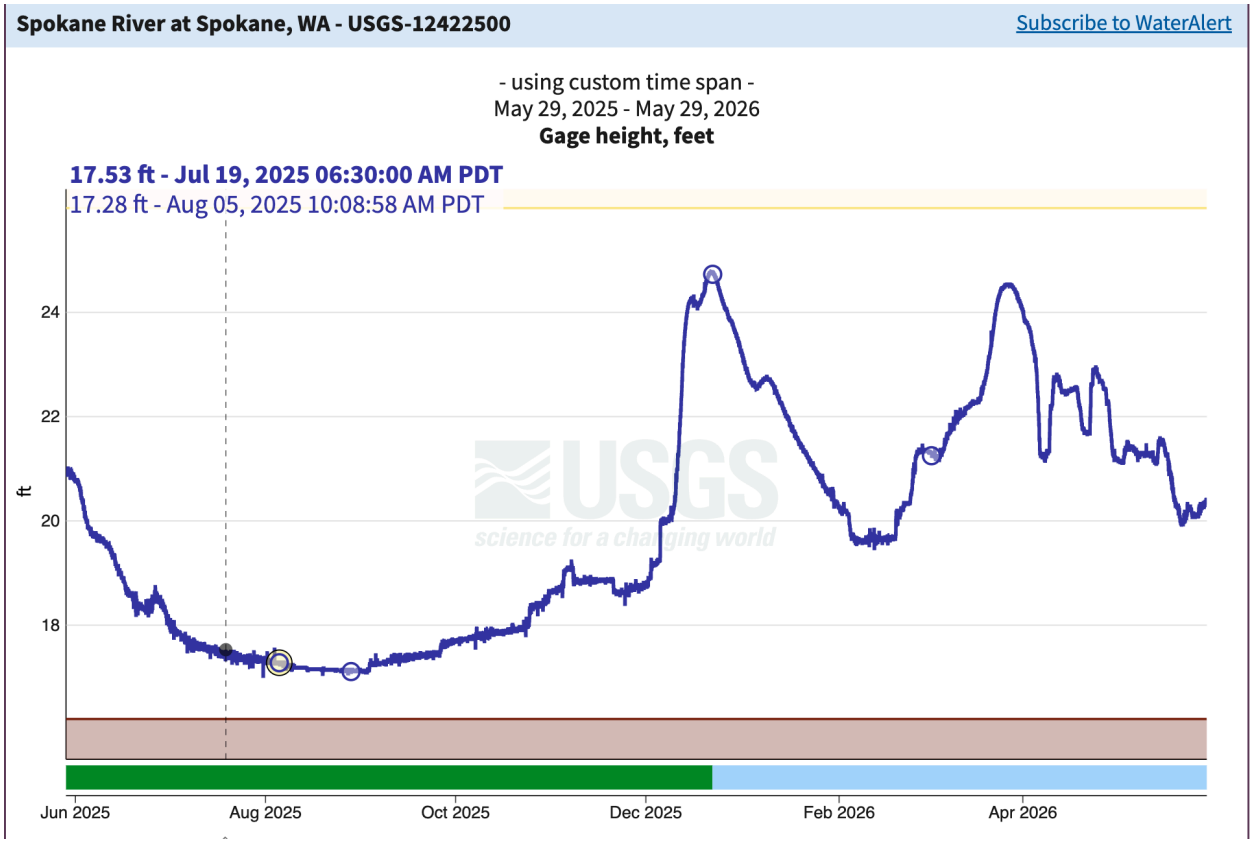
Unit Design Using the 5E Instructional Model

We first start the unit off with the Engage stage. This stage is about getting students interested in the unit and sparking their curiosity, but not giving them all the information yet. This stage is meant to be done in a two day period. In this stage students will be reading in books about water or rivers in groups and writing down what each book was about so in the end there can be a class discussion. For this I picked out 4 books for students to look at (see acknowledgements for the books). For the younger grades you could have a read-aloud and then still have that class discussion. The second part of this stage is having the students examine a photograph of the Spokane River (below) when it was really low.

This photo was taken by the Spokane Riverkeeper. It shows a dried-out section of the river from Barker Road to Sullivan Road in Spokane Valley in 2025. Students will record their ideas, observations, or questions on sticky notes. The sticky notes will then get placed into their own categories such as weather, human use, or climate. Even the younger grades could make their own observations about the low levels of the Spokane River in the previous picture. They would then write them down or the class would have a discussion. After students have had time to look at the picture and write down what they thought, the teacher will introduce the driving question to students to get them started on the next stage.

The second stage in a 5E investigation is Explore and should take around 3 days. In this stage students will be working with data to explore what the answer might be to the driving question. Within the first day students will do a then-and-now comparison of the Spokane River and comparison of environmental messaging, independently or together as a class. Students will then make a timeline of key events and again this can be done independently or as a class. Students will use data from The Spokane Valley-Rathdrum Prairie Aquifer Atlas (fifth edition) and history from Spokane Riverkeeper to make this timeline. Students will also work with data from the United States Geological Survey to graph the water levels in 2001, 2015, and 2025 (see

example below). By students graphing the water levels this will allow for them to see the visual effect of the water dipping in certain seasons. At the end there will be a class discussion where students identify the highest year, lowest year, and possibly the water difference in the years. That leads into our last activity of the Explore stage: water use simulation. In this activity, students will be working through different stations. Within the stations they will have to decide how much water to use based on the scenario given. In the end students will remove that water from a beaker acting as the aquifer and graph the water level over time.



The third stage of my 5E investigative unit is the Explain stage, where students are using the evidence gathered to answer the driving question. This stage should take one day. Since this unit can be done with grades ranging from K-5, I have made choices for this stage depending on what grade you do it with. You can do a teacher-led group discussion for younger grades. The older grades will have a choice, they can make a poster or presentation answering the driving question with all their evidence or students can create an environmental messaging poster. This is also the stage where you can do a take action project like the class volunteering with Spokane Riverkeepers.

The fourth stage is the Elaborate stage and I have one day for it in this unit. Students will be using their new knowledge to add onto a concept or learn a new one that connects to what they just did. For this unit students will do a groundwater modal lab (see image below) with kits at each table group. I got this lab from the University of Wisconsin. Students will build an aquifer modal with sand and gravel layers and add water to simulate groundwater. The model will show how groundwater feeds any river, but more specifically connecting it to the Spokane River. extension worksheet.

Picture on below: University of Wisconsin

The last stage is the Evaluate stage, in which the teacher is evaluating the students. The teacher is now able to see if they understand the concepts they were supposed to get by the end of the unit. The concepts that students should have by the end are that water moves between systems, human activities have an impact on water levels, and that groundwater and surface water are connected.

This award represents the type of lessons that I strive for as a teacher, ones that are inquiry based, locally grounded, and centered on stewardship. By designing this 5E investigative unit for K-5 with a focus on declining groundwater in the Spokane River, I hope to have created a fun and hands-on learning experience for students. In the end I hope that this unit will help students to understand an important environmental issue in their community.

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Andrey Kendys

Cultural Traditions and Nature

This study explores how Slavic immigrant families view outdoor activities and the role nature plays in preserving cultural traditions and family values. To examine these perspectives, I conducted interviews with Slavic immigrant parents and analyzed the common themes that emerged from their responses. Participants recalled walking long distances, helping family members in gardens, exploring forests, and spending time near rivers and lakes. These experiences often occurred without extensive planning and were integrated naturally into daily routines.

Many participants stated that grandparents played an important role in teaching outdoor skills and values. Grandparents frequently introduced children to activities such as gardening, fishing, gathering berries and mushrooms, and caring for animals. Participants often described these experiences as some of their strongest childhood memories. Several parents explained that these activities taught patience, responsibility, and respect for natural resources while also strengthening family relationships.

Benefits of Outdoor Activities

Participants identified numerous benefits associated with spending time outdoors. Physical health was one of the most frequently mentioned benefits. Parents believed that outdoor play encourages exercise, improves fitness, and helps children develop healthy habits. Several participants contrasted outdoor recreation with sedentary activities such as watching television or using electronic devices.

Emotional and psychological benefits were also frequently discussed. Many parents reported that spending time outdoors helps reduce stress and improve mood. Some participants explained that natural environments provide opportunities for relaxation and reflection that are difficult to find in modern urban settings. Parents believed that outdoor experiences can help children develop confidence, independence, and resilience.

Social development emerged as another important theme. Participants described outdoor activities as opportunities for families to spend quality time together without distractions. Camping trips, hiking excursions, and gardening projects often required cooperation and communication among family members. Parents believed that these shared experiences strengthened family bonds and created meaningful memories.

Challenges Faced by Immigrant Families

Although participants expressed strong support for outdoor activities, they also identified several challenges. One common challenge involved balancing work schedules and family responsibilities. Many parents reported working long hours, which sometimes limited opportunities for outdoor recreation. Despite these constraints, participants emphasized the importance of making time for family activities whenever possible. Several participants also noted differences between life in their countries of origin and life in the United States. Some explained that neighborhoods in Eastern Europe often provided easier access to forests, fields, rivers, and other natural spaces. Others reported that children in their home countries tended to

spend more unsupervised time outdoors. In contrast, parents felt that children in the United States often have more structured schedules and greater reliance on technology for entertainment.

Discussion and Implications

The findings of this study suggest that outdoor traditions remain an important part of cultural identity for many Slavic immigrant families. Parents not only value nature for recreation but also view it as a setting for learning, character development, and family connection. Through activities such as hiking, camping, gardening, and fishing, parents continue to pass cultural values and traditions to their children while adapting to life in a new country.

The results also highlight the potential role that families play in promoting environmental awareness. Children who regularly interact with nature may be more likely to appreciate natural environments and engage in environmentally responsible behaviors later in life. By encouraging outdoor exploration and teaching respect for natural resources, parents contribute to the development of future environmental stewardship.

Future research could examine larger and more diverse samples of immigrant families from different cultural backgrounds. Additional studies could also explore how factors such as socioeconomic status, geographic location, and length of residence in the United States influence outdoor traditions and environmental attitudes. Such research would provide a deeper understanding of the relationship between culture, family practices, and environmental engagement.

Montserrat: A Journey Through Art

By Phoebe Milatz

When I chose Eastern Washington University to finish my bachelor's degree, I knew the chances of studying tropical ecosystems were slim. Even though the rainforests, estuaries, and diverse wildlife of tropical countries called my name, I knew studying the prairies, wetlands, and unique geology of Cheney, Washington would be just as beneficial to a future biologist. But when I learned that the biology department was planning a study abroad trip to Montserrat, a tiny island in the Caribbean, I knew my wishes were fully realized. Upon landing in Montserrat after a whirlwind of international travel, long layovers, and loading into a tiny eight-person passenger plane, I looked around and thought, “Wow. I’m finally here!” After a quarter’s worth of planning, the mountains, fresh air, and sun setting slowly over the ocean represented a sigh of relief. My dream of researching and creating art in tropical ecosystems was finally coming true.

Over Winter quarter 2026, I set out to create watercolor paintings of the flora, fauna, and landscapes of Montserrat. While on the island, I took film photos of the ghauts (steep ravines that link Montserrat’s mountains and hills to the sea), canopies filled with epiphytes, beach cliffs covered in cacti, and the Soufrière Hills Volcano. With these colorful images in hand, I had a plethora of material to inspire my paintings.

Using watercolor to depict whistling frogs, Antillean Crested Hummingbirds, the Montserrat Oriole, Montserrat’s painted black iguana, and memorable beaches like Margarita Bay and Old Road Bay, I returned to the island again and again through my art. I was transported back to watching the sunset over the Caribbean Sea, even as the snow fell outside my window. In ten weeks, I created eight paintings that highlighted a glimmer of the staggering biodiversity of Montserrat. Creating this art opened a pathway for me to reflect deeply on my experiences of the

island and allowed me to share those stories in the three showcases where I presented my artwork.

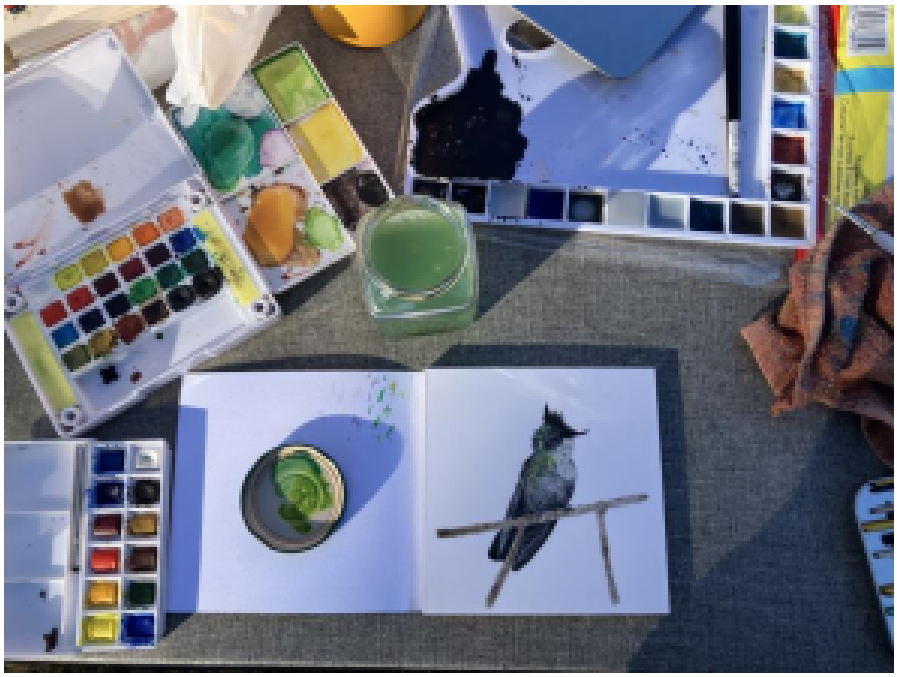
When I first presented my artwork at the Ecology: At Home and Abroad research showcase, I was nervous. I was the only person setting up art in a symposium dominated by research posters. Instead of graphs, figures, and a methods section, I had watercolors, 35mm film photos, and a QR code for people to scan and listen to whistling frogs singing. However, as I set up more of my pieces, I noticed more and more people stopping to look at my photos and paintings. I reminisced over island memories with students I traveled with, answered questions about my artistic process, and was blown away by the outpouring of support I received. I got to share my artwork with students, faculty, and family members, and with every conversation, I felt increasingly encouraged that artwork belongs in research symposium spaces. Following this showcase, I shared my art in Eastern's Research and Creative Works Symposium and the Natural Science Student Showcase, and I felt honored to connect with more people over the wonders of Montserrat, biology, and art.

I feel lucky to have been a part of this inaugural study abroad trip, and I hope that if you saw my artwork, you could sense I created it out of love and respect for this incredibly resilient island in the Caribbean. Communicating the biodiversity of Montserrat, the importance of endemic species, and the vulnerability of these ecosystems to habitat disturbance and climate change was easier to express through paintings than through any other medium I could have chosen. When I set out with the goal to create artwork about Montserrat's biodiversity, I had no idea how much I would learn about the island and how my observational skills would become sharpened out in the field, or that it would inspire me to earn my art minor, or how many impactful conversations would be shared with members of Eastern's community. As I finish my degree and transition into my career, I hope to inspire future students to work from the heart and share their experiences with the world in the medium that speaks to them, to ask for

room in spaces that might not be used to seeing projects like theirs, and to pursue their passions, whatever they may be.

Conversations with the community was a special benefit of creating this body of work.

Sharing my artwork at the Ecology: At Home and Abroad Winter Research Symposium.



A snapshot of the artistic process creating the Antillean Crested Hummingbird.

Montserrat's painted black iguana (*Iguana melanoderma*), an endemic species who darkens with age.

Whistling frog (*Eleutherodactylus johnstonei).* These tiny amphibians get their name from their loud whistles they share with islanders every night.

Old Road Bay at sunset— a truly magical place.

The Role of the Rattlesnake Flats Wind Energy Project in Promoting Sustainable Energy Awareness

Myra K. Miller

Eastern Washington University

A Clawson- Youngs Scholarship Project

June 7, 2026

When I originally proposed my project, I selected the broad topic of wind turbines and sustainable energy awareness because renewable energy continues to play an increasingly vital role in meeting future energy demands. As my project developed, I focused specifically on the Rattlesnake Flats Wind Energy Project, a large-scale wind farm located approximately fifteen miles south of Ritzville, Washington. Through direct observation of the project, conversations with individuals involved in its operation, and independent research, I gained a deeper understanding of how wind energy contributes to sustainable energy goals. More importantly, I learned that successful renewable energy production depends not only on technology but also on communication, coordination, maintenance, and teamwork.

The Rattlesnake Flats Wind Energy Project holds special significance for me. Multiple turbines are located on my family's farmland. Growing up in Eastern Washington, I have always been familiar with the region's intense winds, agricultural landscape, and rural communities. When construction of the wind farm began, I had the opportunity to observe the project firsthand. Over the years, I have continued to visit the site and learn more about its operation. This personal connection provided a unique opportunity to study sustainable energy in a real-world setting rather than through textbooks or online research.

The Rattlesnake Flats Wind Energy Project consists of fifty-seven wind turbines located along a ridge that stretches through the wheat-producing region of Eastern Washington. The project was developed by Clearway Energy Group in partnership with Avista and represents the first green energy project developed under Washington State's Clean Energy Transformation Act. The wind farm produces approximately fifty average megawatts of electricity, enough to power roughly 38,000 homes each year. In addition to increasing renewable energy production, the project helps support Washington's long-term goal of transitioning toward a cleaner and more sustainable energy future.

As part of this project, I spent time researching the development and operation of the wind farm while also drawing from my personal observations and experiences. I visited the site during construction and after completion. This allowed me to see how the project evolved over time.

1 Construction of the Rattlesnake Flats Wind Energy Project

One of the most memorable parts of this project was watching the wind farm take shape in an area I had known my entire life. During construction, I encountered massive semi-trucks transporting turbine blades and other components along the same roads I used to travel to high school. There were times when I found myself delayed on the way to school because a convoy carrying turbine parts was moving through the area. At the time, it could be a little frustrating to be stuck behind equipment that seemed to take up the entire road. Looking back, it is a funny reminder of just how large these turbines really are. I also had to be aware of construction activity while operating equipment and working in the fields, because several turbines were built on or near my family's farmland. Although the project occasionally made navigating the farm more challenging, I mostly found it fascinating to watch. Seeing the turbines rise from the landscape gave me a unique perspective on the scale of renewable energy development and helped me appreciate the amount of planning and coordination required to complete a project of this size.

2 Transportation and installation of wind turbine components during construction.

I also spoke with family members, operators, and managers involved with the project. These conversations provided valuable insight into the work required to keep a large renewable energy facility operating efficiently and safely. One lesson that stood out for me was the amount of effort that goes into both the visible and behind-the-scenes operations of a wind farm. The workers explained that successful operation requires constant coordination among each crew. What appears from a distance to be a simple wind turbine generating electricity is part of a much larger system that depends on communication, planning, safety procedures, and teamwork.

Before beginning this project, I viewed wind turbines primarily as a source of clean electricity. While that remains true, I now understand that wind energy projects are much more complex than they appear from a distance. One of the most important lessons I learned was the amount of coordination required to keep the operation running smoothly. Every aspect of the project requires planning, scheduling, safety procedures, maintenance, and ongoing monitoring to ensure reliable energy production.

I gained greater appreciation for the role of maintenance and operations within renewable energy systems. Wind turbines are highly sophisticated machines that must operate in changing weather conditions throughout the year. Maintaining equipment, responding to operational issues, and ensuring worker safety all require significant effort behind the scenes. People see wind turbines turning and assume they simply produce electricity on their own. Through this project, I learned that a large team of skilled professionals contributes to the success of the operation every day. Conversations with workers also helped me understand just how massive these structures are. Seeing them from a distance is one thing, but standing near them provides an entirely unique perspective on their size and engineering.

3 Completed wind turbines at the Rattlesnake Flats Wind Energy Project

Another important outcome of this project was a deeper understanding of sustainable energy awareness. Public discussions about renewable energy often focus on environmental benefits, but my experience showed me that renewable energy projects also involve economic, and community considerations. Projects such as Rattlesnake Flats create jobs and contribute to energy independence. They require cooperation among landowners, energy companies, utility providers, regulators, and local communities.

In addition to its environmental benefits, the Rattlesnake Flats Wind Energy Project has made a significant impact on the local community. Through my research, I learned that the project brought approximately $12 million in local spending to Adams County and created more than 250 jobs during construction. Even after construction was completed, the wind farm continued to support the local economy by sustaining full-time positions for technicians and maintenance crews. These facts helped me realize that renewable energy projects are not only investments in cleaner energy but also investments in rural communities and local economies.

I grew up in this area, so the project felt much more personal than a typical research topic. Even today, whenever I return home from college, I see the turbines from our house. I see

them from the fields, and while traveling throughout the area. Over time, they have become a familiar part of the landscape. What I appreciate most about them is not just their size or the electricity they produce, but what they represent. Each turbine is the result of countless hours of planning, construction, maintenance, and teamwork by the people who helped make the project possible. Seeing them every day serves as a reminder that large-scale renewable energy projects are accomplished through the efforts of many dedicated individuals working toward a common goal.

One of the most valuable aspects of this project was seeing how renewable energy affects my own community. Because the wind farm is located near my family's property, I have been able to observe its impact over several years. Watching the project move from construction to full operation helped me better understand the long-term commitment required to develop sustainable energy infrastructure. It also demonstrated how technological innovation can be successfully integrated into rural communities and support broader environmental goals.

The Rattlesnake Flats Wind Energy Project provided an excellent opportunity to explore sustainable energy through a real-world example. Observation, research, and conversations with individuals involved in the project helped me develop a greater appreciation for renewable energy production and the people who contribute to its success. The experience strengthened my understanding of wind power, and demonstrated the significant role renewable energy projects can play in creating a more sustainable future. I am grateful for the opportunity provided by this scholarship to further explore a topic that is both personally meaningful and increasingly important to communities across Washington State and the nation.

4 View of the Rattlesnake Flats Wind Energy Project from the surrounding agriculture area

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Yaelle E. Reeve

6/6/2026

Clawson-Youngs Award Report

Is Bigger Better? Effect of Forb Island Size on Pollinator Attraction in Prairie Restoration

Native prairie ecosystems are among the most endangered habitats in North America, with many remaining fragments isolated by agriculture and urban development. One of these endangered prairie ecoregions is the Palouse. Historically, the rolling hills of the Palouse Prairie ecoregion spanned more than 18,000 mi² across eastern Washington, northern Idaho, and parts of northeastern Oregon. This diverse prairie system supported a wide range of pollinators, including solitary bees, bumble bees, butterflies, and more. Today, more than 99% of this habitat has been converted to cropland or developed land, leaving only small, isolated remnants on steep slopes, rocky outcrops, and unmanaged lands (Noss et al., 1995; Looney et al., 2012). As a result, both native plant and pollinator populations within the Palouse Ecoregion have experienced substantial declines.

With less than 1% of the Palouse Prairie ecoregion retaining native vegetation and reconstruction efforts failing to restore ecologically important species, research is needed to determine restoration strategies for more difficult to establish native plants and pollinators. My research aims to evaluate how variations in the size of grouped wildflower plantings (pollinator islands) affect native forb establishment, floral abundance, and pollinator community structure within the Palouse Prairie restoration site at Eastern Washington University. No studies in the Palouse Prairie have simultaneously evaluated how pollinator island patch size influences both native plant establishment and pollinator attraction during the early stages of restoration. Most restoration research has focused on seeding methods or pollinator responses independently,

leaving a critical gap in our understanding of the effect wild flower patch size has on plant–pollinator interactions in fragmented prairie systems.

My study takes place at the Eastern Washington University Palouse Prairie Restoration pilot site, a 15-acre portion of the 130-acre restoration project seeded in 2021. A patch-based restoration design was implemented with three pollinator island size treatments: 0.1 m² (20 replicates), 1 m² (10 replicates), and 10 m² (10 replicates). Each pollinator island consists of four native forb species: *Penstemon attenuatus*, *Potentilla gracilis*, *Symphyotrichum ascendens*, and *Geranium viscosissimum,* planted 1.5 ft apart to maintain a consistent planting density across patches while allowing sufficient space for plant growth and competition. These species were selected because they are culturally important to regional tribes, have documented high value to pollinators and wildlife, or provide critical ecosystem services.

An important component of this project was public engagement with ecological restoration. During the spring of 2026, I helped organize and lead an event called “Plant the Prairie” which focused on planting 1,400 native plant species needed for my thesis project at our restoration site. The event attracted 72 registered volunteers, including Eastern Washington University students, faculty, and staff, as well as members of the local community and the Washington Native Plant Society. Together, volunteers planted native prairie species that will provide valuable habitat and floral resources for pollinators while contributing to the long-term restoration of native prairie ecosystems.

The planting event provided participants with an opportunity to learn about a Palouse Prairie ecoregion restoration project near them and to get direct, hands-on experience implementing restoration practices. Many volunteers were unfamiliar with the ecological importance of native prairies, including those they have access to in their own backyards (or at

least close by!). Volunteers gained a greater appreciation for the role native plants play in supporting biodiversity and maintaining healthy ecosystems.

This event fostered stewardship among the volunteers, with a few still asking about the well-being of the plants they planted months earlier. Stewardship is important because restoration projects often require long-term commitment and community support to be successful. The enthusiasm demonstrated by volunteers during this event shows the value of public involvement in restoration efforts. The success and volunteer turnout of the planting event represents one of the most rewarding aspects of this project, demonstrating that ecological restoration research can serve both scientific and educational purposes.

Currently, fieldwork is underway to collect data. Fieldwork consists of monitoring the planted pollinator islands throughout the growing season for signs of herbivory and conducting pollinator observations that are followed by collection. Pollinators interacting with flowers' sexual structures will be collected and identified to their lowest taxonomic level in the lab. Butterflies and bumblebees will not be captured due to conservation concerns. All applicable collecting permits have been acquired. Floral abundance and plant establishment are also being recorded to better understand how pollinators use their resources.

This project has allowed me to develop research skills, which include field sampling techniques, ecological monitoring, data management, statistical analysis, and scientific communication. Conducting this study has required careful planning and coordination to account for environmental variability and changing field conditions. Through this work, I have gained valuable experience conducting ecological research and communicating my scientific findings into practical recommendations for restoration practitioners and the general public.

Sharing the results of this project with the broader community has been an essential part of the research process. In Spring 2026, I presented my findings at the annual EWU Student Research and Creative Works Symposium, and in Winter 2026, I presented at the Natural Science Showcase, engaging students, faculty, and community members interested in ecological restoration and pollinator conservation. This strengthened my science communication skills while also engaging community involvement and awareness of Palouse Prairie ecoregion restoration efforts.

This project has contributed significantly to my academic and professional development. By conducting independent ecological research, I have strengthened my interdisciplinary approach to problem-solving, preparing me for future opportunities in the scientific field. This opportunity has also fueled my interest in restoration ecology and pollinator conservation, leading me to read scientific literature in my free time. It has also provided opportunities to collaborate with faculty mentors, engage volunteers in restoration activities, and share scientific findings through presentations and public outreach.

The work supported by the Clawson-Youngs Award will continue beyond the award period. Data collected through this research will contribute to my M.S. thesis and help inform future restoration efforts at EWU and regionally, within the Pacific Inland Northwest. This research project aims to fill in gaps in current effective restoration strategies for maximizing pollinator habitat. While improving restoration outcomes, this project also helps support biodiversity conservation in one of the region's most threatened ecosystems, the Palouse Prairie ecoregion.

I am grateful to the Clawson-Youngs Foundation for supporting this research and making these opportunities possible. The award provided resources that allowed me to advance my thesis

research, engage community volunteers in restoration activities, present my findings, and contribute to ongoing efforts to restore and conserve native prairie ecosystems.

Figure 1: Picture of me (in red vest on the left) and my fellow graduate students (friends) who helped make this event a success.

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Reconstructing Belonging Among Immigrants and Refugees Through an Eco-Social Lens

2026 Clawson-Youngs Award Project Report
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Introduction

The relationship between land, identity, and belonging has traditionally been conceptualized as geographically bounded[1]. Within this framework, land is often understood as a fixed territorial site of origin closely tied to racialized and nationalized identities. However, for immigrants and refugees, experiences of land are neither static nor solely physical[2]. Instead, land functions as a dynamic and relational construct that is continuously reinterpreted across shifting social, cultural, and environmental contexts.

The project was inspired by the researcher's own experiences as an immigrant and by her work with immigrant and refugee communities through social work practice. Throughout the social work journey, the researcher noticed that many conversations surrounding migration focused primarily on trauma, adjustment, or economic integration, while the environmental and relational losses associated with displacement were often overlooked. This research sought to better understand how immigrants and refugees in the United States experience these losses and reconstruct meanings of land and belonging in new environments.

Using a qualitative methodology, this research draws on semi-structured interviews with participants from diverse countries and backgrounds. Based on an eco-social perspective, this study conceptualizes land not only as a physical environment but as a relational and socially constructed space shaped by human relationships, ecological context, and lived experience. By amplifying the voices of immigrants and refugees, this research underscores the importance of integrating environmental, cultural, and social dimensions into the understanding of belonging, and offers implications for developing ecologically grounded social work practices.

Research Process

This qualitative study utilized semi-structured interviews with five immigrants and refugees from India, Japan, Venezuela, Syria, and the Democratic Republic of the Congo (DRC), residing in Spokane, Washington. Participants represented both voluntary and forced migration experiences and ranged from individuals who had lived in the United States for ten years to more than three decades. Interviews explored participants' memories of homeland, relationships to nature and community, migration experiences, and strategies for reconstructing belonging after resettlement.

The collected interview data was analyzed using qualitative thematic analysis, following the systematic six-phase framework established by Braun and Clarke[3]. It was selected for its theoretical flexibility and its capacity to identify, analyze, and report patterns across diverse narratives. The analysis was a recursive and iterative process between the original transcripts, extracted codes, and the overarching thematic structure to deepen the analytical depth. During this initial review, reflective memos were documented to record preliminary impressions and potential patterns. Subsequently, the researcher analyzed the initial coding of the transcripts and assigned descriptive labels to segments of text relevant to the research questions.

The codes specifically targeted patterns of attachment to land, disruption of place-based

identities, and strategies participants utilized to reconstruct belonging in their new environments. Following the initial coding, codes were refined into broader themes reflecting the relational and eco-social dimensions of participants' experiences. These themes were then reviewed against
the original data set to check if they accurately reflected the participants' narratives. Finally, the themes were defined and named to capture the essence of the findings and provide a holistic perspective on the lived experiences of immigrants and refugees.

Findings

The thematic analysis of the interview data identified three primary themes that describe how immigrants and refugees reconstruct their relationship with land and belonging. These themes highlight a shift from viewing land as a physical or territorial entity to conceptualizing it as a relational, sensory, and communal system of living.

1. Land as a Relational and Communal Space

Participants consistently described land as something relational rather than individualistic. Their understandings of land were closely connected to family systems, community relationships, cultural practices, and collective ways of living. Several participants described growing up in environments where child-rearing, caregiving, and community support were shared responsibilities. Participant May (P1) reflected that "it takes a whole village to raise kids," emphasizing that belonging came from collective care and interdependence rather than individual ownership[4]. Participant Brown (P3) also described his homeland as a place where "doors were open" and neighbors cared for one another naturally[4].

Participants also described relationships with nature as reciprocal. Rather than viewing nature as separate from themselves, many participants understood land as something alive and relational. Participant Anika (P2) discussed learning outdoors and participating in seasonal cultural practices connected to nature, while Participant Paula (P4) described feeling "truly part of the sea"[4]. These narratives demonstrated that land was deeply intertwined with identity, dignity, culture, and memory. For many participants, displacement represented not only geographic movement, but also the loss of familiar social and environmental systems that once provided emotional stability.

2. Dislocation as Rupture

The second theme reflects the deep disruption of place-based identity that occurs during the migration process. For participants, migration was not simply a physical relocation, but an emotional and sensory uprooting that interrupted their connection to land. This disconnection was experienced as the loss of familiar environmental cues that once grounded their sense of self and belonging. Participants discussed missing familiar climates, landscapes, food, smells, sounds, and everyday routines that once grounded their sense of self. Participant Anika (P2) described feeling like a "fish out of water" after moving from India to the United States, reflecting on the loss of barefoot play, fruit trees, and communal social life back home[4]. Participant Paula

(P4) also explained that although Spokane's natural beauty was meaningful, it could never fully replace her emotional connection to the Caribbean Sea[4].

Additionally, the loss of social ecology was another major rupture of displacement. Participants frequently contrasted communal systems in their home countries with the more individualistic social structures they encountered in the United States. Several participants described their homelands as places where neighbors played active roles in one another's

lives, while social interactions in the United States often felt distant and formalized. Similarly, participants also discussed changing perceptions of safety after migration. Some reflected that safety in their home countries was experienced collectively through community relationships, while safety in the United States often required greater individual awareness and self-protection.

Differences between voluntary and forced migration also shaped experiences of rupture. Refugee participants described displacement as sudden and irreversible, tied to conflict, violence, and the inability to return home safely. In contrast, voluntary migrants often described migration as a gradual process of adjustment, although feelings of loss and cultural disconnection remained present.

3. Re-rooting in the New Land

Despite experiences of rupture and displacement, participants utilized resilient strategies to build a new sense of belonging within the specific geographic and social surrounding in Spokane, Washington. Rather than a passive assimilation into the dominant culture, participants intentionally worked on building communities and bridging their past identities with their new social and environmental identities.

Several participants found emotional grounding through Spokane's natural environment. Rivers, mountains, parks, and greenery served as therapeutic spaces that created continuity between past and present environments. Participant Brown (P3) described the Spokane River as "neutral," explaining that nature provided a sense of peace outside the pressures of navigating unfamiliar social systems[4].

Cultural preservation also played an important role in rebuilding belonging. Participants recreated micro-homelands within their homes through language, food, gardening, music, religion, and cultural traditions. Participant Anika (P2) grew Indian herbs and decorated her home with cultural artifacts to maintain continuity with her homeland, while another taught Arabic and Islamic traditions to her children to preserve cultural identity across generations. Perhaps the most significant finding was the shift from land-based belonging to people-based belonging. Multiple participants emphasized that belonging was ultimately reconstructed through relationships and community rather than geography alone. Participant Paula (P4) stated, "The sense of belonging is finding people. It's about people, not about land"[4].

Several participants transformed their own experiences of migration into community leadership and advocacy. Refugee and immigrant participants created organizations, support networks, and culturally responsive spaces that helped newcomers navigate housing, employment, language barriers, and social isolation. Through these efforts, participants rebuilt belonging not only for themselves, but also for others experiencing displacement.

Reflection and Significance

This project challenged the idea that belonging is tied exclusively to geography or nationality. Instead, participants' experiences revealed that belonging is continuously reconstructed through relationships, cultural continuity, memory, and interactions with both people and environments.

The findings also highlighted the importance of considering environmental and relational dimensions within social work practice. Conversations surrounding immigration and refugee resettlement often focus heavily on trauma, employment, and assimilation, while overlooking the emotional significance of land, sensory familiarity, and community connection. Participants' narratives suggested that healing after displacement may involve more than economic stability or language acquisition. Access to safe public spaces, parks, community gardens, cultural organizations, and supportive social networks also played significant roles in emotional

well-being and identity reconstruction. These findings support the need for more culturally responsive and ecologically grounded approaches within social work and community practice.

As a researcher with an immigrant background, conducting this project was personally meaningful. Listening to participants' stories deepened the researcher's understanding of migration as an ongoing process of negotiation between memory, identity, and place. While experiences of displacement differed across participants, all described a continued effort to create belonging while carrying pieces of home with them.

Future Directions

This project represents an initial exploration into the relationship between migration, land, and belonging through an eco-social lens. Future research may expand this work by including larger participant groups, additional geographic regions, and intergenerational immigrant experiences. Examining differences between rural and urban resettlement environments may also provide deeper insight into how infrastructure, access to nature, public systems, and community networks shape immigrants' and refugees' experiences of belonging. The findings additionally suggest opportunities for interdisciplinary collaboration between social work, environmental studies, urban planning, and community development.

Scan the QR code below to read the full research writing.

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Final Spatial Distribution of PFAS on the West Plains in Spokane County, Washington

Over the past year, the West Plains PFAS Fate and Transport Study has expanded significantly through the integration of newly released groundwater monitoring data from Fairchild Air Force Base (FAFB). These data, combined with the existing Eastern Washington University (EWU) student-collected dataset, as well as some of the Environmental Protection Agency (EPA) collected data, have allowed me to create higher-resolution PFAS plume density maps for PFOS, PFOA, and PFHxS across the West Plains region. Using ArcGIS Pro, updated hotspot analyses now reveal more accurate plume density, refined concentration gradients, and slightly improved insight into potential migration pathways within the basalt-dominated aquifer system. This paper summarizes the progress I have specifically made since the initial phase of the project, and it highlights the impact of the new FAFB (Fairchild Airforce Base) dataset and provides a concluding synthesis of the current understanding of PFAS behavior in the West Plains.

Per- and polyfluoroalkyl substances (PFAS) remain a persistent environmental concern due to their chemical stability, hydrophobicity, and widespread industrial and military use. In the West Plains of eastern Washington, PFAS contamination has been documented in both private and public groundwater wells, with PFOS, PFOA, and PFHxS, representing the most detected compounds. Previous work by the EPA, I and other EWU students established baseline spatial distributions of PFAS across the region, but data gaps (particularly near FAFB) limited the resolution of early plume models.

Over the last year, the release of additional monitoring data from FAFB has provided a critical missing component. These new data points, many located near suspected source zones, have allowed for more robust interpolation, improved density mapping, and a clearer understanding of plume morphology. The integration of these datasets marks a major step forward in characterizing PFAS fate and transport within the aquifer system.

PFAS compounds are synthetic carbon-fluorine structures used in aqueous film-forming foam (AFFF), industrial lubricants, textiles, non-stick coatings, and other manufactured materials (NTP, 2016; ASTDR, 2019). Their environmental persistence has earned them the label “forever chemicals,” though emerging technologies may hopefully improve degradation potential. PFAS tend to adhere to soils due to hydrophobic interactions but can still migrate into groundwater, particularly in fractured basalt systems where preferential flow paths accelerate transport (Brusseau, 2024).

The West Plains aquifers are composed primarily of Miocene-aged Columbia River Basalts, emplaced between ~16.5 and 16.3 Ma (Pritchard et al., 2020). These basalt flows contain complex networks of fractures, vesicles, and interflow zones that influence groundwater movement. Because the region relies heavily on private wells-- many of which draw from shallow basaltic units, understanding PFAS mobility is essential for protecting public health and guiding mitigation strategies.

EWU Student and EPA collected data (2019–2025) including private well sampling, municipal well data, and publicly available monitoring results was combined with new FAFB monitoring data. All data were standardized for coordinate system, concentration units, before spatial analysis. I utilized ArcGIS Pro to create density maps for PFOS, PFOA, and PFHxS and interpolate concentration surfaces

The new FAFB dataset dramatically sharpened the spatial definition of PFAS plumes. Key improvements include more accurate plume origin identification, with PFOS and PFHxS showing strong concentration gradients radiating from AFFF-associated zones on base. Clearer migration pathways, particularly southwest and southeast along basalt interflow zones. It reduced uncertainty in areas previously interpolated from sparse data. PFOS and PFHxS remain the dominant contaminants, with the highest concentrations near FAFB and measurable migration into off-base private wells. PFOA shows a more diffuse distribution, consistent with its higher mobility.

The updated maps reinforce the role of basalt flow boundaries and fracture networks in controlling PFAS transport. Concentration gradients align with known paleochannel deposits and interflow zones described by Pritchard et al. (2020), suggesting preferential flow along these features.

The integration of FAFB data represents a turning point in understanding PFAS distribution in the West Plains. Earlier maps provided a broad overview, but the new dataset fills critical spatial gaps and validates suspected plume pathways. The improved resolution also highlights the complexity of PFAS transport in fractured basalt systems—an environment where traditional porous-media models may underestimate migration potential.

These findings underscore the need for continued monitoring, particularly in areas where plume boundaries remain dynamic. As more wells are sampled and as filtration systems are installed, future maps will help track changes in concentration and evaluate the effectiveness of remediation efforts.

The updated PFAS plume density maps produced through the integration of EWU and FAFB datasets represent the most accurate depiction to date of PFOS, PFOA, PFHxS, and PFBS distribution in the West Plains. The enhanced spatial resolution has clarified plume origins, migration pathways, and areas of highest concern, providing essential information for public health protection and resource management.

This work demonstrates the value of collaborative research between academic institutions, government agencies, and the community. As the project continues, these maps will serve as a foundation for future hydrogeologic modeling, remediation planning, and public outreach. The progress made over the past year marks a significant step toward understanding—and ultimately mitigating—the PFAS impacts on the West Plains aquifer system.

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Beck Walsmith

The Cultural and Environmental Implications of the Introduction of Cell-Cultured Salmon on Indigenous Communities in the Pacific Northwest

Introduction

This research is an anthropologically grounded speculative analysis of the potential ways the introduction of cell-cultured salmon may impact PNW Indigenous Communities culturally and environmentally, and how various PNW Indigenous cosmologies, relational frameworks, food values, and commensality affect perspectives on cellular meat.

Discussions of cell-cultured meat center around its economic prospects, marketability, and viability as a meat replacement. These narratives frame cell-cultured meat as a revolutionary technology for combating the increasing stressors of the Anthropocene: climate change, global food insecurity, and animal exploitation in industrial agriculture. However, these conversations are largely conducted through dominating Western lenses that prioritize ownership over stewardship or interconnectedness perspectives, as well as anthropocentricity over kincentricity. These narratives widely ignore the ways the introduction of cellular meat fits into other cultures' ecological values, and in the case of this research, Pacific Northwest (PNW) Indigenous Communities' various cosmologies, traditional ecological knowledge, food sovereignty, and data sovereignty. Indigenous perspectives found within North America on cell-cultured meat originate primarily from First Nations scholars, with a large gap in literature on PNW Indigenous perspectives. I combine expressed Indigenous perspectives on cell-cultured meat (Grant as cited in Ruder et al, 2023; Robinson, 2016; Robins as cited in Eschner, 2022), histories of cultural and material data theft by biotechnology companies (Cox, 2020; Vandana, 2016; Vázquez, 2023), analyses of the ties between colonialism and animal agriculture (Belcourt, 2020; Bowness et al, 2025; Eschner, 2022; Shiva, 2016; Wadiwel, 2020; Struthers Montford et al, 2020), and research

into the cultural and ecological values of Pacific Northwest Communities (Northwest Public Broadcasting, 2023; Sark as cited in Cox, 2020; Segrest as cited in Vázquez, 2023) in order to construct a facts-based, anthropological speculation of how cell-cultured meat's introduction on an industrial scale could impact Indigenous communities in the PNW. This report summarizes four main themes of concern I have identified around the implementation of cell-cultured meat in this context. These are: 1) that the cell-cultured meat industry ignores indigenous ecological values and cosmologies; 2) that cell-cultured meat exacerbates the already-ingrained Western, neoliberal perspectives and values in our current food system; 3) that cell-cultured meat introduces the potential for considerable data sovereignty concerns; and 4) that cell-cultured meat threatens Indigenous food sovereignty.

Cell-Cultured Meat: A Brief Definition and History

I first learned about cell-cultured meat last Spring, while listening to an episode of the food anthropology podcast, *Anthrodish* (Duignan, 2020). Cell-cultured meat is a meat product, be it salmon, hamburger, chicken, pork, bison, or an even more endangered animal, that is cultivated from cells. First extracted, most often from a live animal via biopsy, the cell-lines are then nursed in a bioreactor with a nutrient-rich solution of protein growth factors, nutrients, and scaffolding to encourage cell growth (Risner 2025, pg63; Wang 2025, pg1). Upon learning about cell-cultured meat, I wondered: What about the cultural importance of salmon? What does cell-cultured meat mean for culturally significant animals like the Salmon and Bison for Indigenous Communities? What does it mean for a company to "cultivate" an animal that local Indigenous Communities have stewarded for thousands of years (Sark as cited in Cox; Segrest as cited in Vázquez)?

Theme 1: The Cell-Cultured Meat Industry Ignores Indigenous Ecological Values and Cosmologies

In many PNW Indigenous belief systems, animals have non-human personhood and exist in kinship with humans, engaged in a relationship of reciprocity, respect, and mutual

appreciation. This is familiar to Lennox Island First Nations member Dr. Margaret Robinson who, in her essays, examines Mi'kmaq philosophies and traditions to infer and argue a Mi'kmaq perspective on cell-cultured meat (Robinson, 2014). The Mi'kmaq pursue only sustenance, not abundance, and in return, moose willingly sacrifice themselves to Mi'kmaq hunters in times of hardship. Robinson writes:

> The advent of in-vitro meat might mean that moose meat comes to be seen as a thing— a de-spirited secular object— rather than the sacrificial gift of a brother and a friend. If the mechanisms by which sacrifice is construed— the moose permitting themselves to be caught— is removed from the equation, and moose meat is grown and harvested, will our relationship with our food, and with the moose from which it originates, still be grounded in respect and gratitude? (pg13).

Dr. Tabitha Robin, Métis and Cree Member and Assistant Professor of Applied Biology at University of British Columbia considers cellular animals an example of "the violence that can be committed against marginalized peoples when their values are ignored. Moose, salmon, deer are kin, not just food."

Robin noted that, "For Indigenous Peoples, the healthiest food we can eat is food that contains the most relationships…Because moose is in contact with sun, wind, stars, soil, plants, etc. it is full of good relationships. Cellular 'food' is devoid of good relationships" (Robin as cited in Eschner, 2022). When writing about cell-cultured meat, Robin writes "food" and "animals" in quotations, bringing into conversation questions such as: 1) Are cell-cultured animals real "animals"? "Real" food? 2) and how might these answers change depending on your cultural background or beliefs?

Theme 2: Cell-Cultured Meat Production Exacerbates the Already-Ingrained Western, Neoliberal Perspectives And Values in our Current Food System

Food systems in the United States remain rife with colonially imported anthropocentrism, speciesism, and Western food ontologies, built upon the separation of Indigenous Peoples from their native lands, plants, and foods (Belcourt, 2020; Bowness as cited in Eschner, 2022). European colonizers' ecotheological beliefs were vital to their justification of invasive

settlement, working as the ideological grounding for Manifest Destiny, land theft, and the exploitation of nature (Struthers Montford, 2020; Wadiwel, 2020).

Key to this settler logic was the colonial ideological transition of animals from non-human persons and kin into mere objects for consumption. Colonialism has long conceptualized animals as less-than human commodities meant for extraction "embedded in a necropolitical global economy…and already consigned to death, to be consumed as meat, clothing, scientific data, and so forth" (Belcourt, 2020). Cell-cultured meat transforms the animal from a living being to an object of consumption, stripping it of not just its autonomy but also its non-human personhood.

Many scholars argue that cell-cultured meat does not inherently eliminate any of the pistemic or structural violence of animal agriculture (Poirier, 2022) and may in fact be the epitome of industrial agriculture rather than a disruption. Can this new type of industry be implemented within wider frameworks without creating and recreating the same epistemic injustices and asymmetries of power?

Theme 3: Cell-Cultured Meat Raises Data Sovereignty Concerns

In 2014, Pacific Northwest communities like the Muckleshoot, along with other tribal organizations called attention to biotechnology company Aquabounty Technologies' genetically modified salmon. Created by splicing the growth hormone regulating gene of the Pacific Chinook

with the Atlantic Salmon and the promoter sequence of the ocean pout, Aquabounty patented a GMO named AquAdvantage salmon. Aquabounty advertised that the AquAdvantage salmon would reach the deemed "market size" of four to five kg of weight in just 16 to 18 months instead of 30 to 32 months, like the traditional timeline for a salmon (Cox, pg2). In 2018, the AquAdvantage salmon was the first bioengineered animal approved for sale for human consumption by the FDA (Vázquez, 2023).

Muckleshoot Tribe member and nutritionist Valerie Segrest, as well as Mi'Kmak First Nations member and Professor Charlie Sark both expressed disdain for Aquabounty's actions, with Sark saying, "salmon are sacred…You just can't change the genetics of an animal that Indigenous peoples have used for thousands of years without consulting them" (Sark cited in Cox, 2020).

Corporations have long abused patenting laws in order to claim patents on plants, particularly those resilient to drought, floods and other climate events. They claim novelty over seeds and plants that Indigenous communities have held traditional ecological knowledge of since time immemorial. This raises questions around who has the right to the genetic material of animals, especially if they are significant to Indigenous Peoples who have stewarded them. I argue that we can anticipate various data sovereignty issues that Indigenous Communities will face in coming years around cell-cultured meat, based on the extensive history of biopiracy committed by corporations through seed patents, the predatory patenting industry, and Aquabounty's extraction of genetic material in creating the AquAdvantage Salmon.

Theme 4: Cellular Meat Threatens Indigenous Food Sovereignty

Cell-cultured meat is a highly biotechnological process containing automated systems, AI integration, and top-down, vertical consolidation. Entrance into the cellular meat market requires intensive economic investment, scientific industry, and material infrastructure that remain less accessible to rural communities and small-scale food producers.

The assumption that cell-cultured meat would eliminate many of the pollutant factors within traditional animal agriculture, resulting in decreased environmental impact, is what commonly leads to the idea that cell-cultured meat would inherently be better than traditional animal agriculture. However, this is due to a black box phenomenon surrounding cell-cultured meat (Latour, 1987). Besides the completed cell-cultured meat product, the biotechnological processes and realities of cell-cultured meat remain invisible to the everyday person, leaving

consumers susceptible to techno-utopian narratives of cell-cultured meat as a one-and-done technofix. This prioritizes new biotechnologies over Traditional Ecological Knowledge.

In future work on this topic, I will conduct qualitative, semi-structured interviews to gather the perspectives and opinions of PNW Indigenous Community members' views on cell-cultured meat and Salmon, specifically those who work in related fields such as food sovereignty, biotechnology, and data sovereignty. To protect the confidentiality of interviewees, specific tribal affiliations, and potentially job positions, will not be identified in the research results. This is why the overarching identifier of Pacific Northwest Indigenous Communities is being used rather than individual communities' names, and I recognize that none of these perspectives speak for the views of all members of any specific tribe or Pacific Northwest Community members as a whole.