



BOOK OF ABSTRACTS



Photo of the Lower Cle Elum River restoration site during the 4th cohort site visit with Kittitas Conservation Trust in August 2025

This research was funded by the National Science Foundation (NSF) G#2125758

NRT: Rivers, Watersheds, Communities: Training an Innovative, Cross-Sector Workforce for Equitable, Multi-Scale Decision-Making Towards Human and Ecosystem Health

Location:

Washington State
University – Vancouver

14204 NE Salmon
Creek Ave, Vancouver,
WA 98686

May 13 – 15, 2026

Rivers, Watersheds, and Communities Annual Symposium 2026



WASHINGTON STATE
UNIVERSITY



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Rivers, Watersheds, and Communities Annual Symposium 2026



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ABOUT THE PROGRAM

Focusing on the Columbia River Basin (CRB), this traineeship program teaches graduate students from across the United States how to study challenges in rivers, watersheds, and communities as they relate to human and ecosystem health. Central to the traineeship is the development of a community engagement approach, which begins with the recognition that communities face diverse and complex issues and leverages local knowledge to identify key problems or implement equitable solutions. Students participating in this program will engage with communities to co-produce solutions and opportunities to the invisible water crisis through scientific training, research, and problem-solving.

This program will integrate the natural sciences, engineering, social sciences, and traditional knowledge to develop a transdisciplinary research program in river-watershed-community (RWC) systems that ultimately produces equitable solutions to pressing, societal problems experienced by diverse communities. Program activities are focused on two education and training objectives: (1) to affect a cultural shift in graduate STEM education by embracing transdisciplinary learning and the co-production of science through community engagement, and (2) to transform our STEM graduate training into a student-centered mentoring model. Education and research themes address basic and applied questions related to water quality and landscape dynamics of river systems, to anthropogenic changes in the environment that affect ecosystem health, and to equitable mitigation of the cultural, economic, or health consequences experienced by communities. The traineeship program gives students the flexibility to pursue individualized research paths and provides hands-on training experiences to build skills and competencies in communication, teamwork, ethics, cultural knowledge, traditional knowledge, transdisciplinarity, and quantitative/computational research methods. Program elements weave engagement experiences throughout the student experience in the form of novel courses, leadership training, and the development of a CRB Living Atlas focused on data integration and visualization, and multi-media communication. The student-centered mentoring model includes a trainee development plan, external mentoring, and faculty development. Program elements will be institutionalized in the form of the Community Engagement in River and Watershed Systems (RWC) Certificate available to all STEM students.



LAND ACKNOWLEDGEMENT

Washington State University acknowledges that its locations statewide are on the homelands of Native peoples, who have lived in this region from time immemorial. There are 37 federally recognized Tribes that historically shared their traditional homelands and waterways in what is now Washington State. Of these, 29 are federally recognized Tribes in Washington with the remaining Tribes in Idaho, Montana, and Oregon, some of which represent multiple tribes and bands. The University expresses its deepest respect for and gratitude towards these original and current caretakers of the region. As an academic community, we acknowledge our responsibility to establish and maintain relationships with these tribes and Native peoples, in support of tribal sovereignty and the inclusion of their voices in teaching, research and programming. Washington State University established the Office of Tribal Relations and Native American Programs to guide us in our relationship with tribes and service to Native American students and communities. We also pledge that these relationships will consist of mutual trust, respect, and reciprocity. As a land grant institution, we also recognize that the Morrill Act of 1862 established land grant institutions by providing each state with “public” and federal lands, which are traced back to the dispossession of Indigenous lands. In 1890, Washington State received 90,081 acres of Indigenous Lands designated to establish Washington State University. Washington State University retains the majority of these lands to this day. We acknowledge that the dispossession of Indigenous lands was often taken by coercive and violent acts, and the disregard of treaties. For that, we extend our deepest apologies. We owe our deepest gratitude to the Native peoples of this region and maintain our commitment towards reconciliation.



CERTIFICATE STUDENTS



Tanvir Ahmed
School of the Environment, Ph.D. Student
Advisors: Dr. Kara Whitman

Evaluating the Fate of Conserved Water in Coupled Social-Ecological Systems

My study focuses on examining how agricultural and municipal water conservation strategies interact to shape the fate of conserved water in the Walla Walla River Basin. The study uses a participatory system dynamics modeling approach within a social ecological systems framework to integrate hydrological processes, human decision making and governance structures. This approach engages stakeholders, including farmers, water managers and agencies in co-developing the model, refining assumptions and validating system structure. The model captures key processes such as irrigation practices, municipal demand management, return flows, groundwater recharge and instream flow requirements, while also representing broader system interactions, feedback and institutional dynamics that influence pathways of water allocation. The analysis focuses on how conservation changes the pathways of water allocation, including shifts in consumptive use, return flows, groundwater recharge, and instream availability across sectors and ecosystems under different scenarios and policy conditions.



Madison Honig
Department: Anthropology, Ph.D. Candidate
Advisors: Rodríguez-James², JK Hlay³, E Hagen¹, N Merullo¹, BA Rothamer², M Gaffney¹, CB Smith², AD Blackwell¹, CR Hodges-Simeon²

¹Department of Anthropology, Washington State University, Pullman, WA

²Department of Anthropology, Boston University, Boston, MA

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Since 2024, Madison has been studying water quality in Utila, Honduras. She has analyzed 18 different types of perfluoroalkyl substances and polyfluoroalkyl substances (PFAS) commonly known as “forever chemicals”

Contextualizing growth and development in Utila, Honduras.

The Utila Child Health Project is a long-term study of health and growth and development of children in Utila. In Utila, drinking water infrastructure is limited, and its quality is impacted by the existing physical, social, political and infrastructural context. To date, few studies have examined the cumulative exposure of PFAS and its downstream effect on short and long-term health outcomes, especially in children. In March 2025, twenty-one drinking and tap water samples were collected from households enrolled in the study and analyzed for 16 different PFAS compounds using LC/MS according to EPA Protocol 537.1. 52% of the samples demonstrated detectable levels of at least one PFAS compound with higher contamination present in households located near the town center. These findings indicate that PFAS are a relevant contaminant for both drinking water and household water in Utila, Honduras, particularly for children in vulnerable developmental stages. In February 2025, a pilot study was conducted in tandem aiming to capture local perspectives from children on their own health and water quality. We conducted a photovoice project with a subset of children enrolled in the Utila Child Health Project to explore and contextualize perceived sources of environmental concern related to water quality and health. The children were asked to capture images related to water quality and health on the island by providing them with a disposable camera and a journal. After one week, a group interview was held to collect information on their perceptions of their local environment and on the photography project. Our findings indicate that children are uniquely positioned to provide context on environmental perspectives given their proximity to water. Their photos also highlight that they are attuned to environmental threats to water quality and recognized the benefits of living in proximity to natural spaces.



1st COHORT



Hailey Smith
School of the Environment, Ph.D. Candidate
Advisor: Julie Padowski

Modeling the Impacts of Basin-Scale Restoration on Stream Temperature in Warming Climate

Shifting thermal regimes threaten cold-water riverine ecosystems and the communities that depend on them. In the Yakima River Basin on central Washington, warming stream temperatures regularly impact endangered salmonid spawning success and overall life histories. As the impacts of climate change become more pronounced, we model climate-driven stream warming in the Yakima River Basin and assess the effects of increased shade using multiple riparian restoration scenarios. A spatial-stream-network (SSN) model is used to predict average maximum weekly stream temperatures in the 2040's and 2080's from June 10th to July 7th, during a critical period for salmon migration into the basin. Thirteen physical and climatic covariates were developed at basin-wide and weekly scales using existing, publicly available data.



Seth Flanders
School of the Environment, Ph.D. Candidate
Advisor: Alex Fremier

Investigating Landholder Perspectives on Floodplain Connection Practices

Ecological restoration aims to re-build ecosystem resilience, function, and services over large landscapes. Most times this will require restoration on privately owned lands. Promoting restoration on private property necessitates an analysis of the incentives and obstacles influencing owner participation. In this paper, we conducted a systematic literature review of the processes, methods, and results of research studying landholder perceptions of restoration adoption. We used the framework of social, environmental, and ecological objectives to categorize the motivations and barriers of landholder adoption. We found that the greatest limiting factors to adoption were economic in nature. Even after addressing economic concerns, there was a complexity of factors influencing landowner decisions to engage in restoration. We found personal and communal social themes were most reported, had a diversity of influences on participants, and seeded the complexity impacting decision making. We explore these themes for restoration practitioners to consider when engaging with private landholders



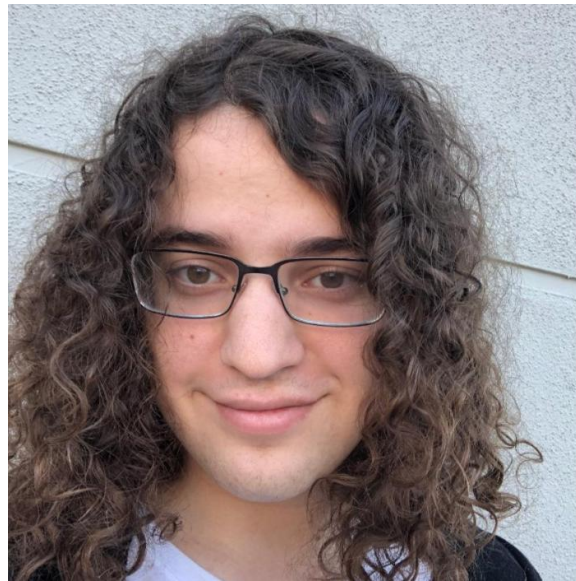
2nd COHORT



Alex Lopez
Bureau of Reclamation Fish Biologist
School of Biological Sciences, Ph.D. Candidate
Advisors: Dr. Patrick Carter and Dr. Michael Phelps

Thermal tolerance as it relates to physiological performance and genetics in two populations of fall Chinook The project aims to understand the ecology and physiology of Red Rock Coulee Fall Chinook to determine if this stock exhibits enhanced thermal tolerance compared to mainstem Columbia River fall Chinook (Priest Rapids Hatchery).

Red Rock Coulee experiences summer temperatures well above Chinook salmon lethal temperatures ($\sim 24^{\circ}\text{C}$) for sub-yearlings that express the stream type life history trait. Physiological performance (SMR) of Red Rock Coulee and Priest Rapids fish will be measured across a range of temperatures at the WSU Aquatic Phenomics Center. In the WSU phenomics center, we will use the Loligo system to measure oxygen consumption rates to compare metabolic rates of the two populations to see if there is a phenotypic difference between the two populations. Gametes were collected from both populations and reared in the WSU phenomics center. Otoliths were also obtained from carcasses in Red Rock Coulee and were used to analyze introgression in the system. Fin Clips were collected to assess population structure of the Red Rock Coulee population. Parentage Based Tagging and Genetic Stock Identification was used to analyze genetic data and determine the relationship of this population to other Columbia River Basin Chinook Populations. Future experiments will include whole genome population genetic data to identify associations between loci markers and phenotypic traits. This will allow us to identify candidate genes associated with thermal tolerance.



Cassie Rueda
Department of Sociology, Ph.D. Candidate
Advisor: Dylan Bugden

Impacts of Environmental Policy/Agency Changes during the Second Trump Administration on Tribal Communities

The second Trump administration has radically altered a wide array of federal environmental laws, regulations, and policies in the brief period it has existed, ranging from the introduction of the “Make America Beautiful Again” Commission to the dismantling of the EPA’s ability to regulate issues such as greenhouse gases and PFAS-based pesticides. Notably, it has also pushed to eliminate vast expanses of federally protected public land. Shifts in environmental policies may potentially have significant impacts on the ability of tribes to maintain their treaty rights and to exercise their food sovereignty through the construction and maintenance of sustainable and local food systems, particularly as the dismantling of federal agencies may impact the ability of tribes to ensure the land and waters of their ancestral homelands remain in good health. Broader Trump-era policies such as tariffs may also make it harder for tribes to maintain said food systems. I hope to identify a tribal partner who is interested in evaluating the present and future impacts of relevant policy shifts on the lives of relevant knowledge-holders within their community, particularly in regard to how these changes have altered relationships with state and federal agencies, as well as how tribal food sovereignty efforts have been affected. Exact specifics would be developed in collaboration with a tribal community with an interest on the topic. Tribal communities are at the forefront of protecting our lands and waters from pollution and the ongoing threat of climate change, and as such many are likely to experience the impacts of these policy shifts before anyone else. As such, I believe it is important to support tribal efforts in dealing with the rapidly changing environmental policy landscape.



Jordan J. Thompson
Department of Anthropology, Ph.D. Candidate
Advisors: Dr. Rachel A. Horowitz, Roger
Amerman, and Dr. John Blong



Jordan Thompson, Dr. John Blong, and Whitman College undergraduate intern Ben Todd, excavating at Kelly Forks Work Center, one of her dissertation study sites.

Relational Landscapes: Indigenous Data Sovereignty and Nimíipuu Knowledge in the Bitterroot Mountains

Land, people, materials, and knowledge systems are deeply interconnected. As a critical component of subsistence (foodways), the pursuit of quality toolstone shaped landscape exploration and was an essential consideration in the seasonal movements of past mobile societies. Raw material selection and technological practice therefore provide insight into the acquisition of place-based environmental knowledge, changing human–environment relationships, and broad scale environmental adaptive strategies over time. Drawing on geoarchaeology and ethnogeology—a method for understanding the organization of earth knowledge from an Indigenous perspective—this study examines stone technology, regional toolstone sources, and their distribution to better understand past mobility networks, shifting subsistence strategies, and the integration of landscape knowledge within social and ontological systems. The North Fork of the Clearwater River connects the Bitterroot Mountains to the interior Columbia Plateau and has long been integral to the seasonal rounds of the Nimíipuu (Nez Perce). Despite its cultural and ecological significance, mountain environments within Nimíipuu homelands remain underrepresented in archaeological research, narrowing interpretations of past engagement with them. From a landscape perspective guided by principles of Indigenous Data Sovereignty, this project approaches archaeological data as grounded in Nimíipuu ontologies. Emphasizing relational accountability and collaborative interpretation, the research integrates archaeological methods with Indigenous knowledge to situate data within interconnected social, ecological, and ethical systems, reaffirming Indigenous authority in the production and stewardship of landscape and cultural knowledge.



Evan Leacox
Department of Anthropology, Ph.D.
Candidate
Advisor: Rob Quinlan



Evan Leacox working on the bow of Bobby Fosseck's cottonwood dugout

Engaging in changing complex decision-making paradigms

Social-Ecological Systems (SES) challenges are complex, best addressed within their specific contexts, and benefit from bringing together diverse perspectives. Building such coalitions is a relational process, one that is strengthened through shared, in-person engagements between people and place, and can support the decision-making authority of situated knowledge holders such as indigenous and grassroots actors. These experiences allow the physical setting itself to shape how participants share values and develop perspectives, aiding the formation of effective, complex decision-making groups. This approach is likely more effective than assembling teams based solely on technical expertise, which are often guided by a single institutional perspective. Instead, it builds on a fundamental human capacity: our evolved ability to form and adapt collaborative networks. This capacity is especially important under conditions of environmental uncertainty—which place pressure on the relationships that form SES. Heightened or prolonged uncertainty is often experienced as dissonance: a mismatch between expected and actual conditions. Dissonance affects behavior, social/cultural cohesivity, and physical well-being (although the thresholds for experiencing it vary culturally). While people naturally seek to resolve dissonance, simultaneous multi-party efforts to do so in complex social and cultural settings may contribute to uncertainty and dissonance as much as alleviate it. Engaging in shared relational time and settings may help address this challenge by supporting the development of a more convergent cultural “conscience,” or co-shaped values, among diverse participants in decision-making processes. My exploratory doctoral research reflects on these dynamics as a participant in the Columbia River Basin’s canoe culture—a highly salient Indigenous cultural space that brings together Indigenous and non-Indigenous actors. This setting increasingly intersects with multiple layers of SES governance and stewardship, offering insights into more equitable decision-making practices while also challenging dominant Western approaches to addressing complex problems



3rd COHORT



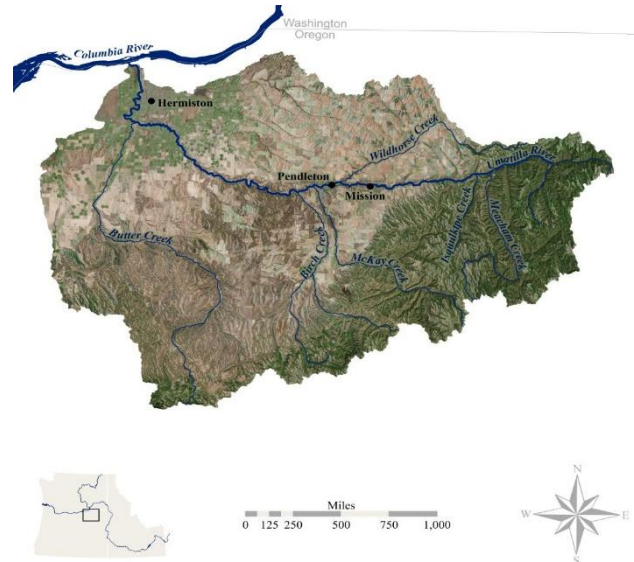
Ted Ballenger
School of the Environment, Ph.D.
Candidate
Advisor: John Harrison



"Early morning fieldwork on Cougar Reservoir,
Sept 2023."

Rates and Controls of Methane Emission from Four Pacific Northwest Reservoirs with Contrasting Management Regimes

Although collectively reservoirs constitute a globally significant source of anthropogenic methane (CH_4), there are still few investigations of reservoir CH_4 fluxes and their controls that span multiple seasons, years and reservoir types. Here we present results from a two-year study of diffusive and ebullitive CH_4 fluxes in four contrasting reservoirs in the Pacific Northwest United States. Using floating chambers outfitted with CH_4 sensors ($n = 105$), supported by gas chromatography and environmental monitoring, we identified chlorophyll-a, water temperature, season, reservoir type (run-of-river vs storage), and hydrostatic pressure fluctuations as significant predictors of CH_4 flux. These findings indicate that water-level fluctuations and chlorophyll-a are associated with increased ebullitive flux in reservoir forebays, reinforce previous work demonstrating that neglecting ebullition can substantially underestimate total CH_4 emissions, and highlight that strong seasonal variability necessitates full annual sampling to accurately constrain emission estimates.



Map of the Umatilla River Basin

Sarah Hewitt
Department of Civil and Environmental
Engineering, M.S
Advisor: Dr. Sasha McLarty
Hydrologic Interactions between People
and Environment (HIPE) Lab

Enhancing First Foods Through Sustainable Groundwater Management

Groundwater in the Pacific Northwest is a subject of concern for a couple of reasons: quality and quantity. The increase of harmful anthropogenic activities have reduced natural groundwater recharge, creating negative implications for ecosystems and affecting the quantity of groundwater available for extraction. The main goal of my research is to optimize water supply resilience while taking into account Indigenous perspectives, management strategies, and approaches to decision making. My research aims to understand the role that groundwater has played in supporting First Food habitats in the Umatilla River Basin. Objectives of my research are to 1) quantify change in hydro-meteorologic conditions, 2) identify how those changes, coupled with legislative, economic, and engineering actions, have impacted the health of riverine First Food habitats, and 3) create a framework to advance indigenous-informed sustainable groundwater management.



Neo Koite

School of the Environment, M.S

Advisors: Erica J. Crespi & Caren S. Goldberg

Autumn Habitat of Northern Leopard Frogs in Washington.

Since the 1980s, Northern Leopard Frogs (*Lithobates pipiens*, NLF) have experienced declines across their northwestern range and have been considered state endangered in Washington since 1999. Only one NFL population remains in Washington state, located in the Potholes Reservoir Wildlife Area Unit (near Moses Lake, WA). Thus, this species has been listed as a Species of Greatest Conservation Need by the Washington Department of Fish and Wildlife (WDFW). While much research has focused on the breeding habitat of NLFs, less is known about their post-metamorphic habitat use during the autumn period. In partnership with the WDFW, we investigated terrestrial habitat use by the NLF in the presence of invasive American bullfrogs (*Lithobates catesbeianus*) in autumn. We used a multimethod approach of visual encounter surveys, radiotracking, and borescope surveys to describe habitat use and evaluate associations between NLF and environmental features from October - December 2025. We hypothesized that NLFs would use areas away from bullfrogs and select areas of higher vegetation cover. We found a male-biased sex ratio of captured frogs, and cumulative total distances moved within ponds by radio-tracked males were greater than those of females. Based on the timing of our study, the frogs we captured arrived at their brumation sites by early October. We found no evidence of habitat selection based on vegetation cover, but we did find evidence that NLFs were more likely to be found close to bullfrogs, contrary to our hypotheses. We also observed NLFs in small earthen cavities (i.e., holes) above the water surface along pond edges, where some co-occurred with bullfrogs, indicating that holes may function as shelters. Some of these holes were occupied by large numbers ($N > 12$) of NLFs and bullfrogs. This study highlights a previously undocumented sex ratio bias during the shoulder season and hole co-occupancy by both NLFs and bullfrogs. This contributes to the greater understanding of autumn habitat characteristics and strategies of NLFs in their northwestern range. Furthermore, the results of this study can inform future NLF reintroduction and conservation strategies across the Pacific Northwest.



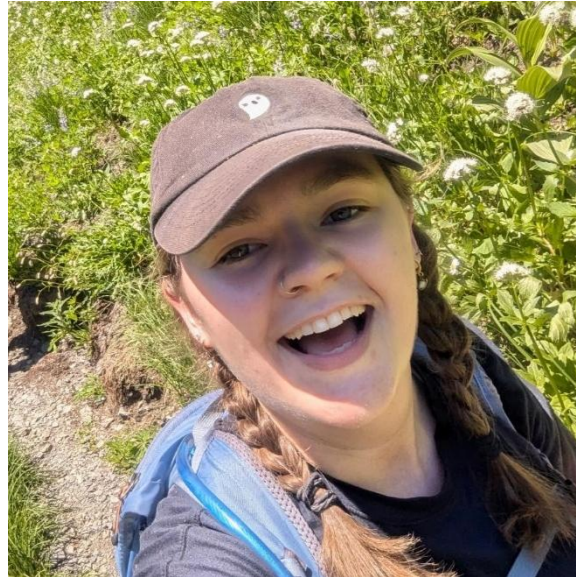
Jasmine Ortiz
School of the Environment, M.S
Advisor: Kara Whitman



Two people are seen sailing upon Spirit Lake with Mt. St. Helens in the background, mid 1970, before the eruption in 1980. This photo was provided to me by the Cowlitz County Historical Museum.

From Ash to Assets: Reclaiming Recreation and Tourism at Mount St. Helens

For forty-five years, the communities surrounding Mount St. Helens National Volcanic Monument have watched coordination efforts produce plans, committees, and reports without producing meaningful change. Recreation access has declined; gateway community economies have stalled, and governance barriers identified in planning studies from the early 2000s remain largely unchanged. This research begins from a different premise: the issue is not simply failing coordination, but the absence of structured pathways for community knowledge to shape how problems and solutions are defined. When community perspectives are excluded, resulting plans reflect institutional priorities rather than lived experience. In partnership with the Spirit Lake–Toutle/Cowlitz River Collaborative, this study uses participatory action research to ground the work in community-identified priorities. Semi-structured interviews with fifteen stakeholders across the corridor serve as the primary data source, capturing perspectives from agency staff, gateway community members, tourism professionals, and nonprofit and private representatives. Reflexive thematic analysis identifies patterns in how governance challenges are experienced across roles and jurisdictions. Findings are translated into a community-facing participatory GIS story map, developed through the Wayfinder adaptive governance framework, to make results accessible and usable in decision-making spaces. As the fiftieth anniversary of the 1980 eruption approaches in 2030, community leaders are already working toward a shared vision for the region. This research contributes by ensuring community knowledge is not only included, but actionable within that process.



Rebecca LaRue
Ph.D. Candidate in Politics, Philosophy, and Public Affairs
Advisor: Michael Goldsby

Cooperation and conflict on watershed management in the Pacific Northwest: Under what conditions does collaborative government work?

The governance of common-pool resources, such as water, have always proved a challenge. In the face of what the United Nations has deemed a ‘global water bankruptcy,’ this issue has become even more critical. As traditional government management solutions fail, people are increasingly turning to the solution of collaborative governance as an alternative management strategy for common-pool resources, including water. However, some collaborative governance arrangements last for decades, while some collapse before they are truly able to begin. This wide range of outcomes poses an interesting research puzzle: Why do collaborative arrangements have varied levels of health and usefulness in response to external conflicts, disputes, and pressures?

My research approaches this question from the perspective of punctuated equilibrium theory and the institutional analysis and development framework, while incorporating insights from historical analysis. This project examines three different collaborative governance arrangements related to water management in the Pacific Northwest to attempt to answer this question (the Yakima Basin, the Klamath Basin, and the Spokane River). This project will use a combination of process tracing, network analysis, and survey research to investigate this question. The preliminary hypotheses for this project are that collaborative arrangements will be healthier and more useful when 1) they have external support, 2) the institutions are able to evolve, and 3) the stakeholders involved have non-antagonistic relationships. This research will broaden understanding of what makes collaborative arrangements healthy and useful in the long-term, which could lead to stronger collaborative arrangements. This overall could help arrangements produce better governance outcomes of common-pool resources, such as water.



Constanza Kremer
Department of Civil and Environmental
Engineering, M.S
Advisor: Dr. Jan Boll



Study Site: Crumarine Creek Idaho

Development of a Stable Water Isotope Aided Hydrological Model: iso-SMR

Understanding the relationships between biophysical components is crucial to creating integrated management solutions to environmental challenges. My work considers a water resource system and a biological system. For my master's thesis, I developed an isotope-aided version of the Soil Moisture Routing SMR model, a GIS-based hydrology model (iso-SMR). Using observed precipitation and streamflow hydrometric and isotopic data in the Crumarine Creek watershed in Idaho, I evaluated the main hydrological processes driving the timing and sources of streamflow and assessed the representation of internal catchment processes inferred from isotopic observations. For my community-engaged (CE) project, I present the development of a system dynamics model that simulates the Western Ridged Mussel life cycle. I co-developed this model with Dr. Alexa Maine using Stella Architect. My thesis showed snow accumulation and melt were the main contributors to saturation-excess runoff generation, percolation, and peak streamflow. Baseflow drove streamflow during the summer due to drying soils and evapotranspiration. Isotopic and water age analysis showed dampening of event water and mixing of young water with water stored in the subsurface, highlighting the role of antecedent soil moisture and subsurface storage to streamflow generation and mixing mechanisms in the watershed. The CE project showed the Western Ridged Mussel's dependence on sculpin fish population dynamics, a lag in the adult mussel population's response to changes, and the sensitivity of adult mussel mortality to factors other than longevity. The model includes an educational game available online. Although further research is needed, iso-SMR proved to be a novel and parsimonious approach to isotope-aided hydrological modeling that requires minimal calibration. Such models can be broadly used in water resources management in the face of climate change. The Western Ridged Mussel life cycle model resulted in a tool that supports efforts to restore and improve awareness of native freshwater mussel populations in the western USA.



4th COHORT



Marissa Ortiz
School of the Environment, M.S
Advisors: Sarah Roley, Alex Fremier & John Harrison



Static gas chambers collecting greenhouse gas emissions from beaver pond

Greenhouse Gas Emissions from Beaver Dams

Aquatic ecosystems can be sources of greenhouse gases. Beaver (*Castor canadensis*) ponds represent a unique and understudied ecological niche with the potential to influence greenhouse gas dynamics. Beavers are well known ecosystem engineers whose dam building transforms flowing streams into ponded wetlands that provide many ecosystem services, including carbon sequestration, while potentially increasing CH₄ and CO₂ emissions. This research aims to identify the role of beaver ponds on CH₄ and CO₂ fluxes through seasonal sampling with static chambers. We also measured dissolved oxygen, temperature, water depth, and nutrient concentrations. Chambers for gas collection, as well as depth sensors, were both deployed at upstream controls and pond locations at three different sites, including a suburban, agricultural, and forested site. In the suburban site, net CO₂ production was higher in the pond location than in the upstream control; the suburban pond emitted CO₂ at a rate of 9.98 mg C/L/m ± 14.27 while the control emitted 7.37 mg C/L/mppm ± 9.83. In contrast, the pond and control at the agricultural location had very similar fluxes (pond: 2.52 mg C/L/m ± 0.78, control: 2.42 mg C/L/m ± 0.5). Based on preliminary results, beaver dam ponds have the potential to emit more greenhouse gases, but patterns vary with land use, suggesting that site characteristics can mediate beaver effects.



Samuel Hall Watson
School of the Environment, M.S
Advisors: Dr. Deepti Singh & Dr. Kevan
Moffett



Sam Hall Watson responding to the Red Bridge
fire near Cle Elum last summer on a DNR engine
crew

Biophysical mechanisms of forest recovery and reburns in wet PNW forests

The unique environment inside the burn scar of a severe wildfire can be conducive to elevated fire weather conditions, making some burn scars highly susceptible to re-burning. This is particularly true for burn scars in climatically wet PNW forests, which have been observed to be prone to destructive and costly reburns. Feedbacks between vegetation regrowth, soil moisture, and microclimate within the burn scar are known to contribute to elevated fire risk, but the physical mechanisms of such interactions are poorly understood. We use a combination of original field data, gridded environmental data, and high-resolution numerical modeling to characterize these mechanisms, and to test for correlations between plant evapotranspiration (ET) and reburn risk in post-fire early successional forests. We hypothesize that quantifying the relationship between soil moisture and plant transpiration may serve as a capable indicator of reburn susceptibility.



Claire A. Boudard
School of the Environment, M.S
Advisors: Dr. Gretchen Rollwagen-Bollens &
Dr. Stephen Bollens



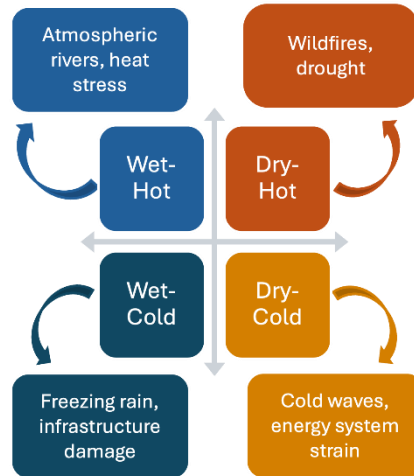
Claire Boudard and *Anodonta spp.* Mussels from last year's feeding incubation experiments.

The Feeding Ecology of Native Freshwater Mussels in the Columbia River Basin

Freshwater mussels play a critical role in aquatic ecosystems yet are globally imperiled. As filter feeders, they enhance water quality, accumulate pollutants such as heavy metals and microplastics and serve as prey for other organisms. In the Columbia River Basin (CRB), native mussel populations have severely declined due to habitat alteration, reduced water quality, and climate-related stressors. These declines threaten both their ecological and cultural roles, as Indigenous communities have relied on native mussels for over 10,000 years as a “First Food” central to traditional practices. Furthermore, western freshwater mussels remain significantly understudied compared to their eastern counterparts, particularly in their feeding ecology. This research aims to (1) quantify the clearance and ingestion rates of native freshwater mussels, (2) determine whether these mussels selectively feed on particular microplankton taxa, and (3) explore how seasonal fluctuations in plankton communities and temperature may alter mussel feeding dynamics. To address these questions, we will conduct laboratory feeding experiments in Spring, Summer, and Fall, using *Anodonta spp.* collected in Walla Walla, Washington. Feeding selectivity experiments will compare initial and final microplankton assemblages over different feeding incubation periods. Microscopic analyses of samples will identify microplankton taxa consumed, testing for selection for or against any prey category. Functional response experiments will determine how ingestion, grazing, and clearance rates vary across prey concentrations and temperatures. This research will advance our understanding of mussel-plankton interactions and provide insight into how environmental variability shapes feeding behavior. Collectively, these findings will advise propagation and restoration efforts led by the Confederated Tribes of the Umatilla Indian Reservation in the CRB.



Amanda Laverty
School of the Environment, Ph.D. Student
Advisor: Deepti Singh



Four types of compound temperature-precipitation extremes and their implications for western North America.

Large-Scale Circulation and Compound Weather Extremes in Western North America

Extreme weather and climate events pose significant threats to society, including adverse impacts on human health, increased food and water insecurity, damage to infrastructure, and extensive economic loss. Compound or co-occurring extremes can produce disproportionately greater impacts than isolated events. Synoptic-scale weather features such as atmospheric high-pressure systems shape the occurrence of co-occurring extremes like concurrent heat and precipitation deficits (i.e., dry-hot events). Changes in the frequency, intensity, and duration of such extremes are influenced by changes in atmospheric circulation patterns and thermodynamic changes in the Earth system, including warming and increasing humidity. Advancing our understanding of the relationship between various atmospheric circulation patterns and extreme events, and their changes, is important for enhancing predictability and societal preparedness.

In this study, we investigate how different large-scale atmospheric circulation patterns influence daily-scale compound temperature and precipitation extremes across all four seasons in western North America. Specifically, we address the following research questions: 1) What is the likelihood and spatial pattern of compounding events associated with different circulation patterns? 2) How have the characteristics of compound events and their relationships to large-scale atmospheric dynamics evolved over 1940-2024?

To address these questions, we apply K-means clustering on daily ERA5 500hPa geopotential height anomalies to categorize typical circulation patterns over the region and across seasons. For cluster patterns in each season, we quantify the frequency and spatial extent of four types of compound extremes: wet-cold, dry-cold, wet-hot, and dry-hot, and examine their temporal changes.

By evaluating how large-scale atmospheric patterns shape the characteristics of compound events, this work aims to advance understanding of high-impact climate hazards and inform forecasting, emergency preparedness, and adaptation. The framework developed here will be extensible to other regions and types of compound extremes influenced by large-scale circulation, offering a process-based tool for assessing climate risks associated with compound events.



Olivia De Stefano
School of the Environment, Ph.D. Student
Advisor: Hannah Hämmerli



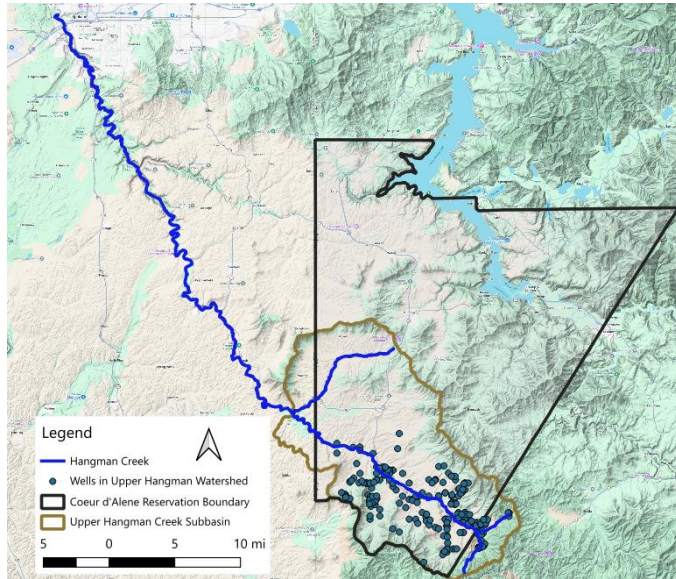
Olivia De Stefano visiting the Ice Harbor Dam

Institutions and Value Articulations in the Lower Snake River Dam Debate

This research aims to examine how institutions shape the articulation and legitimization of environmental values in the Lower Snake River Dam (LSRD) debate. These dams provide navigation, hydropower, and irrigation services, while also contributing to the decline of endangered and threatened salmon species, producing a complex governance dispute spanning nearly a century. Building on environmental values theory, this study will identify and analyze how intrinsic, instrumental, and relational values are expressed, and how institutional structures influence which of these values are legitimized or marginalized in decision-making processes. The project is guided by three hypotheses: (1) policy decisions are informed by specific value articulating institutions that select and legitimize a narrow set of values that do not fully represent what is important to actors and affected communities; (2) the legitimation and marginalization of values by institutions reflects underlying power dynamics; (3) within institutions, the type of values articulated are changing over time. The project will focus on key moments of conflict and collaboration spanning from the 2008 Fish Accords to the resumption of litigation over the LSRDs in 2025. Documents associated with these events will code value statements as intrinsic, instrumental, or relational and examine recurring themes, how language is operationalized, and the power dynamics embedded in relevant institutions. Temporal analysis will track how value articulations shift across documents to assess institutional change over time. Finally, patterns identified in document analysis will be used to inform semi-structured interviews with key actors involved in the LSRD conflict. Comparing institutional documents with interview data will allow for the assessment of differences between institutionally validated and lived values. This research will contribute to understanding how institutional processes constrain or enable value pluralism, particularly the recognition of relational values, and how these constraints may shape both the persistence of conflict and the possibilities for more inclusive and effective pathways toward conflict resolution.



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Map of the Upper Hangman Creek Subbasin including the Hangman Creek and the known well locations

Investigating Seasonal Drying in Hangman Creek and the Historical Relationship of the Coeur d'Alene People to the Watershed

This study aims to investigate the seasonal drying patterns of Hangman Creek and examine the environmental and cultural significance within the historical relationship of the Coeur d'Alene people to the watershed. By exploring hydrological changes alongside Indigenous perspectives and historical land use, the project aims to better understand how shifts in water availability have affected the creek ecosystem and the communities connected to it. The research integrates environmental observations, historical records, and cultural context to highlight the long-standing relationship between the Coeur d'Alene people and Hangman Creek, while also considering the broader impacts of seasonal drying on watershed health and regional sustainability. A long-term goal of this project is to support restoration efforts that increase the Coeur d'Alene Tribe's access to First Foods, particularly salmonids that are culturally, nutritionally, and spiritually significant to the community.