Research Advances in Fisheries, Wildlife & Ecology

&

Western Forestry Graduate Research Symposium

2023 Joint Meeting

April 14, 2023

Event Program

Research Advances in Fisheries, Wildlife & Ecology

Oregon State University

WESTERN FORESTRY GRADUATE RESEARCH SYMPOSIUM

WELCOME TO THE 2023

Joint RAFWE and WFGRS Conference!

The annual Research Advances in Fisheries, Wildlife, and Ecology (RAFWE) conference, hosted by Oregon State University's College of Agricultural Sciences – Department of Fisheries, Wildlife, and Conservation Sciences Department, and the Western Forestry Graduate Research Symposium (WFGRS), hosted by Oregon State University's College of Forestry, will for the first time be jointly hosted in 2023. This year's theme is ***Confluence.*** Indeed, this year we celebrate the confluence of scientific disciplines at this event which showcases current graduate student research and fosters educational opportunities, community building, and academic excellence by providing a space for students to present their work to the university community. This event offers graduate students a forum to receive feedback on their proposed and current research, promoting student engagement, enthusiasm, and interdisciplinary collaboration.

We are honored to present this year's keynote speakers, **Gabe Sheoships** (hosted by RAFWE) and **Cal Mukumoto** (hosted by WFGRS).

Gabe Sheoships is the Executive Director of the Friends of Tryon Creek, where he leads efforts focused on community building, environmental engagement, and protection of the natural world. Gabe is Cayuse, an enrolled citizen of the Confederated Tribes of the Umatilla Indian Reservation. Friends of Tryon Creek is a 52-year-old 501©(3) non-profit organization dedicated to urban forest within the boundaries of SW Portland and Lake Oswego, Oregon. Environmental education, community engagement, and ecological restoration have been the focus of the organization's mission, in partnership with Oregon State Parks. Under Gabe's leadership, the organization has taken strides to recognize the Indigenous narrative of the land, and to better serve the forest and human community through the lens of an Indigenous worldview. The organization serves 60,000 people each year, of that 25,000 are K-12 youth, primarily elementary age students. Gabe has reinvigorated the organization's board of directors, strategic plan, mission, and staff to better reflect the whole community, which includes the entire Portland, Oregon metropolitan area. Under his leadership, new programming includes: a cultural fire restoration plan, culturally focused BIPOC (Black, Indigenous, Peoples of Color) nature day camp programming, and a campaign to build a new education pavilion within the forest canopy, in addition to continued environmental programming that instills values of ecological stewardship within the large, diverse human community. His talk is entitled: **'*Indigenous worldviews, western models of environmental management, and ecological futurisms*'.**

Cal Mukumoto is the Oregon State Forester and Director of the Oregon Department of Forestry. Cal's extensive leadership career includes diverse accomplishments in economic development, natural resource management, turnaround solutions, and biomass energy development. He has worked extensively in the Native American business community, serving on the Boards of six Tribal enterprises. Cal is a graduate-level forester who has managed all aspects of forests. He was Chair of the Oregon Parks and Recreation Commission, has served as Vice-Chair on the Oregon State Board of Forestry and was a board member of the U.S. Board for the Forest Stewardship Council. Cal also enjoys being engaged in his community by being a member of the Board of Education for Southwestern Oregon Community College and participating on the Board of Trustees of Oregon Parks Forever. He has also worked on local forest collaboratives, chairing the Metolius Multi-party Management Team for eight years. Cal holds a bachelor's degree in Forest Management

from Humboldt State University and a Master of Business Administration from the University of Washington. His talk is entitled: **'*Oregon Department of Forestry, Research Needs and Policy Development*'.**

We are further delighted to share oral and poster presentations by graduate student researchers on a variety of interesting subjects. Topics range in scope from forest management and products to wildlife, ecology, and human dimensions, at scales from genes to landscapes. This year's participants communicate an array of research spanning all three departments in the College of Forestry: Forest Ecosystems and Society (FES), Forest Engineering, Resources and Management (FERM), and Wood Science and Engineering (WSE); as well as from the College of Agricultural Sciences' Department of Fisheries, Wildlife and Conservation Sciences (FWCS) and Microbiology Department (MB); the College of Science's Integrative Biology Department (IB); and the EULA Chile Environmental Sciences Centre. RAFWE and WFGRS prioritize support and inclusivity for all natural resource students.

Demand for natural resources and pressure on the ecosystems that sustain them have never been greater. Meanwhile, compromises among diverse perspectives on how to meet these challenges can feel increasingly out of reach. Solutions will require innovative strategies to conducting and communicating science across boundaries, disciplines, and backgrounds. In this spirit, **we welcome you to the symposium and invite you to share in the success of the graduate students' research efforts, as well as this year's theme: Confluence.**

Acknowledgements

While RAFWE and WFGRS are student-organized events, they would not be possible without generous support from the Department of Fisheries, Wildlife, and Conservation Sciences (FWCS) and the College of Forestry (CoF). The RAFWE and WFGRS organizing committees would like to thank Dr. Tom DeLuca (Dean of CoF), Dr. Katy Kavanaugh (Associate Dean for Research of CoF), the CoF marketing and communications team, and the department heads of FERM, FES and WSE. Additionally, we would like to thank Dr. Selina Heppell (FWCS Head) for ensuring event funding and for leading a seminar on academic job preparation, Dr. Jim Rivers (FERM) leading a seminar to help improve their scientific communication and presentation skills, and Chris Cousins for leading a GitHub seminar. We would also like to thank Shalynn Pack (FWCS) for organizing undergraduate volunteers, Amanda Polley (FWCS) for assisting with media and communications, this year's keynote speakers, and the many other students, staff, faculty and research associates who volunteered their time to make this event possible.

Organizing committees

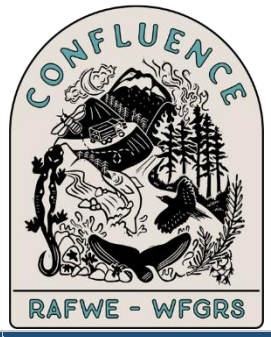
RAFWE

Lauren Diaz
Fang-Yu (Betty) Shen
Cara Appel
Lindsay Millward
Kenneth Loonam
Christopher Cousins
Liam Mueller Brennan
Anna Kennedy
Allison Dawn
Lara Mengak
Jeremy Rockweit
Jasmine Williamson
Scott Mitchell

WFGRS

Mark Kerstens
Graham Frank
Ian Goodwin
Will Hirsch
Kira Minehart
Jessie Thoreson
Megan Sampognaro
David Hamilton
Michael Winfield

…and many more!



SCHEDULE OF EVENTS

Friday, April 14th, 2023
Peavy Forest Science Center and Richardson Hall
Oregon State University, Corvallis, OR

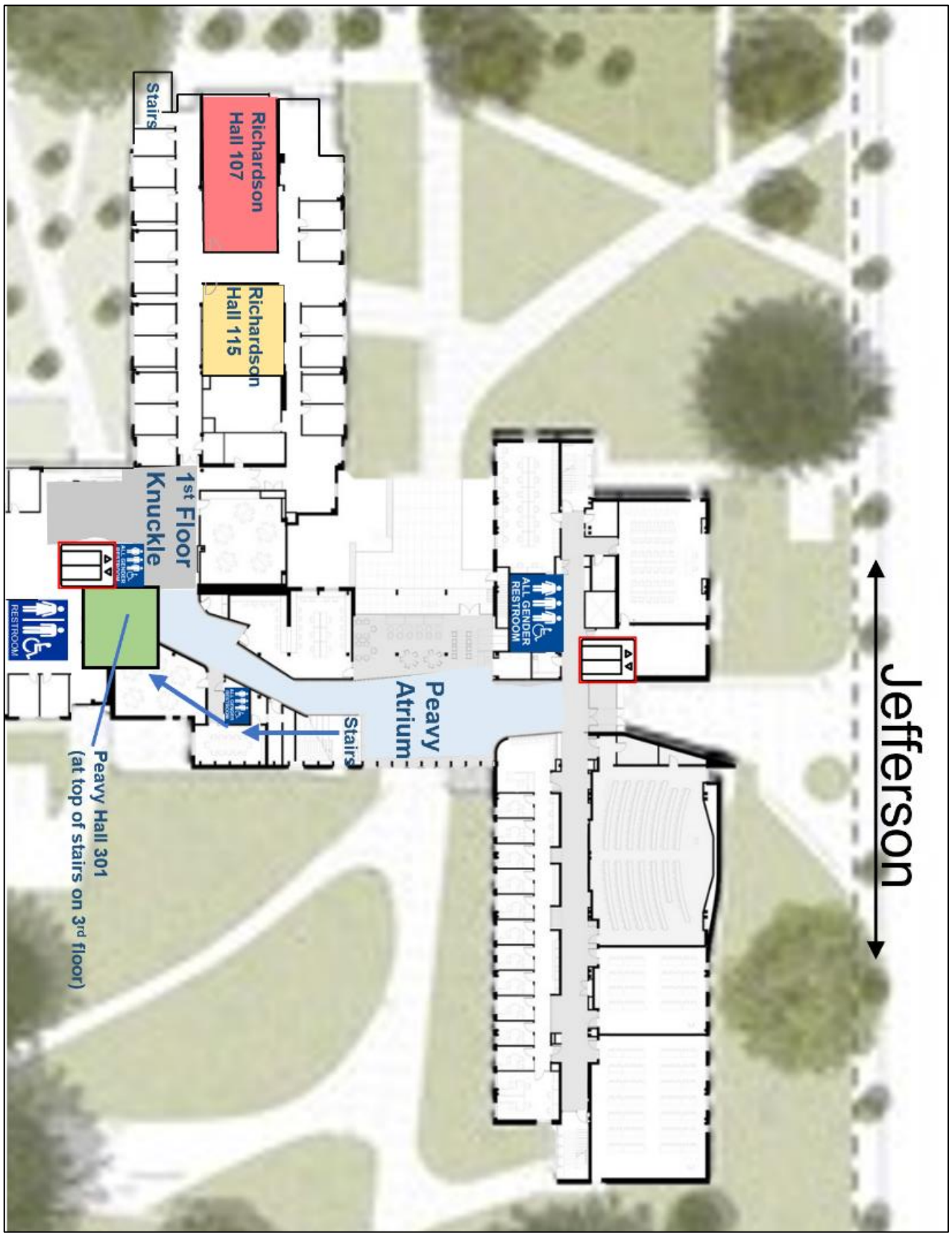
	Registration, Evaluation Forms, Raffles, and Silent Auction | First Floor Knuckle, All Day		
8:30	Breakfast from NY Bagels (will remain available until it's gone)		
	Opening Remarks and Keynote Speaker | Richardson Hall 107		
	Richardson Hall 107		
9:00	**Cal Mukumoto | *Oregon Department of Forestry, Research Needs and Policy Development***		
9:50	Break – Coffee, Tea, and Snacks in the 1st Floor Knuckle		
	Concurrent Session 1: Innovations in Forest Management	**Concurrent Session 2: Dreaming of Streams**	**Concurrent Session 3: Disturbance in the Anthropocene**
	Peavy Forest Science Center 301	Richardson Hall 115	Richardson Hall 107
10:00	Lok Mani Sapkota | *Assessment of evolving peoples' forest relationship in Lower Mekong sub-region*	Tatiana Latorre | *Patterns of emergence in aquatic insects from intermittent and perennial streams at the H.J. Andrews Experimental Forest, Oregon*	Ian Goodwin | *Weighing the Benefits of Returning Fire to Landscapes: Strategic Fire Management Expenditures*
10:15	David Hamilton | *Forestry Electric Vehicle Energy Routing*	Jaime Ortega | *Drivers of Relative Streamflow Contributions and Flow Paths in Mountainous Headwater Streams*	Sefa Karabas | *Douglas-fir Reforestation After Wildfire in the Pacific Northwest of the U.S.A.*
10:30	Will Hirsch | *Lasers and Streams: Applications of Handheld Mobile Laser Scanning in Headwater Stream Hydrology*	Zach Perry | *The Effects of Physiography on Flow Paths and Water Storage in a Mountainous Catchment*	Skylar Roach | *Relationship of Soil Fungal Communities and Burn Severity to Post-Fire Vegetation Response*
10:45	Chaney Hart | *Gene expression – phenotype relationships in a field study of photorespiration-suppressed transgenic poplars*	Aleah Dew | *Community Dynamics of Native and Non-Native Fish in a Changing Ecosystem*	Claire Williams | *Effects of Fuel Treatments on Post-Wildfire Resilience in the Sagebrush Steppe*
11:00	Lauren McCaskill | *Equity in Community Forestry in the Western US*	Arif Jan | *Invasive performance and climatic niche dynamics of Rainbow and Brown trout in the Himalayas*	Anna Kennedy | *Quantifying Geomorphic and Vegetative Change in Restored Tidal Wetlands of the Nisqually River Delta*
11:15	Kaci Radcliffe | *Climate vulnerability and adaptation for family forests: A case study in assessing climate risks and adaptation pathways to support inter-generational forest management* [VIRTUAL]	Katie Kennedy | *Quantifying the habitat suitability for juvenile* Oncorhynchus mykiss *throughout the Oregon Coast at multiple scales*	Laura Rossana Macedo Amarilla | *Quantifying the effect of deforestation on biodiversity-carbon co-benefits in Paraguayan forests: Preliminary results*
11:30	Dana Skelly | *Decreasing correlation between long-term Energy Release Component (ERC) averages and large fire growth days*	Gustavo Bizama | *Can future environmental conditions support endangered freshwater fishes under climate warming?*	Emma Sloan | *Equity in Resilience: Wildfire in the Rogue River Basin*

	Poster Session 1 and FREE Lunch | PFSC Atrium and First Floor Knuckle		
12:00	Lunch from Baguette and Qdoba will be provided at 12pm. Please give poster presenters priority for serving lunch so they can eat before presenting.		
12:00	Poster Session 1 runs from 12:00 – 1:00 pm and **even numbered** poster presenters will be available to discuss their work throughout the first hour. Please see the list of abstracts for a list of presenters and poster titles.		
	Poster Session 2 | PFSC Atrium		
1:00	Poster Session 2 runs from 1:00 – 2:00 pm and **odd numbered** poster presenters will be available to discuss their work throughout the second hour. Please see the list of abstracts for a list of presenters and poster titles.		
	Concurrent Session 4: Mammals of All Sizes	**Concurrent Session 5: Are birds even real?**	**Concurrent Session 6: Small Picture, Big Picture**
	Peavy Forest Science Center 301	Richardson Hall 115	Richardson Hall 107
2:15	Kenneth Loonam | *Safety for all: the unique vulnerabilities in field work and first steps to change*	Nina Ferrari | *Understanding the Vertical Distributions of Birds and Microclimate in H.J. Andrews Experimental Forest*	Elliott Cameron | *The story of one invertebrate, two fish parasites, and the largest dam removal project in the world*
2:30	Hannah Sawyer | *Acoustic behavior of bowhead whales in a foraging hotspot in the Western Beaufort Sea*	Cara Appel | *Vocal activity of northern spotted owl pairs*	Farallon Broughton | *Strange (river)bedfellows: stream ecology meets parasite ecology*
2:45	Chelsea Harris | *Utilizing Drone Footage of Gray Whale (*Eschrichtius robustus*) Nares to Identify Transition Indicators Between Exhalation and Inhalation Events*	Ethan Woodis | *Nest habitat assessment of marbled murrelets (*Brachyramphus marmoratus*)*	Cailin Sinclair | *Mercury trophic transfer to a biosentinel species: quantifying biomagnification by larval dragonflies and other predatory invertebrates*
3:00	Kenneth Loonam | *Predators, plants, and peers: the relative effects of top-down and bottom-up forces on elk demography*	Katie Stoner | *Comparing survey methods for puffins in the Kodiak Archipelago*	Leon Rogers | *The role of fungal substrate on lignocellulytic enzyme expression and mixed laccase specificity. Implications for bioprospecting*
3:15	Michael Hansen | *Fall and Winter Observations of Little Brown Myotis and California Myotis in Mount Rainier National Park* [VIRTUAL]	Carina Kusaka | *Spatial analysis of trends in Tufted Puffin breeding habitat on the Oregon Coast*	Santiago Domínguez-Sánchez | *Residency patterns and movements of oceanic manta ray in Bahía de Banderas, Mexico*
3:30	Trenton Gianella | *Evaluating the impact of annual grass herbicide treatments on mule deer forage quality, quantity, and composition* [VIRTUAL]	Miles Scheuering | *Where have the rails gone? Mapping distribution and abundance of yellow rails in the Klamath Basin*	Natalie Donato | *The Effects of Electromagnetic Fields on the Behavior of Skates*
3:45	Gabriella Brill | *Analyzing Movements and Habitat Use of White Sturgeon in Response to Limited Recruitment in the John Day Reservoir*	Mark Kerstens | *Is lodgepole pine a goldilocks tree? Landscape scale drivers of Black-backed Woodpecker habitat use in green forest*	Jessie Thoreson | *Understanding Xánthiip (Black Oak,* Quercus kelloggii*) Ecocultural Revitalization in the Western Klamath Mountains*
	Closing Remarks and Keynote Speaker		
	Richardson Hall 107		
4:10	**Gabe Sheoships | *Indigenous worldviews, western models of environmental management, and ecological futurisms***		
	Silent Auction, Awards Ceremony, and Evening Mixer		
	Peavy Forest Science Center Atrium		
5:00	Last chance to bid on the silent auction items! Following the conclusion of the silent auction, the awards for top 3 poster and oral presentations will be awarded along with best undergraduate poster and oral presentation. This will transition into our dinner and evening mixer event in the Peavy Atrium! Dinner and drinks provided by OSU Catering. Open bar followed by cash bar.		

	Poster Sessions | PFSC Atrium
Poster #	**Session 1 | 12:00 p.m. - 1:00 p.m.**
2	Catherine Carlisle | *Modeling above-ground carbon dynamics under different silvicultural treatments*
4	Jessica Blunn | *Cumulative Disturbance Legacies: CO_2 respiration as a potential indicator of behavior from beetle killed* Pinus contorta *bark char legacies in forest soils*
6	Madelyn Maffia | *Longevity of Large Wood Restoration Success to Improve Coho Salmon Habitat: A 2D Modeling Approach*
8	Puspa Raj Joshi | *Novel prescriptions in forest management and impact on harvesting cost*
10	Megan Sampognaro | *Evaluating native bee community response to fuel-reduction treatments in private industrial dry forests*
12	Katie Wampler | *Drivers of Carbon Concentration and Character Through a River Network Following a 2020 Oregon Wildfire*
14	Jansen Ivie | *Quantifying the Response of Coastal Cutthroat Trout to Wildfire in the Oregon Cascades*
16	Sven Rodne | *Historical Forest Structure, Composition, Growth, and Spatial Patterning of Shade Intolerant Trees in Oregon's Rogue Basin*
18	Mayah Baker | *Analyzing blue and fin whale abundance using bioacoustics*
20	Andres Olivos | *Assessing the availability of marine habitats for introduced salmon in South America*
22	Erin Lunda | *Characterizing the effects of environmental variability and individual biological characteristics on green sturgeon recruitment success*
24	Kyra Bankhead | *Spreading Dynamics of Maladaptive Foraging Behavior Among Highly Social Predators*
26	Marie Tosa | *Who needs old growth forests? Multi-taxa biodiversity surveys of forests in the Pacific Northwest*
28	Rahiza De Thomas | *Assessing de diversity of aquatic insects in rural and urban ponds of North Texas, USA*
30	Sheridan Hardy | *Lateralization in Red Crossbills: Does Morphology Influence Behavior?*
32	Jacob Dickey | *Habitat and Distribution Analysis of Freshwater lamprey in Oregon's Goose Lake Basin*
34	Dorothy Zahor | *Do the Feathered Fear the Felines?*
36	Meagan White | *Disentangling the seasonality of decomposition rates in aquatic and riparian systems*
38	Cody Wainscott | *In-depth characterization of bondlines in cross-laminated timber made with preservative-treated lumber*
40	Laila Brubaker | *Identifying and locating sensing and signaling receptors in* Ceratonova shasta *with immunofluorescence staining*

Poster #	Session 2 | 1:00 p.m. - 2:00 p.m.
1	Yury Llancari Valenzuela | *Forest Vegetation Management Strategies for reforestation in the Lowland Forest Region of Washington*
3	Cedric Pimont | *The Effects of Wildfire on the Spatial Variability in Soil Hydraulic Conductivity*
5	Jessica Blunn *| Soil infiltration rate in watersheds with differing management and disturbance regimes: HJ Andrews Experimental Forest*
7	Paige Byassee | *Proposal: Productivity and Stress Tolerance of Mixed-Species Plantations in Southwest Washington State*
9	Kellee Boyer | *Monitoring Soil Accretion and Geomorphic Change Using LiDAR at Wapato Lake National Wildlife Refuge*
11	Katie Hill | *Roles and associations of fungal pathogens with emerald ash borer,* Agrilus planipennis*, mortality in* Fraxinus latifolia *in Orego*n
13	Amanda Kelly & Cliff Zavala | Restoring ecological resilience using local ecological knowledge on private lands: a case study in landowner driven adaptive management
15	Owen Fortey | *Oregon Coast's History and Present-day Risk of Wildfire*
17	Anna Wemple | *Factors Influencing Regeneration Patterns Following Large Disturbance*
19	Cecelia Frisinger | *Chick Provisioning of a Threatened Seabird Under Divergent Ocean Conditions*
21	Charlotte Hussain | *The Diet of the Salmon Shark: Not Just Salmon*
23	Fang-Yu (Betty) Shen | *Quantifying change in avian abundance through data integration to inform perspective on the functional value of ecosystem services*
25	Margaret Campbell | *The Effects of Offshore Wind Farms on Fisheries and their Effectiveness as Other Effective Area-based Conservation Measures in Marine Spatial Planning*
27	Rebecca Kelble | *Are Relatively High Common Raven Densities Contributing to Declining Greater Sage-grouse Populations in Central Oregon?*
29	Alyssa Eklund | *Wildlife Interactions with Large Log Crossing Sites in Lookout Creek, H.J. Andrews Experimental Forest, Oregon*
31	Abigail Vukanovich | *Thermal metabolic study of Pacific Cod (*Gadus macrocephalus*) using otolith stable isotope chemistry*.
33a	Marina Larson | *Fins not Fingerprints: Using Photographic Identification to Track the North Eastern Pacific Population of White Sharks,* Carcharodon carcharias
33b	Marina Larson | *Diet and Philonema infections in reservoir-rearing juvenile Chinook salmon (*Oncorhynchus tshawytscha*)*
35	Mercedez Allen | *Diversity of riparian spiders in the Lookout Creek basin, H.J. Andrews Experimental Forest, Oregon*

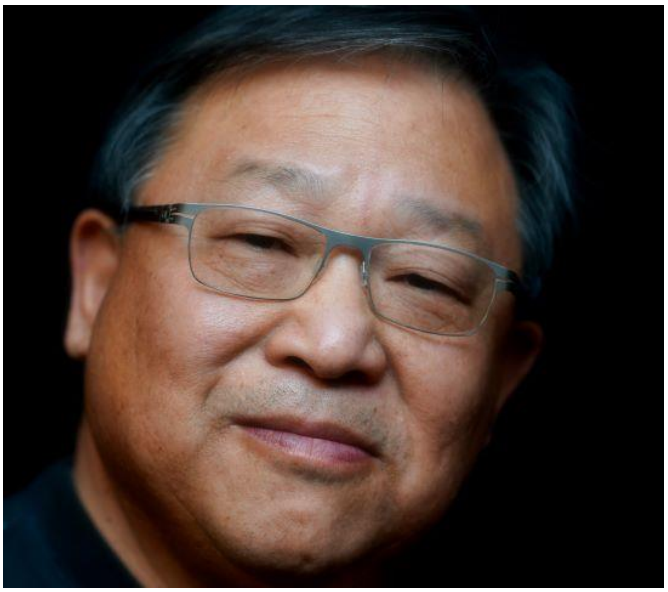
Event Map


Jefferson
Peavy Atrium
Stairs
ALL GENDER RESTROOM
Richardson Hall 107
Richardson Hall 115
Stairs
1st Floor Knuckle
RESTROOM
Peavy Hall 301
(at top of stairs on 3rd floor)

Opening Keynote Address | Cal Mukumoto.....9:00 a.m.

Oregon Department of Forestry, Research Needs and Policy Development

This keynote address will provide an overview of the Oregon Department of Forestry (ODF) operations, its current strategic planning efforts, and the research needs that ODF foresees to fulfill its mission and vision. Cal will also address how research may impact policy development at ODF.



Speaker Bio:

Cal Mukumoto is State Forester and Director of the Oregon Department of Forestry. Cal's extensive leadership career includes diverse accomplishments in economic development, natural resource management, turnaround solutions, and biomass energy development. He has worked extensively in the Native American business community, serving on the Boards of six Tribal enterprises. Cal is a graduate-level forester who has managed all aspects of forests. He was Chair of the Oregon Parks and Recreation Commission, has served as Vice-Chair on the Oregon State Board of Forestry and was a board member of the U.S. Board for the Forest Stewardship Council. Cal also enjoys being engaged in his community by being a member of the Board of Education for Southwestern Oregon Community College and participating on the Board of Trustees of Oregon Parks Forever. He has also worked on local forest collaboratives, chairing the Metolius Multi-party Management Team for eight years. Cal holds a bachelor's degree in Forest Management from Humboldt State University and a Master of Business Administration from the University of Washington.

Closing Keynote Address | Gabe Sheoships.....4:10 p.m.

Indigenous worldviews, western models of environmental management, and ecological futurisms

Speaker Bio:

Gabe is the Executive Director of the Friends of Tryon Creek, where he leads efforts focused on community building, environmental engagement, and protection of the natural world. Gabe is Cayuse, an enrolled citizen of the Confederated Tribes of the Umatilla Indian Reservation. Friends of Tryon Creek is a 52-year-old 501(c)(3) non-profit organization dedicated to an urban forest within the boundaries of SW Portland and Lake Oswego, Oregon. Environmental education, community engagement, and ecological restoration have been the focus of the organization's mission, in partnership with Oregon State Parks. Under Gabe's leadership, the organization has taken strides to recognize the Indigenous narrative of the land, and to better serve the forest and human community through the lens of an Indigenous worldview. The organization serves 60,000 people each year, of that 25,000 are K-12 youth, primarily elementary age students. Gabe has reinvigorated the organization's board of directors, strategic plan, mission, and staff to better reflect the whole community, which includes the entire Portland, Oregon metropolitan area. Under his leadership, new programming includes: a cultural fire restoration plan, culturally focused BIPOC (Black, Indigenous, Peoples of Color) nature day camp programming, and a campaign to build a new education pavilion within the forest canopy, in addition to continued environmental programming that instills values of ecological stewardship within the large, diverse human community. www.Tryonfriends.org. Gabe is the co-founder of the Oregon Land Justice Project, a statewide effort to build shared land reclamation and environmental conservation goals, between environmental organizations and Pacific Northwest Tribes. Gabe serves as co-instructor for the Portland State University Certificate in Tribal Relations Program, through the Institute of Tribal Government and Center for Public Service in the Mark O. Hatfield School of Government. Gabe was appointed as a commissioner for the City of Portland's Planning and Sustainability Commission in 2021. In other volunteer roles, Gabe serves as the Board President for the Tributaries Network, Chair of Nesika Wilamut (formerly Willamette River Network), and is a board member for the Center for Diversity and the Environment, and Freshwaters Illustrated, three of the four being nonprofit environmentally focused organizations. Gabe has an MSc in Fisheries Biology from Oregon State University, and a B.S. from Portland State University.

Oral Presentations

1. Assessment of evolving peoples' forest relationship in Lower Mekong sub-region **10:00 a.m.**

Lok Mani Sapkota[1]*, Reem Hajjar[1]

[1] Department of Forest Ecosystems and Society, Oregon State University, Corvallis, OR

* Email: sapkotal@oregonstate.edu

Local communities have been managing forests for time immemorial. The last five decades has seen substantial progress in formalization of peoples' relationship with forests through community forestry programs, particularly in low- and middle-income countries. Despite receiving strong scholarly attention in certain parts of the world, community forestry, particularly in Southeast Asia, suffers from Knowledge gaps in contextualizing the emergence of community forestry programs, and understanding how communities adapt to formalization in dynamic social-ecological systems. To help address this, our research will assess how local peoples' relationship with forests has been evolving in community forestry contexts in Lower Mekong. We will take a political ecology and historical institutionalist approach, combined with the social-ecological systems framework, to answer three specific questions: i) how have historical social, economic, political, environmental contexts shaped community forestry programs in Cambodia, Thailand, and Vietnam? ii) how enabling is the environment for community forest programs to succeed in achieving their stated objectives and targets in Cambodia? iii) how have local peoples' relationships with forests changed amid rapid rural transitions? While the first question will cover three countries, the latter two will be answered focusing on four provinces in the Prey Lang extended landscape in Cambodia. We will use mixed methods, nesting the collection and analysis of qualitative and quantitative data. In addition to using historical quantitative information on social, economic, and environmental indicators, we will gather data through purposively selected key informants from community forestry stakeholders from the three countries and focus group discussions and surveys with different subgroups within forest managing local communities from the selected landscape. Our analysis will suggest how community forestry can better adapt in the emerging contexts and align with the evolving needs, interests, and capacities of local communities. Such insights would be useful to improve policies to strengthen peoples' relationships with forests, and thereby to help community forestry programs achieve seemingly ambitious targets in the Lower Mekong Region.

2. Patterns of emergence in aquatic insects from intermittent and perennial streams at the H.J. Andrews Experimental Forest, Oregon **10:00 a.m.**

Tatiana Latorre[1]*, Ivan Arismendi[1], Sherri Johnson[1], Emily Giordono[2]

[1] Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, OR

[2] Environmental Sciences, Oregon State University, Corvallis, OR

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The number of intermittent streams, defined as those with no flow during part of the year, have increased worldwide in the last decades due to climate change. Changes in flow status can impact aquatic subsidies to terrestrial systems and have been overlooked in the literature. In this study, we contrast insect emergence and biodiversity from two intermittent and two perennial streams flowing into Lookout Creek at the H.J. Andrews Experimental Forest during two periods (2003-2004 versus 2022). A series of emergence traps were set per to collect adult aquatic insects during dry season. We measured additional covariates including temperature, substrate composition, and canopy cover.

Collected insects were preserved in ethanol and identified under the lowest taxonomic possible level. Preliminary findings suggest that stoneflies such as *Alloperla* and *Malenka*, mayflies such as *Hetageniidae*, and caddisflies as *Dolophiloides* persist in both intermittent and perennial streams during the two sampling periods. Future efforts will include the identification of others groups sensitive to desiccation and the relationship between the duration of water flow and the emergence of adults during the dry season.

3. Weighing the Benefits of Returning Fire to Landscapes: Strategic Fire Management Expenditures

10:00 a.m.

Ian Goodwin[1]*, Mindy Crandall[1], John Sessions[1]

[1] Department of Forest Engineering and Resources Management, Oregon State University, Corvallis, OR

* Email: ian.goodwin@oregonstate.edu

The accumulation of fuels in fire prone wildland environments, and changing climatic conditions, have resulted in increasingly volatile fire behaviors. As a result, social and operational risk, management expenditures, and budgetary requirements for responsible agencies are heightening. The USFS manages 193 million acres across the United States with a variety of strategic options available for wildland fire management. When a fire ignites on federal land, the responsible agency may choose to suppress the event, monitor, or manage the event for resource benefit if adequate weather and public acceptance exists. With intensifying fire regimes, exploration of the potential outcomes of the 'use' of naturally ignited wildfire events, rather than suppressing ignitions, is warranted. This study examines wildfire events that occurred across six USFS Regions from FY 2015 to 2018 assembled from multiple databases to produce a spatially explicit exploration of individual fire events. Multidimensional event-dependent (i.e., fuel characteristics) and independent factors (i.e., weather characteristics) contributing to fire management workload under both reactive and proactive management strategies are modeled and tested using econometric methods. While the management of wildland fires is essential to protect infrastructure and public safety, discretionary wildfire appropriations to the USFS and BLM, required to manage these events, have increased two-fold over the last decade, reaching $7.55 billion in 2022. Metrics estimating the impact of strategic choice are critical for fire managers and policy makers to accurately assess potential avenues for reducing expenditures, operational workloads, and fuel loadings throughout United States Federal lands systems.

4. Forestry Electric Vehicle Energy Routing

10:15 a.m.

David Hamilton[1]*, Kevin Lyons[1]

[1] Department of Forest Engineering and Resources Management, Oregon State University, Corvallis, OR

*Email: david.hamilton@oregonstate.edu

In forestry operations, logging trucks travel to the top of a hill, pick up a heavy load, and then travel downhill to mills at lower elevations. 40-60% of the cost of harvesting lumber is attributable to fuel and transportation costs. Naturally, considerable thought is given to the economization of fuel costs and forest planners often select travel routes that minimize fuel consumption. When a heavy load is picked up at the top of a hill, you can harvest (or capture) some of that potential energy to conserve

total round trip fuel costs. Electric vehicles provide an additional opportunity wherein you can use "regenerative braking" to capture the vehicle's kinetic energy by recharging the battery while braking. Energy recapture is even more important in forestry because the terrain is remote and rarely has access to charging stations or electricity. The objective of my research is to provide a tool capable of minimizing energy expenditure across a forest road network. I hypothesize that this tool will show alternate routes to the conventional shortest routes based on distance and time. My tool uses graph theory to spatially map a forest road system (the McDonald and Dunn Research Forests) as a multidirectional network with edge weights based on energy lost or gained across a segment. Then I use a shortest path algorithm on the system to determine the route that uses the least energy across the landscape. My research is unique because it contrasts traditional routing tools by using energy across road segments as the route weight and incorporating negative edge weight.

5. **Drivers of Relative Streamflow Contributions and Flow Paths in Mountainous Headwater Streams** **10:15 a.m.**

Jaime Ortega[1]*, Catalina Segura[1], Pamela Sullivan[2], and Rennee Brooks[3]

[1] Department of Forest Engineering, Resources and Management, Oregon State University, Corvallis, OR

[2] College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, OR

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Headwater streams are the most abundant in the stream network of almost all catchments. These small tributaries are critically important as water sources and solute to downstream systems. Despite their recognized importance, few studies have focused on understanding the variability of their influence on downstream flow conditions. In this study, we quantified the annual discharge contribution of five tributaries (Cold, McRae, Mack, Nostoc, and Longer Creek) to Lookout Creek (main tributary), a 64 km^2 basin in the H.J. Andrews Experimental Forest, Oregon, USA. Our analysis is based on weekly stream and precipitation samples collected and analyzed for major cations (Ca, K, Mg, Na, Si, Al, and Sr), anions (Cl, SO_4, and NO_3), and water isotope ratios. Preliminary results based on samples collected year-round showed a wide range of isotope ratios across tributaries. Yet, Cold Creek exhibited remarkably stable values, contributing most of the flow (>65 %) to Upper Lookout Creek during the summer months. Cold Creek also has the highest solute concentrations of Mg, Na, Ca, and K, compared to the other investigated streams. In contrast, the Al and Sr concentrations were lower in Cold Creek compared to the rest. These results indicate that the chemical variability across streams will be an effective tool for separating water sources and discharge contributions. We will use two and three-end member analysis and concentration-discharge relationships to unveil the spatial and temporal variability in flow paths. Additionally, the spatial variability in unit-area discharge will be used to quantify seasonal streamflow contributions. Our study is relevant in understudying the spatial variability of water availability in streams in the rainfall-snow transition zone as this region continues to migrate up in elevation because of climate change.

6. **Douglas-fir Reforestation After Wildfire in the Pacific Northwest of the U.S.A.** **10:15 a.m.**

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Wildfire is a common disturbance in dry conifer forests. Anthropogenic climate change, natural climate variability and a legacy of fire suppression in the region have increased wildfire potential over the last decades in the western United States. The 2020 fire season was particularly catastrophic, in part due to strong eastern winds late in the summer after several months of low precipitation. Reforestation after fire introduces additional challenges beyond those of standard reforestation practices. Some of these challenges include replanting seedlings under established trees in non-merchantable stands, a lack of information on post-fire vegetation community dynamics, and a limited understanding of how pre-fire stand structure impacts post-fire conditions. The specific objectives are: i) To determine the effect of wildfire on soil physical and chemical attributes; ii) To determine the effect of wildfire microclimate conditions, iii) To determine the effect of pre-wildfire stand age/structure on post-fire early seral vegetation community dynamics, iv) To determine the effect of pre-wildfire stand age/structure and FVM on soil moisture dynamics, and v) To determine the effect of pre-wildfire stand age/structure and FVM on Douglas-fir seedling performance. Four stands were located in the Archie Creek fire in Southwest Oregon, vi) To determine the effect of delayed planting in the effectiveness of FVM and Douglas-fir growth and survival. The site consisted of four different pre-fire stand structures: 1) unburned (harvested in fall 2020), 2) burned when the stand was 2 years-old, 3) burned when the stand was 12 years-old, and 4) burned when the stand 55 years old. At each site, six treatments with different combinations of planting year (right after fire, or delay 1 year) and VM regime (pre and post planting herbicide treatments) were applied using a complete randomized block design with four replications of each treatment. In each plot, 6 rows of 6 seedlings were planted at 10x10 ft spacing. Within each plot, 5 vegetation survey points were installed to monitor vegetation abundance and species richness. In addition, soil moisture measurements were taken 5 times during the 2021 growing season at each vegetation survey point. A weather station was installed within the study area to record air temperature, relative humidity, rainfall, and solar radiation.

7. Lasers and Streams: Applications of Handheld Mobile Laser Scanning in Headwater Stream Hydrology **10:30 a.m.**

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Handheld mobile lidar scanning (HMLS) presents an opportunity where airborne laser scanning (ALS) fails to resolve features obscured by forest canopy and ground vegetation in dense forests. Until recently, high-resolution data on features in headwater areas have been limited by the logistical constraints of using tape transects and other physical mensuration tools. HMLS yields higher point densities than ALS while providing greater coverage of near-ground features, allowing for novel analysis of data pertaining to hydrology. This study leveraged HMLS to investigate interactions between large woody material, channel morphology, and vegetation in low-order waterways in Western Oregon. Using the GeoSLAM ZEB Horizon handheld lidar scanner, 1000-meter long HMLS surveys were conducted in three watersheds. Large woody material was extracted from lidar point clouds using filtration of normal change rate and linearity metrics. Riparian stand metrics (DBH, height, and canopy volume) were extracted from the cloud in the program 3D Forest. Metrics will be

modeled as covariates predicting localized mean annual discharge, and are expected to provide insight into the relationship between stream geomorphology, physiography, and hydrological response.

8. The Effects of Physiography on Flow Paths and Water Storage in a Mountainous Catchment

10:30 a.m.

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Many mountainous regions rely on snowmelt for water supply. As climate change reduces the reliability of snowpack in these regions, we must work to improve our understanding of how water is stored and when it will be released. Understanding the mechanistic link between terrain physiography and the movement/storage of water in the landscape is critical to make sound predictions of variations in water supply. For this analysis, we are using water stable isotopes (WSI) – a tool that helps us understand spatial and temporal variability in flow paths. We incorporated WSI in surface water samples collected in four synoptic campaigns over two years. Samples are collected across high elevation headwater streams (600–1200m) in the HJ Andrews Experimental Forest, Western Oregon, USA. The spatial/temporal trends in WSI combined with LiDAR derived metrics of topography will be used to infer differences in storage/movement across the landscape. Preliminary results demonstrated that localized variations in WSI occur within a $<1km^2$ area between catchments underlain by similar geology, but with different surface features. We have also observed that many headwater catchments show complex relationships between elevation and isotopic composition, suggesting that the sources of baseflow are not directly controlled by seasonal precipitation. Our results indicate that variability in landscape disturbance legacies as well as terrain moisture levels controls much of the variation in WSI patterns. By using Spatial Stream Network Models, we can evaluate how well topographic parameters (slope, roughness, soil depth) and moisture (seasonality) explain the variability in WSI. Improving our understanding of these water dynamics will help inform water resource availability in the face of a changing climate.

9. Relationship of Soil Fungal Communities and Burn Severity to Post-Fire Vegetation Response

10:30 a.m.

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The effects of fire on above-ground forest systems have been extensively studied. However, research of fire effects on belowground processes is lacking. While the soil microbiome is understood to be vital to conifer growth and regeneration, the complexity of soils means that research on the topic has largely been accomplished on plantation forestry sites and unburned forests. Recently, with the increased fire activity and the urgency to better understand fire's effects on all aspects of ecosystem function, soil been tagged as a topic worth digging into. Recent work has begun to unravel fire effects

on root-zone chemistry; however, this has raised new questions about the effects on belowground microbiota. Understanding dynamics of soil in post-fire environments could be vital to post-fire management in forested ecosystems. This proposed research looks to identify differences in the soil fungal communities across the burn severity gradient in the B&B fire complex, particularly by comparing the high severity with the unburned site data. We also would like to quantify how the vegetation has regenerated differently across the burn gradient. To address these questions, we collected soil samples and vegetation data using three vertical strata: overstory trees, seedlings/saplings, and shrub/ground cover. The measurements will be used to compare the community vegetative structure across the treatment combinations. Soil samples will be taken to extract the fungal genetic data later in the lab. We hypothesize that the soil fungal communities will be different between the unburned and burned areas. We estimate that the community diversity will be reduced on the high severity sites compared to the unburned area. The proposed study is an observational study therefore results will be applicable to dry, arid forests in the eastern Cascade Range and causal inference cannot be stated. This study will continue to expand the growing knowledge surrounding the soil microbiome.

10. Gene expression – phenotype relationships in a field study of photorespiration-suppressed transgenic poplars **10:45 p.m.**

Chaney Hart[1]*, Amanda Goddard[1], Li-Wei Chiu[2], Karli Rasmussen[2], Yumin Tao[2], Christopher Still[1], and Steven Strauss[1]

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Considerable effort has been made to improve the efficiency of photosynthesis, and thereby improve carbon uptake, by reduction of photorespiration (which releases CO_2). Following the pioneering work in tobacco (South *et al., Science*, 2019), we tested the effects of modified expression and insertion of several genes involved in the photorespiratory pathway in multiple transgenic and control lines of hybrid poplar (*Populus tremula x alba: INRA 717-1B4*). As differences in construct efficiency among different transgenic gene-insertion-events can lead to variability in gene expression that influences target traits, we assessed 7 independent “events” for differences in construct expression, physiology, and tree growth through 1.5 seasons in Oregon’s Willamette Valley.

Principal components analysis was used to summarize gene expression variation among events and growing seasons, and their relationships to physiological and tree growth traits. Gene expression data included expression level of two overexpression transgenes, GDH (glycerate dehydrogenase) and MS (malate synthase), and the efficacy of gene suppression via RNAi for PLGG1 (plasticidic glycolate glycerate transporter), over two growing seasons. PCA analysis suggested that the degree of PLGG1 silencing, and the extent of GDH and MS overexpression, are substantially independent and have differential effects on growth and physiological traits.

11. Community Dynamics of Native and Non-Native Fish in a Changing Ecosystem **10:45 p.m.**

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The Goose Lake Basin is an endorheic desert valley on the border of Oregon and California that has been heavily impacted by drought, wildfire, and other environmental stressors. The basin is a region of concern for state and federal agencies because it is home to endemic fish species like the Goose Lake redband trout, Goose Lake lamprey, Goose Lake tui chub, and Goose Lake sucker. These endemics coexist with native and non-native species, including the recently delisted Modoc sucker. Consequently, the Thomas Creek – Goose Lake area has been listed as a "Conservation Opportunity Area" in the Oregon Conservation Strategy. Prior to 2022, consistent monitoring efforts had not been conducted in the Basin for over a decade despite sensitivity to disturbance events and its status as priority habitat for native fish.

We comprehensively sampled 36 sites during the 2022 field season, all of which sites that were previously sampled by ODFW in 2007. An additional 35 randomly generated sites were sampled for eDNA only. In our preliminary results, fish abundances appeared to have declined between 2007 and 2022, although community composition remained relatively unchanged. Sucker species declined the most, likely due to absences in lower Drews and Dry Creeks where they were highly abundant in 2007.

This project will provide updated abundance and distribution estimates to inform state and federal managers as to the population status of at-risk native species, while the spatial database of aquatic habitats, eDNA assay for target species, and population risk assessment will support actionable management outcomes.

12. Effects of Fuel Treatments on Post-Wildfire Resilience in the Sagebrush Steppe **10:45 p.m.**

Claire L. Williams[1]*, Lisa M. Ellsworth[1], Beth A. Newingham[2], Scott Shaff[3], and Carmen Pryor[1]

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Sagebrush steppe ecosystems are becoming increasingly threatened by the invasion of non-native annual grasses, resulting in increased fuel continuity and larger, higher severity fires. In response, fuel managers are implementing fuel reduction treatments across the sagebrush steppe to mitigate fire behavior and encourage native plant recovery following wildfire. The objective of this research is to determine how common fuel reduction treatments (prescribed fire and mechanical) affect post-wildfire fuel accumulation and reburn potential. We collected pre- and 10 years post-treatment fuels data before wildfires burned through four plots in the Sagebrush Steppe Treatment Evaluation Project (SageSTEP) network, and then collected at least two additional years of post-fire fuels data. We built custom fuel models using field data and used the Fuel and Fire Tools (FFT) fire behavior modeling program to model reburn fire intensity metrics: flame length, reaction intensity, and rate of spread. Each site was considered an individual case study due to the variability among the four sites. A Before-After Control-Impact Paired Series (BACIPS) analysis was performed for each site to examine the dual

impacts of fuel treatments and wildfire on modeled fire behavior and fuel accumulation. Site effects had more impact on modeled fire intensity metrics than treatment effects, largely due to the differences in herbaceous fuel responses across sites in the first post-fire year. Burned untreated control plots had fairly stable fire behavior metrics through time-since-fire, but the burned treated plots had highly variable responses by site. Site specific responses are likely a combination of land-use history, wildfire intensity and severity, and local climate conditions and on-going research is needed to pull apart the respective influences of each factor. Understanding the interactions and combined impact of fuel reduction treatments and wildfires is key to making management decisions in a landscape experiencing increasingly larger and more frequent fires.

13. Equity in Community Forestry in the Western US **11:00 a.m.**

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Community forestry is a decentralized form of forest governance that is widely promoted around the world. In the United States, community forestry is growing as a form of forest management, and exists across a range of ownership and governance models, all with different levels of community participation and access to benefits. While a key tenet of community forestry is to bring decision-making and benefits closer to the community, not everyone in a community has the same access. This research examines how community forestry in the western US contributes to equity in access to decision making and benefits from forest management. In pursuit of this goal, we describe two case studies of community forestry in the western US owned by community-based organizations. We conducted semi-structured interviews with community forest managers, local leaders, community members, and other stakeholders. An equity framework, describing procedural, distributional, recognitional, and contextual dimensions of equity was used in the formation of interview questions and analysis of interviews. Preliminary analysis shows that there are a variety of ways for community forests to contribute to equity based upon either formal or informal processes for determining community needs. Additionally, there are differences in how equity presents itself across dimensions in each case study. The intent of this study is to contribute to the discussion of how community forests can be structured more equitably.

14. Invasive performance and climatic niche dynamics of Rainbow and Brown trout in the Himalayas **11:00 a.m.**

Arif Jan[1]*, Ivan Arismendi[1] and Guillermo Giannico[1]

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Rainbow Trout (*Oncorhynchus mykiss*) and Brown Trout (*Salmo trutta fario*) have been introduced to the Himalayan ecoregion for commercial and recreational purposes. These non-native trout compete for space and resources with native coldwater cyprinids i.e., *Schizothorax* species. The distribution of two flagship species i.e., *S. plagiostomus* and *S. richardsonii* substantially overlaps with the distribution of introduced Rainbow and Brown trout. Little is known about the invasive performance of non-native trout in the Himalayas which impedes making clear policies about their propagation via hatchery programs. We used COUE scheme (Centroid shift, Overlap, Unfilling, and

Expansion) to study niche dynamics and overlap of non-native trout with Snow Trout. We found no significant ($p>0.05$) climatic niche conservatism for Rainbow and Brown trout in the Himalayas. However, niche dynamics indices suggest more invasive potential for Brown trout than Rainbow Trout. Lack of niche conservatism for non-native trout is because of either "expansion" to new habitats or "unfilling" of suitable habitats (yet) in the Himalayas. We observed more "expansion" to new habitats for brown trout (74%) compared to rainbow trout (39%). Rainbow trout had more potentially suitable conditions yet to fill, "unfilling" (7%) compared to brown trout (2%). Our analyses suggest more invasive potential for brown trout compared to rainbow trout in the Himalayas. However, rainbow trout as significant ($p<0.01$) realized niche similarity with S. plagiostomus and in case of invasion, which is very likely under the current high propagule pressure, it may negatively affect native snow trout more than brown trout. Brown trout will likely continue to be invasive whereas rainbow trout is still in lag-phase before its ecological expansion. Our results provide baseline for future studies on biotic interactions between snow trout and non-native trout, which will further elucidate invasive potential of non-native trout.

15. Quantifying Geomorphic and Vegetative Change in Restored Tidal Wetlands of the Nisqually River Delta **11:00 a.m.**

Anna Kennedy [1*], Melanie Davis[1,2], Isa Woo[3], Susan De La Cruz[3]

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In the Pacific Northwest, significant advances toward restoration of estuarine habitat in Puget Sound, Washington, were made with the restoration of over 900 acres to tidal exchange. Through a partnership between the U.S. Fish and Wildlife Service Billy Frank Jr. Nisqually National Wildlife Refuge (Refuge) and Nisqually Indian Tribe (Tribe), restoration efforts culminated in 2009 with the removal of nearly five miles of dike to restore over 750 acres of estuary. This complemented three earlier projects completed by the Tribe between 1996 and 2006. Restoration projects were implemented with the aim of restoring and enhancing habitat for a variety of wildlife, particularly the federally threatened Nisqually fall chinook salmon stock. Since 2009, the U.S. Geological Survey—Western Ecological Research Center, Refuge, and Tribe have collaborated to conduct monitoring to assess the effectiveness of these projects to restore estuarine habitat, process, and function. Our study leveraged long-term field survey data and remote sensing datasets to conduct an analysis of fine-scale spatiotemporal change in restored tidal wetlands. To determine elevation and geomorphic change across the estuary, we conducted a change detection analysis with 2011 and 2020 aerial light detection and ranging (lidar) datasets. We conducted RTK-GPS surveys to validate imagery and incorporated vegetation surveys and multispectral aerial imagery to relate patterns of vegetation colonization to elevation change. Preliminary findings indicate that colonization continues to progress slowly in the area restored in 2009 and has predominantly occurred in high elevation tracts on the eastern side of the site. To assess vegetative succession, we analyzed community composition along resampled transects and compared trajectories to reference parcels. This study will contribute information on the trajectory and timeframe of tidal wetland recovery to restoration practitioners and may inform the site selection and design of future restoration projects.

16. Climate vulnerability and adaptation for family forests: A case study in assessing climate risks and adaptation pathways to support inter-generational forest management [VIRTUAL] **11:15 a.m.**

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Climate change will require family forestland owners to withstand and adapt to potentially novel impacts and interacting effects. Inter-generational forest management is further complicated by diverse cultural values and vulnerabilities that can destabilize long-term family institutions and systems (natural and manmade). Considering the complexities of climate change, landowners need site-specific information on climate risks and how forests will respond so they can embed adaptation into future management decisions. To address this need, a landowner-driven case study was conducted for a 1,000-acre property in Northeast Washington. The method used a modified Climate Vulnerability Assessment (CVA) to develop a "climate adaptation lens" and adaptation framework, which is an uncommon tool for private forests and smaller-scale resource managers. Consensus literature and landowner interviews were used to assess climate risks (a composite of vulnerabilities, hazards, and exposures) across ecological, sociocultural, and economic dimensions. Adaptative capacity of these elements were then integrated into strategies deemed suitable and sustainable for inter-generational management. The results of the CVA identified hazards from increasing temperature, CO2, wildfires, and drought. Critical vulnerabilities included changes in hydrology, snowpack, and water and indirect changes in disturbance regimes. Priority exposure points were categorized as forest, family, and infrastructure. Landowner feedback required that climate adaptation actions be embedded within best practices for sustainable forest management and maintenance of ecosystem services. Recommendations included long-term monitoring, reducing forest stand density and fuels, building long-term communication and partnerships, and hardening vulnerable infrastructure and systems. This case study confirms that active management, integrated planning, and knowledge transfer to future generations are tangible strategies to prepare for an unknown future. Connection to the land and each other makes families uniquely positioned and an important example of adapting to climate change, protecting critical ecosystem services, and safeguarding a legacy of stewardship and home.

17. Quantifying the habitat suitability for juvenile *Oncorhynchus mykiss* throughout the Oregon Coast at multiple scales **11:15 p.m.**

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Pacific salmon and steelhead are economically, ecologically, and culturally significant. They offer ecosystem services through marine derived nutrients and as a reliable food source to terrestrial vertebrates. Most Pacific salmon species exhibit some degree of anadromy, experiencing freshwater, estuary, and marine environments as part of their life cycle, and are consequently exposed to stressors in a variety of complex ways. The ways in which individuals interact with these environments, as well as the habitat requirements within each environment, are often dependent on the species of salmonid and their specific life history. Juvenile rearing is a sensitive time, making rearing habitat particularly important to understand. Scale also plays a fundamental role in ecology,

and understanding the role of spatial and temporal scale in habitat suitability for juvenile *O. mykiss* will be integral to informing conservation and management. In this research I will examine the environmental variables which define suitable habitat for juvenile *Oncorhynchus mykiss* in the Oregon Coast major river systems at multiple spatial scales as well as the covariance between juvenile *O. mykiss* and *O. kisutch* abundance and habitat preferences. I will also illustrate the intrinsic potential (IP) for *O. mykiss* and *O. kisutch* habitat within the Oregon Coast range. These objectives will be addressed through 1) habitat suitability models using fine- and broad-scale environmental data, 2) covariance measurements using a covariance matrix, 3) development of IP model for Tillamook populations of *O. mykiss* and *O. kisutch*.

18. Quantifying the effect of deforestation on biodiversity-carbon co-benefits in Paraguayan forests: Preliminary results **11:15 a.m.**

Laura Rossana Macedo Amarilla[1]*, Sean P. Healey[2], Zhiqiang Yang[3], Matthew Betts[1]

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Paraguay is an immensely biodiverse country that lost a significant share of its forests in recent decades due to soy farming and cattle ranching. This project aims to understand the relationship between aboveground carbon stocks and trends in species' habitat amount for mammal species and bird species across time (1985-2020). To achieve this, we applied the Continuous Change Detection and Classification algorithm (CCDC) on Google Earth Engine (GEE) from 1985 to 2020 using the Landsat satellite, which generated harmonic coefficients (54 variables). Secondly, we developed Species Distribution Models for selected species using the CCDC coefficients as environmental variables. The species studied were selected considering four categories of the IUCN red list categories: Least Concern (LC), Near Threatened (NT), Vulnerable (VU), and Endangered (EN), and their relationship with forest cover (i.e., forest-dependent species versus forest-independent species). In addition, the species selected had the highest number of occurrences in their categories and >20 occurrences. Habitat declines occurred for 2 out of 3 mammal species during 1985-2020, *Sturnira lilium* showed the most significant decrease (45 % of reduction). *Tolypeutes matacus* which is associated with Savanna and Shrubland showed a slight increase in habitat (4%). Regarding bird species, 3 out of 7 showed habitat declines, and 4 species showed habitat increases. The species that showed the greatest decrease was *Penelope superciliaris* (15.40%) and the species that showed the greatest increase was *Picumnus cirratus* (40%) which is listed as Least Concern according to the IUCN. This study will be helpful as a baseline for land-use planning and reducing biodiversity loss because the effects of deforestation on biodiversity and the carbon co-benefits in Paraguayan forests have not been studied extensively.

19. Decreasing correlation between long-term Energy Release Component (ERC) averages and large fire growth days **11:30 a.m.**

Dana Skelly[1,2]*, John Bailey[2], W. Matt Jolly[3]

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This work shares changes in Energy Release Component (ERC) values across Oregon and Washington since the 1970s to frame the need to improve our fire behavior indices. Data from remote automated weather stations located on national forests in Oregon and Washington were analyzed to show this trend and correlation with large fires. This was then further analyzed to identify temporal shifts in index thresholds and correlation with large fire growth. As a fire behavior index, ERC is an expression fuel conditions and their availability to burn in the United States. The ERC values are represented in terms of percentiles of their historic value. A high percentile indicates that the current values are meeting or exceeding historical values for a given area. The 90th and 97th percentile conditions used as the reference point for potential extreme fire behavior. In recent years it has become common for portions of the western United States to remain at or above the 97th percentile for long periods of time. The noticeable difference in ERC values from the 1970s-2000 vs the values from 2000 on has led fire behavior modelers to calibrate use of ERC by using only very recent weather data instead of the full range available from historic records to increase daily averages and improve correlation with fire growth. This work documents these changes as part of a larger study intended to improving our descriptions of fuel availability in light of climate change.

20. Can future environmental conditions support endangered freshwater fishes under climate warming? **11:30 a.m.**

Gustavo Bizama[1]*, Juan Andrés Olivos[2], Jan Arif[2], Claudio Valdovinos[1], Ivan Arismendi[2]

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Freshwater fishes are among the most threatened groups in the world due to changes in land use, introduction of exotic species, and climate change. Mediterranean Chilean freshwaters support more than 50% of fishes classified as vulnerable or endangered, but little information exist about their current and future distributions. Endemic species in the family Perciliidae are ideal models to understand the effects of global warming given their low dispersion capacity and limited range. Here, we modeled current and future distributions of habitats of the two species *P. irwini* and *P. gillissi* using maximum entropy models (MaxEnt) optimized for stream networks. We included high-resolution climate layers that allowed us to improve the performance of MaxEnt and identify potential climatic refuges.

21. Equity in Resilience: Wildfire in the Rogue River Basin **11:30 a.m.**

Emma Sloan[1]*, Reem Hajjar[1]

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Forced removal of Indigenous groups and subsequent colonial forest management practices have led to landscape homogenization, fuel abundance, conifer encroachment, and, therefore, a loss of forest and fire resilience in the Western U.S. This loss of forest and fire resilience leads to a loss of social resilience as neighboring communities struggle to adapt to an intensifying fire regime. Across scales, the term resilience has guided land management for the last decade. While a useful metaphor for environmental change, resilience may be unevenly distributed across a landscape or a community. When we add an equity lens to the concept of resilience, we see that resilience is situated and experienced differently by different communities based on knowledge, culture, or resources. Low-income and minority groups often bear the effects of wildland fire disturbance disproportionately and provide valuable insight into conceptions of community resilience to wildfire. Relying on a critical examination of social-ecological systems and resilience thinking, this research uses a qualitative knowledge co-production approach to identify attributes of resilience in the Rogue River Basin of southwest Oregon. The results of this research describe attributes of resilience and their impact on equity and adaptation in the region. A situated understanding of resilience can support land managers, governments, and community organizations as they direct policy attention and practical actions toward equitable resilience.

22. Safety for all: the unique vulnerabilities in field work and first steps to change **2:15 p.m.**

Kenneth Loonam[1]

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Field projects exacerbate the hazards of interpersonal harm through isolation, shared work and living arrangements, concentrated power dynamics, and limited reporting mechanisms. Despite this, few field safety plans include prevention mechanisms or strategies to address harassment and violence. These harms overwhelming impact folks from excluded communities and early career professionals, creating a bottleneck in career pipelines that maintains the dominant demographics of natural resource fields: white, straight, male. Institutional efforts to become more diverse, equitable, and inclusive will fail if they do not include comprehensive field safety plans that make field work accessible and safe for all. The bare minimum begins with acknowledging the existing dangers of field work, providing bystander intervention and anti-harassment trainings, and creating reporting mechanisms that lead to effective responses and do not stigmatize victims.

23. Understanding the Vertical Distributions of Birds and Microclimate in H.J. Andrews Experimental Forest **2:15 p.m.**

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Bird distributions and movement within forested habitats have historically been considered in the horizontal dimension. However, given the height and vertical complexity of Pacific Northwestern old growth forests, failure to consider the vertical dimension can limit our understanding of habitat and space use. Few have examined vertical distributions and partitioning of birds in temperate forests. Further, none have studied the abiotic mechanisms behind these vertical distributions. Bioacoustics, especially use of passive acoustic recording units (ARUs) to document the presence of bird species, is becoming more common in ecology. Most studies use a single ARU installed near ground level to estimate species richness. Novel methods of installing multiple synchronized ARUs at a site at known distance apart allows for localization of birds by triangulating vocalizations.

The goal of this study was to use novel methods to describe patterns of bird distributions and microclimate across the vertical dimension in trees. We installed synchronized ARUs at 10-meter vertical intervals from the understory through the canopy of trees. The ARUs captured vocalizations of birds throughout the breeding season across the vertical dimension. Through application of a convolutional neural network birds in recordings were identified to the species level. Each ARU was paired with a sensor to provide information of the vertical microclimatic profile of the trees. Preliminary results of these novel methods indicate appropriate estimates of vertical height of bird vocalizations. Moreover, patterns in vertical microclimate show temperature differences between the understory and canopy of up to 3 degrees Celsius indicating a thermal buffering capacity of forest understory. These data help us better understand vertical patterns in microclimate and bird distributions the breeding season in Pacific Northwestern forests. As temperatures become more extreme, it is increasingly important to understand how birds partition within their habitat and whether that habitat can serve as microclimate refugia.

24. The story of one invertebrate, two fish parasites, and the largest dam removal project in the world

2:15 p.m.

Elliott Cameron[1]*, Sascha Hallett[1], Jerri Bartholomew[1], Julie Alexander[1]

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Current plans to decommission and remove four hydroelectric dams on the Klamath River will allow anadromous salmon to access historic spawning grounds and alter their pathogen distribution. Two of these pathogens, *Ceratonova shasta* (*Cs*) and *Parvicapsula minibicornis* (*Pm*), are obligate parasites that can cause disease in salmon throughout the Pacific Northwest. Both parasites alternate between waterborne spore stages and infecting both salmon and annelid hosts. While the river below the dams has been monitored for these parasites, more data are needed on distribution and abundance above the dams in preparation for anadromous fish passage. We sampled both water and annelids to describe the distribution of these parasites spatially and temporally between the dams that will be removed. In 2021, *Cs* spore levels were highest in August at the majority of sample sites, measuring up to 28 spores/L. The highest density of *Pm* measured was 78 spores/L. Annelid densities were highest downstream of the J.C. Boyle and Copco 2 dams, and these locations also had the highest densities of annelids infected with *Cs*. Interestingly, although densities of *Pm* were higher than *Cs* in water samples, the prevalence of *Cs* in annelids was higher than Pm. These data suggest there may be hotspots of myxozoan infection risk, and provide a better understanding of disease dynamics in the Klamath River's hydroelectric reach.

25. Acoustic behavior of bowhead whales in a foraging hotspot in the Western Beaufort Sea **2:30 p.m.**

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Bowhead whales (*Balaena mysticetus*) are a keystone species in the Arctic and a subsistence species for native Indigenous communities along the northern coast of Alaska. Like other marine mammals, bowheads' primary method of communication is through acoustic interaction with their surroundings. Although researchers believe that bowhead whales might have the most extensive and dynamic range of acoustic behavior, there isn't a published vocal repertoire during the fall season in the Beaufort Sea, which is a heavily used region of the Bering-Chukchi-Beaufort populations of bowheads. The western Beaufort Sea (WBS) also possesses a location that, under the proper conditions, acts as a bowhead whale feeding hotspot called the "krill trap". This project will both attempt to construct this repertoire and investigate some potential bioacoustic variance associated with environmental factors, time, and space. Hydrophones, or underwater microphones, recorded sounds in various locations of the Beaufort Sea from August of 2020 to August 2022. Non-song bowhead vocalizations, or signals, will be extracted from the data in the fall months, compiled into a dataset to statistically compare and isolate separate signal types. These distinct categories of vocalizations will make up the acoustic repertoire of bowhead whales in the fall. The data from hydrophones of different regions of the WBS will then be compared to examine if there are distinctions between signals depending upon location. This step will be repeated with data from a range of dates to explore if time influences signals. Signals will then be compared between occurrences when the krill trap is on and when it is off to investigate if bowheads may have specific signals communicating feeding opportunities. Research results can increase ecological and biological knowledge of bowhead whales, increase opportunities for more sustainable bowhead management practices, aid in locating key, alternate bowhead feeding areas, and more.

26. Vocal activity of northern spotted owl pairs **2:30 p.m.**

Cara L. Appel[1,2]*, Julianna M. A. Jenkins[1], Christopher McCafferty[1], Taal Levi[2], Damon B. Lesmeister[1,2]

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Monitoring of federally threatened northern spotted owls (*Strix occidentalis caurina*) is transitioning from mark-resight surveys to a passive acoustic framework. Detections from passive acoustic monitoring are effective for estimating rates of spotted owl landscape use and pair occupancy and for detecting population declines. However, estimating the magnitude of decline will be improved by a refined understanding of spotted owl vocal space use. We located activity centers for 7 resident spotted owl pairs in the Coast Range, Umpqua, and Cle Elum study areas in Oregon and Washington and surveyed calling behavior using autonomous recording units in 2021 and 2022. We placed 37 units approximately 1 km apart radiating out to 3 km from each activity center. Units recorded during

crepuscular and nighttime hours for an average of 120 days. We identified calls of spotted owls and barred owls (*S. varia*), a congeneric competitor and important driver of spotted owl population declines. We present results on spotted owl vocal space use in relation to distance from activity center, reproductive status, time of the season, and barred owl calling. In 2021, 94 percent of spotted owl calls were within 2 km of activity centers and 98 percent of calls by females were within 1 km. Spotted owls had reduced calling in areas with vocally active barred owls. This information will aid interpretation of spotted owl detections from passive acoustic monitoring to better estimate population status and inform management practices.

27. Strange (river)bedfellows: stream ecology meets parasite ecology **2:30 p.m.**

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The foundational ecology of running waters is summarized in numerous classic papers that provide geophysical and habitat classification systems for free-living biota – but what about parasites, which are present in nearly every freshwater system on Earth? These often-neglected organisms operate at small spatial scales, but host-parasite interactions can extend over years or decades and take on increasing ecological importance when their effects are considered at watershed- or landscape-level. How well do classical stream ecology theories about the distribution and abundance of organisms apply to parasites? Can incorporating concepts from theoretical parasite ecology add value to studies of free-living organisms? What lessons can we learn from a synthesis of these two disciplines, which remain closely tied but largely independent of each other, and what new questions can we ask about the structure and function of aquatic communities? We propose a theoretical framework linking concepts from stream ecology and parasite ecology as a first step toward a unified theory for riverine parasite ecology. We focus on generating hypotheses for the distribution and abundance of digenean trematodes and their hosts, using *Nanophyetus salmincola* and its host *Juga plicifera* as a case study for Pacific Northwest streams, and provide general recommendations for incorporating parasitological methods into stream ecology studies.

28. Utilizing Drone Footage of Gray Whale (*Eschrichtius robustus*) Nares to Identify Transition Indicators Between Exhalation and Inhalation Events **2:45 p.m.**

Chelsea Harris[1]*, Renee Albertson[2], James Sumich[2]

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Background: Historically, oxygen consumption rates for gray whales (*Eschrichtius robustus*) have been calculated by observing their sea-surface expressions during seasonally variable foraging and winter reproductive activities. While these estimates have been helpful, results have been somewhat generalized and correlate to less precise energetic estimates and oxygen demands. This study sought to observe nares during sea-surface expressions using drone footage to identify

potential transition indicators between exhalation and inhalation events. Because exhalation and inhalation must be equal over time, previous studies have assumed this transition occurs at the midpoint of each breathing event. More precise breathhold durations and actual timing of the transition between exhalation and inhalation, support more accurate estimates derived from sea-surface expressions.

Methods: Drone footage of five individual gray whales was reviewed in the video editing software Filmora, to identify whether there were observable indicators of the transition from exhalation to inhalation. Footage review established breathhold durations to identify the midpoint, the time at which the exhalation and inhalation transition is expected. If observable indicators of the transition from exhalation to inhalation were present, expected and actual transition times were compared.

Results: Drone footage review established precise breathhold durations and physical indicators of the transition between exhalation and inhalation in 53 out of 87 recorded breathhold events among five individuals. Physical indications that supported more precise breathhold durations included release of bubble plumes, and expansion of nares supported more accurate transition times between exhalation and inhalation. While exhalation and inhalation were equal over a series of breathhold events, data reflect individual breathhold events are not occurring at the midpoint consistently for each breathhold event.

Conclusions: These results reflect more precise breathhold durations and actual timing of the transition between exhalation and inhalation. By extension, these data would support more precise estimates that rely on sea-surface expressions.

29. Nest habitat assessment of marbled murrelets (*Brachyramphus marmoratus*) 2:45 p.m.

Ethan W. Woodis[1]*, Matthew G. Betts[1], James W. Rivers[2]

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Understanding the factors that influence nest-site selection and nest survival in the Marbled Murrelet (*Brachyramphus marmoratus*), an endangered seabird that nests in older inland forests, is essential to its recovery. Challenges associated with finding nests of this cryptic species, however, have made identifying such population drivers difficult. To learn more about murrelet nesting propensity, nest site selection and nest survival, we tracked 300 murrelets using VHF-telemetry tags during the 2017-2019, 2021 and 2022 breeding seasons. In total, forty-two individuals (14%) attempted to nest across years and nesting propensity aligned with annual ocean conditions; 0% of birds attempted to nest in 2017 – the year with the poorest ocean conditions as calculated by a suite of localized oceanographic data sets - whereas 39% of tagged birds attempted to nest in 2021 when ocean conditions were relatively improved. Chicks successfully fledged from 11 nests (26.2%), although ocean conditions were not a strong predictor of nest success. For this presentation, I will discuss my proposed research of using LiDAR to measure forest characteristics to determine how they affect nest-site selection and nest survival.

30. Mercury trophic transfer to a biosentinel species: quantifying biomagnification by larval dragonflies and other predatory invertebrates **2:45 p.m.**

Cailin Sinclair[1], Tiffany Garcia[1], Collin Eagles-Smith[2]

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[2] United State Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis, OR

Representative laboratory studies of contaminant cycling depend on mimicking naturally relevant conditions in an unnatural setting. Some toxicants, like methylmercury (MeHg), are highly complex in their freshwater trophic transfer, with field studies documenting wide variability in biomagnification rates. Experimental work is essential to understand this variability, yet the efficacy of laboratory methods to characterize MeHg transfer in aquatic food webs remains questionable. Our work unpacks how different methodologies affect trophic transfer of MeHg from oligochaete prey (*Lumbriculus variegatus*) to larval dragonfly predators (*Anisoptera spp.*) using three different methodologies. We quantified dragonfly dietary bioaccumulation from prey dosed aqueously with MeHg-chloride vs MeHg-cysteine, and with prey dosed dietarily with MeHg-contaminated algae. All experiments used 4 MeHg concentrations and ran for 5-8 weeks. We also evaluated impacts of exposure on dragonfly growth, body condition, feeding rate, predator avoidance behavior, and immune response. Preliminary data suggest that dragonflies bioaccumulate MeHg in a dose dependent manner but there is no difference between MeHg-chloride and MeHg-cysteine trophic transfer ($p>0.5$, Welch's t-test). All dosed treatments showed biomagnification factors less than 3, decreasing with increasing mercury dose. Prey dosed dietarily with MeHg contaminated algae further refined our study by exploring how increasing exposure realism impacts biomagnification. Whether these data indicate constraints in laboratory methods testing or a realistic view of biomagnification patterns occurring in nature will be explored. We will also present results of a metanalysis quantifying effect size and variability drivers in predatory invertebrate MeHg biomagnification reported in the literature. Environmentally representative laboratory methods are critical to accurately quantify contaminant risk and characterize toxicity, and successful future monitoring and modeling efforts depend on deeper examination of dietary accumulation by predatory invertebrates.

31. Predators, plants, and peers: the relative effects of top-down and bottom-up forces on elk demography **3:00 p.m.**

Kenneth Loonam[1], Casey Brown[2], Darren Clark[2], Mary Rowland[3], Michael Wisdom[3], Taal Levi[1]

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[2] Oregon Department of Fish and Wildlife, Adair Village, OR

[3] U.S. Forest Service, Pacific Northwest Research Station, Corvallis, OR

Human influences can rapidly change ecosystems, potentially shifting or disrupting the forces shaping species demographics. In the western United States, anthropogenic influences are accelerating climate change while policy changes are allowing large carnivores to recover from widespread extirpation during the 20th century. Elk (*Cervus canadensis*) in the western U.S. are caught between these two trends. Climate change is limiting forage through droughts exacerbated by extreme temperatures, and cougars (*Puma concolor*), a primary predator of elk, have recolonized much of their

historic range. We tested the effects of these changes on elk demographic rates using a long-term data set from an elk herd in eastern Oregon to build an integrated population model. We used cougar density, elk density, drought severity, and vegetative indices to test the relative importance of top-down (predation from cougars) and bottom-up (available nutrition) forces on elk recruitment and population growth rate. Cougar recolonization corresponded with mean elk recruitment falling from ~0.5 to 0.3 calves per adult female (posterior probability of negative correlation > 0.999) which lowered population growth rate. In a post-hoc analysis, we also found that cougar recolonization corresponded with decreased elk survival from 0.5 years to 1.5 years old. Despite these effects of cougar recolonization on elk demography, the elk population growth rate remained positive; indeed, recruitment of 0.3 calves per female is considered a high recruitment rate for elk. The only covariate representing bottom-up forces that correlated with elk recruitment was the drought index; however, the effect size was much smaller, had a lower posterior probability of being a true correlation (p = 0.905), and we did not detect its influence on the population growth rate. In the time-frame of this study, cougar recolonization played the largest role in the variability of elk demographic rates. However, cougar populations have likely plateaued, meaning they will not drive annual variation in elk demography moving forward. As climate change continues and its effects compound and intensify, its importance to elk demography could increase.

32. Comparing survey methods for puffins in the Kodiak Archipelago **3:00 p.m.**

Katie Stoner[1], Robin Corcoran[2], Megan Boldenow[3], Donald Lyons[1,4]

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[2] Kodiak National Wildlife Refuge, Kodiak, AK

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There has been little consensus on the best methods for monitoring Tufted (*Fratercula cirrhata)* and Horned puffin (*F. corniculata*) populations in Alaska. A patchwork of approaches, including boat-based surveys and land- and boat-based colony counts, is currently used to assess population trends across each species' range. Anecdotal declines suggest an urgent need to evaluate and compare methods, to enhance comprehensive and rigorous range-wide trend analyses for both species. Kodiak National Wildlife Refuge (NWR) has collected significant abundance data on Tufted and Horned puffins as part of 1) a broadly scoped project of designated seabird colony surveys to monitor breeding populations within the Kodiak Archipelago, and, 2) transect-based nearshore marine bird surveys to determine population estimates and trends for the most abundant coastal birds present in the Kodiak Archipelago. We present preliminary results comparing estimates of puffin abundance and evaluating trends derived from these two survey methodologies. By comparing abundance assessments obtained via designated colony surveys and at-sea transect surveys we enhance the potential to work collaboratively across regions to produce comprehensive, accurate range-wide population estimates, despite varying survey methods.

33. The role of fungal substrate on lignocellulytic enzyme expression and mixed laccase specificity. Implications for bioprospecting **3:00 p.m.**

Leon Rogers[1], Paola Torres-Andrade[2], Gerald Presley[1]

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[2] Department of Agricultural Sciences, Universidad del Cauca, Popayán, Colombia

Fungi have become invaluable for processing woody waste material into biofuel and specific material conversions from biomass. For example, converting wood and agricultural waste to ethanol requires removal of lignin while retaining as much cellulose and free sugar as possible. There are two common approaches to fungal pre-treatment; introducing and growing fungi directly onto material is inexpensive but lacks control and consistency, or alternatively to extract and concentrate purified enzymes from fungal bioreactors is very effective but expensive and energy intensive. We intend to inform a middle approach to better select fungi for specific substrates that could leverage fungal preferences for maximum enzyme expression and specificity. In this experiment we have grown four fungi on multiple plant-based substrates (pine, hemp, annatto, agar) for subsequent enzyme extraction and concentration. Crude mixtures of fungal enzymes were assessed for their ability to degrade cellulose and three different phenolic compounds representing different sources of lignin. Our results show that the all the fungi tested modified their enzyme expression based on what substrate they were grown on, and that each fungi had different degrees of specificity as to what type of lignin-like monomers they degrade. These findings support the newly recognized diversity in lignin-decay mechanisms and suggest an untapped treasure trove of fungal enzymatic suites that can be selected for specific chemical conversions with minimal refinement.

34. Fall and Winter Observations of Little Brown Myotis and California Myotis in Mount Rainier National Park [VIRTUAL] **3:15 p.m.**

Michael Hansen[1]*, Dana Sanchez[1]

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Little is known about the fall and winter ecology of North American hibernating bat species west of the Rocky Mountains.We used to collect data on the movement and phenology of *Myotis lucifugus* and *Myotis Californicus* Mount Rainier in Washington State. Bats were captured *M. Lucifugus* maternity colony and in a forested river valley anda building complex in a rural area mixed species roost alone or in small groups. We 23 *M. Lucifugus* and 5 *M. Californicus*identified 38 dayroost Both species used snag and building roosts. W observed an average of 2-3 roosts per bat during the tracking perioda single roost 23 consecutive daysBats traveled between 13.16 km between sequential roosts *M. Lucifugus* left within a 2-week periode average departure date for *M. Lucifugus* in the rural site was 36 days later *M. Californicus*left the study , suggesting roosts used by *M. Californicus* during this study may represent over-winter roosts, and roosts used by *M. Lucifugus* were transient fall roosts used before moving to hibernacula. This represents the first published effort to telemeter *M. Californicus* outside of the summer season.

35. Spatial analysis of trends in Tufted Puffin breeding habitat on the Oregon Coast **3:15 p.m.**

Carina Kusaka[1]*, Melanie Davis[1,2], James Peterson[1,2]

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Tufted puffins (*Fratercula cirrhata*) are an iconic species in the Pacific Northwest that provide a wide range of ecological, economic, and historically important services such as ecotourism for local communities- and bringing marine derived nutrients to terrestrial habitats. Further, tufted puffins are sensitive to changes in prey availability and as such, are good indicators of overfishing and ecosystem disturbance. Tufted puffin populations on the Oregon Coast have declined dramatically over the past 30 years from over 5,000 birds in 1989 to only 550 birds in 2021. In 2018, the tufted puffin Species Status Assessment (SSA) determined that factors related to breeding site conditions are one of the most probable causes of puffin decline; however, little is known about the specific characteristics of nesting habitat along the Oregon Coast, or how it relates to their population demographics. To address this knowledge gap, we conducted a spatial analysis to examine the distribution of suitable breeding habitat for tufted puffins on the Oregon Islands National Wildlife Refuge, OR, USA. Specifically, we compared the percent cover of vegetation at tufted puffin breeding sites from 1979 to 2021 using a combination of ground truth data, aerial photos of the islands, data from the National Agriculture Imagery Program (NAIP), and other remote sensing data sets. Preliminary results suggest a decrease in the percent cover of live vegetation at critical breeding habitat. After measuring the magnitude of habitat change, we related vegetation loss to site-specific, climatic, and environmental variables to determine potential key drivers of habitat change. Assessing how suitable puffin breeding habitat characteristics have changed over time will provide necessary information to guide refuge managers in habitat restoration and support adaptive management decisions.

36. Residency patterns and movements of oceanic manta ray in Bahía de Banderas, Mexico

3:15 p.m.

Pablo S. Domínguez-Sánchez[1,2,3*], Ana Širović[4], Iliana A. Fonseca-Ponce[2,3], Aldo A. Zavala Jiménez[2,3], Jay R. Rooker[5], Robert J.D. Wells[1], Joshua D. Stewart[3,4]

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The oceanic manta ray (*Mobula birostris*) is an endangered species commonly seen at oceanic islands and seamounts; however, some resident populations have been described in highly productive, coastal areas. Oceanic manta rays are found in high numbers seasonally in Bahía de Banderas, Mexico, a unique nearshore aggregation site for the species. Here, acoustic telemetry was used to investigate the influence of environmental variables on the occurrence of 66 tagged oceanic manta rays over a seven-year period from 2015 to 2021. Seasonal trends in oceanic manta ray occurrence showed a

peak in detections from January to March, and another peak from June to early October. Environmental and physical variables including temperature, chlorophyll-a, tidal range, wind speed and wind direction had a significant effect on the presence of oceanic manta rays. Results also suggest that the El Niño Southern Oscillation (ENSO) had a strong effect on oceanic manta ray presence in the bay, which is consistent with previous studies of this and other populations. At a finer scale, the detections of oceanic manta rays in the south of the bay were greater in the morning hours, suggesting that during the night they may move to deeper waters, similar to patterns reported in other studies of manta and devil rays. This study serves as a baseline for future management plans for the species to minimize impacts to the population from human activities carried in close proximity to oceanic manta ray aggregation sites.

37. Evaluating the impact of annual grass herbicide treatments on mule deer forage quality, quantity, and composition [VIRTUAL] **3:30 p.m.**

Trenton D. Gianella[1]*, Dana M. Sanchez[2]

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The encroachment of invasive annual grasses including cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput-medusae*), and North Africa grass (*Ventenata dubia*) have drastically altered rangeland habitat across the western United States. Continuous efforts have been made to reclaim these habitats through the application of annual grass selective herbicides. The effectiveness of these chemicals and the response of vegetation post application is well documented, but research is lacking in how these treatments directly affect mule deer (*Odocoileus hemionus*) forage quality, quantity, and composition throughout the year. Our objectives were to evaluate the efficacy of using imazapic (Open Range® G, Wilbur-Ellis) to improve summer mule deer forage and assess the potential negative effects of the chemical on winter forage availability. In fall of 2020, imazapic was applied to fifteen, 8-hectare plots established within mule deer home ranges located in rangeland habitat surrounding Heppner, Oregon, USA. Paired treatment and control plots were monitored for two years in the summer of 2021, fall of 2021, and summer of 2022. Our results suggest that imazapic applications can be used to increase the nutritional quality of forage but may temporarily reduce the quantity of forage available in the first summer after treatment. In the second summer, forage biomass increased significantly but crude protein and digestible energy contents of forage were no longer superior within treatment plots. Imazapic applications had no effect on winter forage biomass or nutritional quality of forage available. Imazapic treatments appear to be an effective strategy to improve summer mule deer forage quality and quantity without adversely affecting winter food sources. This shift in vegetation may help improve fawn production by improving the nutritional quality of summer forage when energetic demand on adult does is at its peak.

38. Where have the rails gone? Mapping distribution and abundance of yellow rails in the Klamath Basin **3:30 p.m.**

Miles Scheuering[1]*, Christian Hagen[1], Jeremy Welch[2], Ken Popper[3]

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Wetland ecosystems across the western US are in decline from overallocation of water resources, competing water uses, and droughts. The Upper Klamath Basin of southcentral Oregon is a key area for migratory waterbirds in the Pacific flyway; however, 90% of perennial emergent wetlands were lost by the 1980s and increased drought has continued to shrink wetlands. Yellow rails (*Coturnicops noveboracensis*) are closely tied to shallow wetlands, with almost all the known breeding range in western North America contained within the Klamath Basin and adjacent wetlands. There are significant knowledge gaps regarding the distribution and migratory patterns of this small and isolated population. Automated recording units (ARUs) offer an opportunity to study their occurrence, behavior, and phenology, while balancing surveyor effort and impact on birds. We deployed 105 ARUs at five sites throughout the Klamath Basin in summer 2022, as part of our pilot season of field work. We completed a total of seven deployments across our sites, totaling 5584 hr of recordings. From these deployments we are performing analysis to determine abundance, occupancy, duration of calling during the breeding season, and effect of moon phase on nightly calling. Studying yellow rails provides information on the distribution and quality of perennial wetlands, and the other species that rely on those habitats.

39. The Effects of Electromagnetic Fields on the Behavior of Skates [undergraduate presentation]
3:30 p.m.

Natalie Donato[1]*, Kyle Newton[2], Taylor Chapple[2]

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Elasmobranchs (sharks, skates and rays) can use bioelectric and geomagnetic fields (GMFs) to forage and navigate, respectively. Although, the potential impacts on those behaviors due to electromagnetic field (EMF) noise from sources like high voltage cables from Marine Renewable Energy (MRE) installations are largely unknown. To understand the potential impacts of MRE installations on the behavior of electrically and magnetically sensitive elasmobranchs native to the Oregon Coast, we exposed Big skates (*Beringraja binoculata*) and Longnose skates (*Beringraja rhina*) to geomagnetic and EMF stimuli. Skates were observed under ambient conditions, then exposed to GMF stimuli that simulated displacement to the northern or southern ends of their distribution. Next, EMF stimuli from direct current (DC) and alternating current (AC) cables were added to these GMF stimuli to determine if their behavior was impacted by EMF noise. Preliminary data analysis suggests that there is no significant difference in quadrant preference (north, south, east or west) between different GMF stimulus conditions. However, additional analyses are ongoing. Preliminary data suggest that the higher levels of activity and spatial use of *B. binoculata* may be a better candidate for future experiments due to its greater observable responses to EMF stimuli. This ongoing research will inform future experimental design and data collection in laboratory and field-based studies.

40. Analyzing Movements and Habitat Use of White Sturgeon in Response to Limited Recruitment in the John Day Reservoir **3:45 p.m.**

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White Sturgeon (*Acipenser transmontanus*) are indigenous to major river systems in the Western U.S. and Canada. Oregon Department of Fish and Wildlife and their partners, Washington Department of Fish and Wildlife and Columbia River Inter-Tribal Fish Commission, have managed and monitored sturgeon populations in the Columbia River since 1989. Since the construction of the Federal Columbia River Power Systems, White Sturgeon populations have become reproductively isolated, resulting in declining recruitment particularly within the middle and upper river impoundments. To address potential limiting factors affecting spawning and recruitment in the John Day Reservoir specifically, ODFW implanted acoustic tags (69kHz V16-6x) in 61 adult White Sturgeon during 2018-2021. Innovasea VR2W and VR2AR acoustic receivers (69kHz) were strategically deployed throughout the John Day Reservoir to track broad-scale movement patterns of mature adult White Sturgeon. A dense array of receivers was deployed 2018 and 2019 in the tailrace of McNary Dam, but data collection and analyses were hindered by lost receivers, tailrace noise, and tag collision. Despite data collection limitations initial analysis conducted in 2018 and 2019 demonstrated males congregating in the tailrace where spawning activity has been previously documented (Parsley and Beckman 1994). Females were detected moving in and out of this area throughout the summer, likely leaving after potential spawning events. Both males and females appear to congregate in the tailrace area during the winter months. Additional research will include a revised attempt to utilize the dense array for fine-scale modeling to determine precise spawning locations. The telemetry data will be paired with location data collected from stock assessment monitoring to create a holistic understanding of large-scale seasonal movements across different age classes. Habitat models for areas that could potentially be used for spawning or rearing will be generated by utilizing side-scan images and environmental data collection.

41. Is lodgepole pine a goldilocks tree? Landscape scale drivers of Black-backed Woodpecker habitat use in green forest **3:45 p.m.**

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Woodpeckers are often described as double keystone species because they increase food availability and create cavities used by other species. Although the Black-backed Woodpecker (*Picoides arcticus*) has been described as a burned forest obligate, recent studies have found breeding pairs in unburned green forest in the western portion of its range. Additionally, our previous research found that reproductive output and juvenile survival were similar in green and burned forests, but that breeding sites in green forests were almost exclusively restricted to stands dominated by late-seral lodgepole

pine (*Pinus contorta*). In this study, we investigated the factors that influence habitat selection within green forests of south-central Oregon to understand how woodpeckers select habitat at the landscape scale during breeding. To do this, we used vegetation data measured at nest sites (*n* = 35) in green forest and paired it with randomly selected plots across our 167,00 ha study area (*n* = 196) to quantify landscape scale habitat selection. Preliminary results suggest that Black-backed Woodpeckers select mature live lodgepole pine nest trees with a higher basal area of small and medium sized snags around the nest site than on average. Because green forests represent the majority of the forested landscape in the western United States, our results will provide information needed by manages to maximize the conservation value of green forests within pyrodiverse landscapes containing burned and green forest.

42. Understanding Xánthiip (Black Oak, *Quercus kelloggii*) – Ecocultural Revitalization in the Western Klamath Mountains **3:45 p.m.**

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Black oak plays an important role in both ecological function and Traditional Indigenous Lifeways across its range including with the Karuk people in present-day northern California. The Karuk have tended black oaks using traditional ecological practices, such as cultural fire, to promote large, full-crowned, acorn producing individuals since time immemorial. These legacy trees, compared to younger individuals, facilitate a disproportionate amount of cultural and ecosystem services including wildlife habitat, acorn production, and fire adaptive stand structure. However, the cessation of frequent, low-intensity Indigenous burning and other Indigenous stewardship practices over the last 100 years of Euro-American colonialism has led to a substantial decrease in the vigor, quantity, and quality of cultural resources including legacy black oaks. These trees are now at a higher risk of mortality from conifer encroachment, moisture stress, and high severity wildfire.

Restoration of black oak groves is a priority of The Karuk Department of Natural Resources (K-DNR). This research, co-developed by K-DNR, a Tribal (Pikyav) Review Committee, and Oregon State University, use qualitative social science research methods to determine what the cultural and ecological priorities are of Karuk cultural practitioners when it comes to the revitalization of black oak stewardship practices.

Research findings illuminate a constellation of values held by Karuk cultural practitioners that, when intact, represent a robust ecocultural system of oak grove stewardship. This research also identifies current barriers to stewardship as seen by Karuk practitioners as well as paths forward. The intention of this qualitative synthesis is to inform Karuk-directed black oak revitalization efforts within these historically stewarded oak groves.

Poster Presentations

Posters will be up all day, and presenters will be available to discuss their work during one of the two sessions: *even numbered* posters will be presented from 12:00 – 1:00 and *odd numbered* posters will be presented from 1:00 – 2:00.

1. Forest Vegetation Management Strategies for reforestation in the Lowland Forest Region of Washington

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Sustainable forest management of Douglas-fir (*Pseudotsuga menziesii*) represents an essential component of the environmental, economic, and social well-being of the state of Washington and the U.S. The lowland forest region represents the major forested area in Washington, considered one of the most important Douglas-fir timber-producing regions. Forest Vegetation Management has emerged as an important component of reforestation programs to increase seedlings' survival and growth, and potentially improve productivity. There are chemical, mechanical, and manual strategies for vegetation control; however, limited information exists on the comparative effects of these methods. This research aims to help Douglas-fir plantation managers increase their productivity through competing vegetation control by providing a better understanding of the effectiveness of different forest vegetation management strategies. My research question is: How well do non-glyphosate herbicide (T1), glyphosate herbicide (T2), logging debris (T3), and manual hand weeding (T4) control competing vegetation in a Douglas-fir plantation in the Washington Lowland Forest Region? If these methods improve forest vegetation management, 1) What are their effects on the survival and growth of Douglas-fir seedlings? 2) How do they affect soil moisture availability? 3) How do they affect biodiversity and the abundance of competing vegetation? and 4) How do they affect the physiological responses of Douglas-fir? This research will contain five vegetation management treatments, as described above, with control included. A complete randomized block design with four replications per treatment will be performed. I will analyze the effect of these methods on survival and growth, soil moisture availability, biodiversity and abundance of competing vegetation, and physiological responses of Douglas-fir. The comparative analysis of competing vegetation alternatives on Douglas-fir plantations will provide a better understanding of the importance of forest vegetation management and will allow the generation of evidence-based management strategies for forestry managers.

2. Modeling above-ground carbon dynamics under different silvicultural treatments

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Forest management decisions affect carbon stock and rates of sequestration. The rotation age that will optimize sequestration over extended periods is the subject of debate. Some argue that shorter rotations facilitate faster sequestration rates due to the accelerated growth rates of younger trees compared to mature or old-growth trees. Others maintain that frequent harvesting will not allow forest carbon to rebound after each subsequent rotation, and thus more extended periods between clearcutting is the superior choice. These contrasting viewpoints are mirrored regarding the impact of silvicultural treatments, that either thinning will enhance the uptake of forest carbon by facilitating faster growth of residual trees or that the removal of any above-ground biomass will outweigh the yields. This study aims to compare the different suites of management decisions and identify practical combinations of rotation ages and thinning applications that will optimize carbon sequestration while meeting other objectives. Stand development under different harvest intervals, and thinning specifications was modeled using a forest vegetation simulator (FVS). We found that site productivity was the major determinant in stand-above-ground carbon dynamics under the scenarios. Thus, the optimal rotation age/thinning treatment combinations differed between site classes. Site classes I, III, and IV were estimated to sequester the most above-ground live carbon under either a single 120-year or 80-year rotation with or without thinning treatments rather than multiple 40- or 60-year rotations. Site class II sequestered the most carbon at a faster rate under an 80-year rotation schedule (0.918 T C/ac/year). For all site classes, one or two low to moderate-intensity commercial thinning applications facilitated faster carbon uptake than they did under a "no thin" scenario for 120-year rotations. 80-year rotations sequestered the most carbon when either zero, one, or two thinning treatments were applied, depending on the site class. For all four site classes, high-intensity thinning applications defined by a residual stand density index of 130 were found to negatively impact total sequestration for all four site classes.

3. The Effects of Wildfire on the Spatial Variability in Soil Hydraulic Conductivity

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Wildfires alter hydrologic processes in forested watersheds, including infiltration and runoff generation. Post-fire decreases in soil infiltration capacities can influence the timing and magnitude of peak flows, annual water yields, and delivery of sediment and nutrients to streams. However, post-fire changes in infiltration capacity may vary with burn severity and its influence on soil structure and water repellency. Although infiltration rates generally decrease post-fire, little is known about how it varies spatially across catchment topography and with burn characteristics. This presents a challenge when modelling and predicting post-fire watershed responses. The goal of this study is to quantify unsaturated soil hydraulic conductivity (*K*) at a high resolution (100s of sites) across both a burned and unburned watershed in the Oregon Cascades. In the unburned watershed, we expect that *hydraulic conductivityK* will be variable across space; however, we expect there will be some spatial organization (i.e., correlation) with topography. Comparatively, in the burned watershed, we expect that soil hydraulic properties will have a stronger relationship with burn severity, overwhelming the topographic influences on hydraulic conductivity. During summer 2023, we will quantify *K* across both a burned (Double Creek) and unburned (Captain Creek) watershed. Double Creek burned in the 2022 Cedar Creek fire, which spanned over 50,000 hectares of the Willamette and Deschutes National Forests. We will quantify *K* using a mini disk infiltrometer. In addition, we will characterize ground

cover, soil texture, soil water content, and organic matter content from each sampling point. We will also develop spatial models by relating field data to burn severity, elevation, topographic wetness index, upslope accumulated area, and other spatial data layers. The model results will improve our understanding of the interaction between burn severity, topography, and soil hydraulic properties following fire, which will improve efforts to model post-fire watershed effects at broader spatial scales.

4. Cumulative Disturbance Legacies: CO2 respiration as a potential indicator of behavior from beetle killed *Pinus contorta* bark char legacies in forest soils [undergraduate poster]

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Pyrogenic carbon plays an essential role in soil processes and forest carbon cycling. Pyrogenic carbon serves as a biological legacy after fire by providing surface area and nutrients for soil microbes and aiding in the establishment of pioneer species. Research regarding pyrogenic carbon inputs from fire capture attention in the Western US due to increasing frequency and severity of wildfire. However, insects still reign as the most prevalent forest disturbance in the US. Research on fire behavior and fire severity indicates that trees killed by *Dendroctenus ponderosae* (mountain pine beetle or MPB) burn at higher intensity than trees killed by fire due in part to decreased moisture contents and changes in foliar chemistry. The difference in charring may lead to different pyrogenic carbon inputs. This study measures soil respiration over time from mineral soil mixed with multiple organic matter inputs from *Pinus Contorta* (Lodgepole pine) trees in the Pole Creek fire in the Eastern Cascades of Central Oregon. The inputs measured in this study include: 1) fire killed wood, 2) MPB killed then burned wood, 3) fire killed bark, 4) MPB killed then burned bark, 5) manually combusted char from both fire killed and MPB killed then burned bark; all measured using an incubation study and LICOR. Results show highest measured levels of CO^2 from bare mineral soil and MPB killed then burned bark char (BKB). These results likely indicate high levels of microbial mass per gram in bare mineral soil, and higher microbial mass and/or structural difference within PyC of BKB. Further analysis is necessary to confirm this potential variability in PyC from these cumulative disturbances.

5. Soil infiltration rate in watersheds with differing management and disturbance regimes: HJ Andrews Experimental Forest [undergraduate poster]

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Disturbance impacts on forest hydrology include factors related to soil infiltration which can increase, decrease, or shift in magnitude. These changes depend on the severity, soil type, overlap, or history of disturbances. In this study, we explored soil physical properties and infiltration rate in relation to

aspect and disturbance (harvested and burned) and undisturbed (old growth, control) soil in three watersheds in the HJ Andrews Experimental forest. The objectives of this project were to 1) qualify soil profiles for disturbed and undisturbed sites on north and south facing aspects, and 2) quantify infiltration rate in relation to pore diameter for disturbed and undisturbed sites on north and south facing aspects. We measured infiltration rate using volume, tension, and radius calculations given by a mini disk infiltrometer in each of 8 total soil pits at left, right, and center positions and increasing depths over time. Our results indicate that disturbance history had a greater influence on soil infiltration rate on south aspects in the A horizon, and aspect had a greater influence on infiltration rate in the B horizon of undisturbed soils. Future work will focus on expanding the quantification of soil hydraulic properties, particularly saturated hydraulic conductivity using infiltration rate data from this data analysis.

6. Longevity of Large Wood Restoration Success to Improve Coho Salmon Habitat: A 2D Modeling Approach

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Coho salmon abundances in Coastal Oregon watersheds have significantly declined since predevelopment conditions primarily due to the creation of undesirable stream characteristics for juvenile fishes during high flow conditions. Large wood (LW) additions have been a heavily practiced restoration mechanism used to improve native fish habitats. However, we lack information regarding LW's long-term benefits. We used a field-calibrated hydraulic model, Nays2DH, to evaluate hydraulic conditions relevant to acceptable fish habitat 2 to 6 years post LW restoration in three alluvial fish-bearing tributaries of the Siletz River in Coastal Oregon, USA. Acceptable salmon habitat was assumed when flow velocity was slower than the critical swim speed of the juvenile Coho fish (v_{crit} = 0.5 m/s) and stream bed refuge was stable represented by the likelihood of entrainment of the median size sediment particles in the stream bed. We observed that the maintenance of the initial benefits of the restoration effort estimated in an increase in the acceptable fish habitat of around 30% appears to depend on the original orientation of the LW pieces and the size of the stream relative to the size of the logs below the bankful flow. Preliminary modeling results indicate that as a result of increased floodplain connectivity from the LW introductions, reductions in water velocity primarily occur near the banks of each reach and maintained or increased velocity occurs near the thalweg. Downstream log jams also appeared to experience the largest amount of change, relative to the upstream log jams in each reach. Maintenance of acceptable coho salmon habitat 7 years after the LW introductions indicates that LW has the potential to continually improve or maintain created fish habitat over numerous years, specific to the reach scale characteristics. The findings from this research are ecologically important for identifying locations of restoration for species that require longer time frames of maintained acceptable habitat for population recovery or for land managers that strive to improve sustained instream hydraulic complexity.

7. Proposal: Productivity and Stress Tolerance of Mixed-Species Plantations in Southwest Washington State

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Compounding environmental stressors and harvest limitations are increasingly straining timber cultivation in the U.S. Pacific Northwest (PNW) and demanding adaptive strategies. Intensively-managed forest plantations, specifically monocultures, constitute most timber harvest in the region. However, research suggests mixed-species plantations could offer ecological and economic benefits, including increased resilience to climate change. Our goal is therefore to develop understandings of mixed-species silviculture practices in the PNW. Little research exists for mixed-conifer plantations in this region, and even fewer studies have examined species mixtures at the individual tree scale. The objectives of this proposed research are to (1) Use dendrochronology to describe differences in individual tree growth according to neighborhood composition of five major conifer species, and (2) Quantify tradeoffs between tree growth and resilience to extreme climate events in pure and mixed stands. To achieve these objectives, we ask (1) How does individual tree growth in mixed-species conifer plantations deviate from analogous monocultures, and (2) How do extreme weather events influence individual growth patterns? We hypothesize that individuals within a single species demonstrate different growth trajectories, depending on neighborhood species composition. Additionally, we will explore how growth trajectories deviate in response to extreme climate events and potentially benefit forest resilience. Our investigation will utilize the Wind River Experimental Forest, composed of coastal Douglas-fir (*Pseudotsuga menziesii var. menziesii*), western white pine (*Pinus monticola*), Pacific silver fir (*Abies amabilis*), noble fir (*Abies procera*), and western hemlock (*Tsuga heterophylla*). Using tree cores, plot inventory data, and historical climate data, we will assess individual tree growth and responses to extreme climate events in monocultures of each species, as well as 1:1 mixtures of each species with Douglas-fir. These results will offer a direct framework for mixed-species plantation management, as well as guide future research of forest plantation productivity and integrity in the region.

8. Novel prescriptions in forest management and impact on harvesting cost

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The Washington State Department of Natural Resources (WADNR) has been using Variable Retention Harvesting and Variable Density Thinning to manage its natural forests in Washington State, with the aim of ensuring sustainable forest management. However, these management practices are now being questioned due to the increased risk of climate change and other forms of uncertainty like habitat fragmentation in the Olympic Peninsula. To address these issues, new forest management treatments (Complex Early Seral Stage and Accelerated Variable Density Thinning) are being introduced on an operational scale that aim to increase habitat heterogeneity, and generate revenue for trust land beneficiaries. However, the large-scale implementation of new treatments is uncertain due to the unknown harvesting cost. Therefore, this study aims to find harvesting cost for new treatments and determine the cause of difference in harvesting cost between new and current treatments. The study will involve systematic observation of various phases of forest harvesting work and recording the time taken for each operation to complete a cycle. Previous research has

demonstrated that an uneven pattern of trees left in a harvesting unit can significantly increase the cycle time of harvesting equipment. Our hypothesis is that the harvesting cost of new treatments will be higher than that of current treatments due to the uneven retention of stands throughout the stand block to achieve ecological goals. To ensure that outcomes of study are not affected by slope and aspect, we will compare the new and old treatments side by side using the same harvesting crew and equipment. A detailed time and motion study will be conducted separately for each operation phase, including felling, yarding, and processing. The results of the comparison will provide valuable insights into the effectiveness and efficiency of harvesting machines and systems and inform the development of a more efficient and adaptable forest management harvesting system.

9. Monitoring Soil Accretion and Geomorphic Change Using LiDAR at Wapato Lake National Wildlife Refuge

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Wetlands are ecologically important systems that play key roles in erosion control, water quality, flood protection, and carbon sequestration, and serve as diverse habitat for numerous aquatic and terrestrial plants and animals. A key service of wetlands is their ability to function as carbon sinks due to their primary productivity and slow decomposition rates of organic matter, thus impacting the global carbon cycle. Over the past several decades, a shift in environmental policy has led away from wetlands being viewed as unproductive lands in need of draining to an understanding of wetlands as integral to healthy ecosystems and a need to focus on wetland restoration. Monitoring wetlands then becomes an important tool in measuring restoration progress: monitoring tools allow us to establish a baseline in wetland condition and function, detect change, and to characterize trends over time. Soil and carbon accretion rates can be unique to each wetland. Past studies suggest that a steady state model of accretion is invalid. Thus, we hypothesize that the accretion rates for Wapato Lake National Wildlife Refuge (WLNWR) follow a similar non-linear model form, particularly with temporal changes in plant productivity and decomposition rates. This proposed research will use a LiDAR-equipped drone to map soil accretion and geomorphic change at WLNWR at monthly intervals. Historic Landsat satellite images will be used to develop a baseline and provide historical context for change. This will be an observational study that does not involve random selection or sampling, so the results will only apply to WLNWR. This study will contribute to the growing body of work that demonstrates the utility of LiDAR in wetland restoration monitoring.

10. Evaluating native bee community response to fuel-reduction treatments in private industrial dry forests

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Severe wildfires have steadily increased in the western U.S. over the past several decades. This has led to an increase in the use of fuel reduction techniques to lessen the effects of wildfire and mitigate timber loss. Although fuel reduction techniques have the potential to influence native bee populations, this topic remains virtually unexplored in dry forests of the Pacific Northwest. In this study we will quantify bee community response to treatments undertaken to mitigate fire risk on private industrial forestlands in Northern California. We will quantify bee community change at sites that are subjected to two distinct fuel reduction treatments implemented to reduce fire risk: fuel reduction treatments, where thinning is used to reduce tree density, and fuel breaks, where trees and other vegetation are removed. To assess fuel reduction treatments, we will use a space-for-time substitution to assess how bee communities change from the timing of treatments. For fuel reduction areas, we will adopt a similar approach and sample areas that differ in the time since treatment while also considering unburned sites and areas that have burned recently (<5 years). We will sample bees with both passive and active sampling approaches, quantify nesting and floral resources, and determine the resource availability for bees based on treatment type. We predict that treatments with more bare ground, woody debris, and floral resources and less canopy cover, will increase native bee abundance and diversity. Our study will provide new information regarding how bees - which are critical for food security and biodiversity - respond to widely used fire management techniques. It will also provide a framework for timber managers to understand how decisions made to reduce fire risk have downstream consequences on native bees.

11. Roles and associations of fungal pathogens with emerald ash borer, *Agrilus planipennis*, mortality in Fraxinus latifolia in Oregon

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First detection of emerald ash borer in North America was reported in 2002 in Michigan and Ontario, Canada. First detection west of Colorado has now been confirmed (2022) in Oregon. Mortality in North American ash stands has been as high as 99% of infected trees. We hypothesize that mortality of ash trees may be exacerbated by fungal pathogens introduced by EAB infection. Indirect pathogen vectoring may be initiated by opportunistic entry via boreholes. However, a second pathway may be through existing gut microflora in the adult EAB and passage via egg laying in wood tissue. The purpose of this study is to identify fungal populations in infected and uninfected ash trees and to identify fungal populations in the gut of adult EAB captured in live traps. Both parts of this study will be done in the Oregon confirmed infection areas. Fungal species identification will be done through Next Generation Lumina sequencing.

12. Drivers of Carbon Concentration and Character Through a River Network Following a 2020 Oregon Wildfire

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In 2020, the Holiday Farm wildfire burned approximately 18% of the McKenzie River subbasin, which is the source water for ~200,000 people. Wildfires can substantially alter water quality, which has fueled concern about drinking water source quality following the Holiday Farm fire. Post-fire, the greatest water treatment challenges are often due to elevated turbidity and dissolved organic carbon (DOC). These water quality parameters are also critical to the health of aquatic ecosystems. Past studies have illustrated variable responses of DOC after fire; thus, it is important to improve our understanding of the underlying drivers of post-fire DOC changes. To do this we are collecting 131 water samples across the McKenzie subbasin four times during the year to capture variation in streamflow conditions. Samples will be analyzed for DOC concentrations and excitation emission matrices (EEMs) to describe the source, size, and aromaticity of the carbon molecules. During an early fall storm, two years post- fire, we did not find evidence that burn severity impacted DOC concentrations. However, we did observe that more severely burned areas had higher ratios of humic like to fresh organic matter suggesting that while the carbon concentrations may have recovered to pre-fire levels, the types of organic in the system remain affected by the fire. Next, we will develop spatial stream network (SSN) models to identify drivers of carbon concentrations and character. Additionally, the models will enable us to predict carbon concentrations and character along the stream network at a high spatial resolution (~100 m) and identify hotspots, which may facilitate future high temporal studies. Overall, we hope to better understand the mechanism of carbon transport to streams after wildfires, which will help us create better models describing post-fire conditions. Understanding how wildfire alters DOC is critical to preserve aquatic ecosystem health and source water quality.

13. Restoring ecological resilience using local ecological knowledge on private lands: a case study in landowner driven adaptive management [undergraduate poster]

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The introduction of intensive agriculture in the 20 th Century, along with declines in native ungulate grazing pressure, fire suppression, and introduction of exotic species, have dramatically decreased upland prairie and oak woodland habitat in the Willamette Valley. The remaining upland prairie is <1% of its pre-agriculture acreage and oak woodland is 7% of its original acreage. With these rare habitats occurring primarily on private land, local ecological knowledge (LEK) is critical for both restoration and conservation. Understanding the decision process for landowner-driven adaptive management through LEK may be critical for conservation of this remaining habitat. Here, we present a pilot study

to examine the influence of LEK on landowner-driven adaptive management using rotational grazing as a tool for restoration of degraded oak and prairie habitat and conservation of intact oak and prairie habitat. Data will be gathered over 5 years to assess the influence of LEK-based rotational grazing on native species' recolonization of degraded sites and native species' persistence within intact habitat. This study offers a rare lens from which to view the nuanced management of individual landowners based on LEK, and the potential for rare habitat conservation and restoration of degraded lands in the Willamette Valley. Our results will add to a small body of preexisting literature and inform landowners interested in using rotational grazing to enhance, rather than inhibit, restoration and conservation goals in upland prairie and oak woodland in the southern Willamette Valley.

14. Quantifying the Response of Coastal Cutthroat Trout to Wildfire in the Oregon Cascades

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The occurrence of large, high severity wildfires has increased in many regions, including the Western United States, in the past few decades. Shifts in the wildfire regime have increased interest in the effects of wildfires on a range of ecosystem components, including water quantity, water quality, and aquatic ecology. Past studies have found a range of fish responses to wildfire. However, a lack of pre-fire data in most systems affects our ability to explicitly quantify the magnitude of wildfire impacts on abundance, condition, and distributions of fish populations. In 2020, the Archie Creek Fire burned the forests of the Hinkle Creek Paired Watershed Study (HCPWS) in the in the Umpqua River basin of the Western Cascades of Oregon. The original HCPWS quantified forest harvesting effects on water quantity, water quality, and fish populations from 2002–2011. These earlier data provided the rare opportunity to quantify fish responses to wildfire. In the second year after the fire, we used the same methods as in the HCPWS (single-pass electrofishing in stream pools) to estimate relative fish abundance through ~2.7 km of South Fork Hinkle Creek. We made a longitudinal comparison of cumulative mass of age 1+ Coastal cutthroat trout (*Oncorhynchus clarki clarki*). By quantifying fish in every pool through the mainstem of South Fork Hinkle Creek, this study provides a whole river (rather than reach-scale) assessment of how fish populations respond to wildfire disturbance in headwater streams on managed forest land in the Pacific Northwest. Relative to the most recent two years of the HCPWS (2010. 2011), our preliminary data suggests limited effects of fire on fish condition.

15. Oregon Coast's History and Present-day Risk of Wildfire [undergraduate poster]

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Current findings on Oregon's coastal fire history and the present risks with the evolving wildland-urban interface issues in the region. I aim to demonstrate the considerable and vital fire history on the Coast Range and that there are a variety of factors that continue to present risks for fire in the

future. A fire history of Tillamook county will be presented using ODF fire data, GIS data (back to 1962), newspaper clippings, and piecing together land records from museums and county databases for fires before 1962. Human-caused fires and lightning-caused fires will be gone over to show the risks of both. Given the information collected, I will aim to show the risks of wildfire from the history and weather trends in the region to show there is still a threat despite the lack of knowledge of coastal fire history. Because of climate change and historic weather conditions, wildfire needs to be considered as a risk in this landscape.

16. Historical Forest Structure, Composition, Growth, and Spatial Patterning of Shade Intolerant Trees in Oregon's Rogue Basin

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The Rogue Basin, located in southwest Oregon, is an area of high concern for wildfire risk and drought conditions. One solution posed by land managers is to manage our current forests to be more resilient to the effects of wildfire and drought. These solutions often call for reductions in basal area and stem density by evaluating pre-existing forest metrics and determining how much basal area and/or the number of stems needed to be retained/removed to meet target metrics for forest resilience. Evaluation for historical metrics of basal area and stem density is often based on assumptions of differences in diameter measurements and tree morphology to determine which trees would have been present in historical stands and should be retained. These assumptions of historical stand metrics can vary widely depending on specific site topography, disturbance, and climate. We are posing the following questions to assist land managers with historical basal area, composition, growth, and spatial pattern metrics of shade intolerant trees to better inform decisions on managing for more resilient forest conditions; (1) What is the historical forest structure and composition across forest types?, (2) What is the spatial distribution of older, shade intolerant trees across forest types?, and (3) How is radial growth of shade intolerant trees affected by clumping? To answer these questions, we will use dendrochronological methods to crossdate tree core samples taken from sites randomly located throughout the Rogue Basin to know which trees persisted on the landscape historically. The goal would be to infer our results of historical structure, composition, growth, and spatial patterns to different forest types located in the Rogue Basin.

17. Factors Influencing Regeneration Patterns Following Large Disturbance

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Natural regeneration of endemic tree species is essential to the recovery of forest ecosystems following disturbances. Understanding the biotic and abiotic factors that influence natural regeneration patterns is important for both ecological studies and post-disturbance management. Regeneration densities can vary widely by species and are strongly influenced by multiple factors at

multiple scales. The primary drivers of regeneration densities are seed availability which is a function of distance to seed source among others, local climate condition which is a function of elevation, slope, and aspect among others, and competing or facilitating vegetation. Pseudotsuga menziesii forests are one of the most extensive, valuable, and highly productive forest types in the world and western Oregon, Washington, and British Columbia are some of the most productive regions of these forests. In an era of global change, projected changes in fire regime and climate may alter the success of Pseudotsuga menziesii regeneration following large disturbance. In this study we will use a GIS and multiple regression modeling tools to analyze data quantifying natural regeneration collected on BLM land that burned in western Oregon in 2020. Our primary questions are: 1) Which biotic and abiotic factors exert the strongest influence on regeneration success i.e., Pseudotsuga menziesii seedling densities? 2) How do the strengths of these factors vary across burn severities? Our null hypothesis is that distance to seed source is the predominant factor influencing regeneration densities across burn severities. Our alternative hypotheses are 1) factors such as local climate, soil type, and vegetation strongly influence regeneration across varying burn severities, and 2) relevant biotic and abiotic factors interact on multiple scales across varying burn severities to influence regeneration densities. The goals of this study are to improve our understanding of contemporary regeneration dynamics and to develop a predictive model to inform post disturbance management.

18. Analyzing blue and fin whale abundance using bioacoustics [undergraduate poster]

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Bioacoustics is the emerging interdisciplinary field of science concerned with sounds produced by living organisms. Marine mammal bioacoustics employs acoustic technology to record and understand the sounds produced by marine mammals living in the ocean. It can be an important tool in understanding species distribution and behavior without having to be physically present. In the recent year, Oregon State University's Marine Mammal Institute was recently awarded 2 million dollars by the US Department of Energy to collect data on the distribution of cetaceans and seabirds along the Pacific Northwest coast. The data collected will be used to inform the development of offshore wind energy along the coast. The project, Marine Offshore Species Assessments to Inform Clean Energy (MOSAIC), utilized a variety of different techniques to gather data, including passive acoustic monitoring of cetaceans. My project focuses on analyzing previous acoustic data of blue and fin whales from the years 2018-2020 collected by a hydrophone that is located off the coast of Newport, OR. The data analyzed was used to plot graphs of annual blue and fin whale abundance at this location. For both the blue and fin whales, abundance of these species was highest during the fall and winter months (September-March) and lowest during the spring and summer months (April-August). This pattern is crucial for understanding blue and fin whale distribution off the coast of Newport, OR and the results will contribute to the MOSAIC project.

19. Chick Provisioning of a Threatened Seabird Under Divergent Ocean Conditions

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Identifying the factors affecting population recruitment are critical for recovering a listed species. For the threatened Marbled Murrelet (*Brachyramphus marmoratus*), its cryptic breeding behavior poses considerable challenges to locating nests and identifying agents that limit nest success. From 2018 to 2022, we conducted a large-scale study of murrelet breeding ecology in western Oregon, during which contrasting ocean conditions offered an unprecedented opportunity to study how the marine environment influences offspring provisioning and reproductive output. We predicted that quantity and quality of provisioned food would decrease in years of warmer ocean temperatures when food resources critical to successful nesting are limited. To quantify chick provisioning behaviors and measure parental breeding effort, we used continuous video recordings at 19 nests, constituting the most comprehensive chick provisioning database on record for the species. Of these nests, 10 were successful (fledging age ranged from 30 to 45 days), 6 failed due to predation, 2 failed due to the chick falling from the nest, and 1 failed due to inferred chick starvation. In years of warmer ocean temperatures (2018-2019), the number of feedings per day varied between 0 and 6. Wide variation in mean daily feedings was observed with 1.4 ± 1.1 feedings/day at the nest that failed due to chick starvation, up to 3.3 ± 1.4 feedings/day at a nest that fledged in 32 days. Chicks were provisioned with whole forage fish, and we have identified Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*) as important diet items. The subsequent years of data from cooler ocean temperatures (2021-2022) when food availability was higher, will allow for understanding interannual variation in the marine environment and nest success. Findings from this study will ultimately inform Marbled Murrelet conservation efforts, especially as climate-driven changes continue to impact oceans.

20. Assessing the availability of marine habitats for introduced salmon in South America

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Amidst the extensive introduction of non-native salmon in South America, it is crucial to identify drivers of their distribution and develop tools to inform the effective management of these invasions. This study aims to develop and implement marine habitat models for introduced salmon species, including Chinook (Oncorhynchus tshawytscha), Coho (O. kisutch), and Atlantic salmon (Salmo salar) in southern South America. Mechanistic habitat models were built based on a literature review of estuarine and oceanic habitats for each species at their native ranges. We created habitat relationships fuzzifying the effect of dynamic environmental conditions (e.g., Sea Surface Temperature, Salinity, Current Speed, Chlorophyll- a) on the marine occurrence, survival, and productivity of salmon populations. Our findings show a high spatial and temporal heterogeneity in marine conditions in the study region, influencing the abundance and distribution of suitable environments distinctly for each species. We identified high-risk areas for salmon invasions due to the frequent presentation of suitable marine environmental conditions near freshwater systems with high

potential to support recruitment-limiting life stages (i.e., spawning, rearing). These results provide vital insights into the distribution and potential impacts of non-native salmon on aquatic ecosystems and can inform the development of monitoring and management strategies.

21. The Diet of the Salmon Shark: Not Just Salmon [undergraduate poster]

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The Salmon shark (*Lamna ditropis*) is an understudied shark that can be found in the North Pacific Ocean. Because Salmon sharks have regional endothermy, they likely need to consume large amounts of prey, such as salmon, to meet their metabolic requirements. Yet, the effect of Salmon shark predation is currently not being considered as a contributing factor in salmon stock management, unlike that of seals and seabirds. This missing piece of knowledge is of great interest as salmon, particularly the Chinook salmon, are of immense ecological, economic, cultural, and recreational value. Understanding the full range of the causes of mortality of adult Chinook salmon is crucial as their populations have been declining. To quantify predation on Chinook salmon by Salmon sharks, we performed stomach content analysis on Salmon shark stomachs obtained from deceased sharks in Oregon and Alaska. Within each stomach, we identified prey items based on physical characteristics or otoliths. The majority of prey items identified in Salmon sharks originating from Oregon were Pacific whiting. Among the Salmon sharks that originated from Alaska, tomcod and squid were prevalent. Based on the preliminary results, Salmon sharks may be foraging on different species off the coast of Alaska than off the coast of Oregon. Moving forward, we aim to collect stomachs from more locations, which will increase the representativeness of the data. Our research will expand the knowledge base of a top marine predator which will increase the understanding of Pacific marine ecology and help inform conservation strategies.

22. Characterizing the effects of environmental variability and individual biological characteristics on green sturgeon recruitment success

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Environmental variables during early life stages for sturgeon can have a great influence on recruitment success through survival, growth, and additional physiological processes. Failure to recruit has considerable impacts on relative year class strength and ultimately can lead to population declines. Thus, survival and growth of juvenile green sturgeon in the Central Valley of California has become a key information need for management decision making. This research will aim to understand how environmental variability, individual behavior, and biological characteristics impact recruitment success of juvenile green sturgeon, all while accounting for the great uncertainty regarding the species. An individual based model will be used to simulate how individuals might respond to their internal and external environments. Using this framework, we can evaluate fine-scale processes and identify key patterns and tradeoffs of how individuals interact with each other and their environment under different ecological hypotheses. Green sturgeon are known to be particularly sensitive to water quality stressors and contaminants in the Central Valley. Because of this, there will be an emphasis on exploring individual level responses to these factors and extrapolating those effects to evaluate population-level impacts that are useful for management. By identifying and providing managers with the greatest impediments to recruitment success, informed decisions can be made that will aid in the recovery of this species.

23. Quantifying change in avian abundance through data integration to inform perspective on the functional value of ecosystem services

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Birds are important ecological indicators that provide ecosystem services benefiting human well-being. However, recent anthropogenic activities have impacted bird abundance and the functioning of these services. Building robust estimates on bird abundance and distribution can help scientists assess the degree of impact from habitat change. In this study, we aim to answer three key questions: (1) How many birds are in Oregon and where are they located?; (2) How has the number of birds changed through time?; (3) What is the non-market value of pest control services provided by birds? We propose a data integration approach that integrates planned surveys (e.g. Oregon 2020, Avian Knowledge Network) with citizen and community science (e.g. eBird) to estimate absolute abundance. Additionally, we will incorporate environmental information that is associated with bird habitat preferences to monitor the changes in abundance over time. Finally, we will use a non-market valuation approach to estimate economic value of the pest control services provided by birds. This proposal presents a robust tool for estimating bird abundance and characterizing the important roles that birds play in ecosystem.

24. Spreading Dynamics of Maladaptive Foraging Behavior Among Highly Social Predators

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Unregulated human-induced food provisioning has been a major concern for wildlife conservation, as it reinforces risky behaviors that can lead to injury and death. One well documented example is food provisioning to dolphins, where individuals can solicit, or 'beg' for food hand-outs. Spending time eliciting food from people (i.e. bringing its head out of the water and/or opening its mouth at the surface) can disrupt their natural behavioral budgets. Food hand-outs from recreational boats, in particular, represent resource patches that cannot be monopolized because of their inconsistency in space and time. As a result, many individuals can take advantage of this resource, thus creating a situation conducive for the spread of 'begging' behavior throughout the population. The spread of 'begging' behavior can have profound consequences, which range from altered feeding habits due to habituation, reduced home ranges and social lives, to increased risk of injury by human interactions, to negative fitness consequences. Therefore, while 'begging' can provide an immediate foraging benefit, it implies a high cost and so can be maladaptive in the long-term. Since dolphins are avid learners, there are concerns that foraging tactics such as 'begging' can spread socially among individuals, thereby amplifying such negative effects to the population level. It is therefore important to better understand how the distribution and predictability of human food provisioning activities interact with the spreading dynamics of the 'begging' behavior of highly social and intelligent species, such as dolphins. This effort can provide quantitative evidence for the influence of 'begging' behavior on the social structure of dolphins and identify the individual traits that can affect its transmission pathways across the population.

25. The Effects of Offshore Wind Farms on Fisheries and their Effectiveness as Other Effective Area-based Conservation Measures in Marine Spatial Planning

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Offshore wind farms (OWFs) are increasingly being developed on U.S. coastlines, particularly on the U.S. Pacific Coast. Because these can represent large areas of the continental shelf where vessel traffic is prohibited, these are expected to have serious consequences for fisheries and fisheries management due to displaced effort and loss of fishery-independent survey data. At the same time, the U.S. is engaged in increasing the number of protected areas in its waters in accordance with the 30x30 initiative. OWF areas could contribute to that goal in that they could be considered "Other Effective Area-based Conservation Measures" (OECMs). Previous research involving OWFs being placed along the U.S. Pacific Coast has examined impacts on endangered species, but it has not assessed fisheries impacts or potential conservation benefits. This project will use a combination of population models and existing fisheries data in a management-strategy evaluation framework to assess how fishery and management responses to OWF closures affect fisheries and the value of OWFs as OECMs in the context of ecosystem- based fishery management and conservation. I will create a series of models of increasing complexity to examine the consequences of OWF closures. I am proposing to focus on 3-5 groundfish species with a range of life histories, all of which are harvested via trawl (though there are also fixed-gear and recreational fisheries for some), which would be prohibited in OWF areas. Additionally, assessments for all of the species include indices based on fishery- independent trawl surveys that would also be prohibited in OWF areas. Anticipated results include the loss of catches due to OWF closures and the timescale over which the accumulation of

reproductive biomass within the closures can begin to offset that loss via spillover; as well as how different management control rules and levels of precaution could mitigate losses.

26. Who needs old growth forests? Multi-taxa biodiversity surveys of forests in the Pacific Northwest

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On a global scale, researchers have documented sharp and significant declines in biodiversity over the past century across multiple taxonomic groups including invertebrates, amphibians, songbirds, mammalian carnivores. Forest ecosystems harbor a large portion of the Earth's terrestrial biodiversity, but timber harvest continues to exert significant pressure on biological communities, especially in the Pacific Northwest. Until recently, biodiversity was difficult to quantify, but new genetic methods allow us to survey across multiple taxonomic groups efficiently and simultaneously. The objectives of this study were to determine the multi-taxa response to disturbance on federal forests in the Oregon Cascade mountains, identify species that are dependent on old-growth forests, and develop a method for conservation planning that maximizes biodiversity conservation while maintaining economic output in the form of timber harvest. During 2018, we conducted multi-taxa biodiversity surveys at 96 sites in the Willamette National Forest where we surveyed for fungi, invertebrates, vegetation, songbirds, and mammals across elevation and disturbance gradients. Our data consisted of direct observations and identifying species through genetic methods. We found that fungi had the greatest species diversity (n = 1977) followed by invertebrates (n = 891), and sites that were previously logged had higher species richness. Non-metric multi-dimensional scaling showed that community composition across all taxa was strongly related to elevation and the amount of old growth forest characteristics. Using joint species distribution models and remotely sensed imagery, we produced single species distribution maps and predicted species richness across the landscape. Using these maps, we calculated indices of irreplaceability to highlight areas of high conservation value. Together, these results suggest that communities in multiple taxonomic groups are affected by similar environmental factors. In particular, species found in old-growth forests differ significantly from those in previously harvested areas, suggesting that the loss of old growth forests would result in biodiversity loss.

27. Are Relatively High Common Raven Densities Contributing to Declining Greater Sage-grouse Populations in Central Oregon?

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Greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) populations in Central Oregon (specifically the Brothers/North Wagontire Priority Area for Conservation, hereafter Brothers PAC) are declining more steadily than surrounding populations (such as the Paulina/12 Mile/Misery Flat Priority Area of Conservation, hereafter Paulina PAC). These Brothers PAC populations are at the western edge of current sage-grouse range and the cities of Bend, Redmond, and Prineville, OR are expanding into this area. During the past century, common raven (*Corvus corax*; hereafter raven) populations in the sagebrush biome have expanded with increasing human development of these previously undisturbed habitats. Ravens are known to be significant nest predators of sage-grouse and may negatively impact sage-grouse nest survival at densities equal to or greater than 0.4 ravens/km 2 . As we investigate factors leading to declines in these Central Oregon populations of sage-grouse, we evaluated raven densities in two areas of Oregon in 2018 and 2022. We used data from visual point count surveys in R program Distance to estimate raven densities in the Brothers and Paulina PACs. We fit a hazard rate detection function to both the Brothers and Paulina PAC point count data. In the Brothers PAC, we estimated raven density at 0.7 ravens/km 2 (95% CI: 0.4–1.1), and in the Paulina PAC we estimated raven density at 1.5 ravens/km 2 (95% CI: 0.9–2.5). These estimates suggest raven densities in both PACs may exceed the threshold at which sage-grouse nest success is negatively impacted by ravens, and may lead to suppressed demographic rates in Central Oregon sage- grouse populations. During upcoming field seasons, we will continue these visual point count surveys of corvids and raptors as part of our ongoing evaluation of sage-grouse nest success in this area.

28. Assessing diversity of aquatic insects in rural and urban ponds of North Texas, USA

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Aquatic macroinvertebrates are foundational to support food webs in pond ecosystems as they are key players to many ecological processes such as nutrient cycling, transport and process organic matter, and food resources for upper trophic levels. In semi tropical climates, information about macroinvertebrate community composition is still scarce. In particular, the influence of rural and urban uses on these communities has been overlooked. The objective of this study is to identify whether there were differences in the diversity of macroinvertebrates between urban and rural ponds in the North Texas region. We hypothesized that urban systems would contain less diverse communities than rural ponds due to the cumulative impacts of impervious surfaces, contamination, and habitat modification. We collected replicated samples from six ponds (three in urban areas and three in rural areas) from September to December, 2020. We found seven families including Caenidae, Chironomidae, Corixidae, Gerridae, Haliplidae, Lestidae and Libellulidae. Caenidae was the most common taxa and Haliplidae the least abundant in both types of ponds. Contrary to our predictions, diversity indices showed differences between rural and urban ponds with the last slightly more diverse. Hickory Creek (rural pond) was the only pond in which we were able to identify members of

all seven families. Rural ponds showed more similarity among them with no specific family dominating observed abundances. There was a reduction in diversity in November and December likely due to decreasing water temperatures. The information collected in this project can help us evaluate the human impact on pond ecosystems in subtropical regions.

29. Wildlife Interactions with Large Log Crossing Sites in Lookout Creek, H.J. Andrews Experimental Forest, Oregon

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There is extensive research about the benefits of large wood (LW) for river ecosystems such as reduced erosion, redirected flows, changed nutrient cycles and increased water residence times. Very little is known about the importance of LW to wildlife. This project will address the question: How does wildlife interact with large wood crossings sites in the mainstem of Lookout Creek, OR? We collected almost 9000 camera trap videos at 36 log crossing sites within Lookout Creek that documented wildlife interactions during summer and fall of 2021. Currently, we are finishing the species identification and QA/QC of the dataset. As of now we have identified over 80 different species interacting with the large wood crossings. After the completion of this stage we plan to examine several variables including abundance, temporal and spatial context, and behavior. The question addressed by this project is a key piece to understanding the importance of large downwood crossing rivers. It will help us identify all of the benefits afforded by log jams in rivers and provide further evidence to support the use of large wood in river restoration. Overall, this project will lead to comprehensive datasets and add to the existing knowledge about the topic. The final product of this project will be a StoryMap which will also allow a wider audience to be reached due to easy accessibility.

30. Lateralization in Red Crossbills: Does Morphology Influence Behavior? [undergraduate poster]

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Lateralization of brain function is observed in many nonhuman animals and is thought to give functional advantages in motor and visual performance. In birds, the eyes may be lateralized to maximize predator detection in one eye and detail discrimination in the other – and this is highly consistent across individuals of the same species and influences how birds approach particular tasks. Red crossbills (Loxia curvirostra), however, have unique crossed mandibles to access conifer seeds. The direction of cross occurs in a nearly 1:1 ratio in most populations and is thought to correlate with left vs right footedness. It's unknown if this highly lateralized feeding morphology influences brain lateralization of the visual system. We hypothesized that morphological lateralization would predict behavioral lateralization and predicted that cross direction would predict which foot was used to hold the cone and which eye was used to visually investigate cones placed into the cage. In this pilot study, six captive Red crossbills were given pine seed cones for three, 20-minute sessions spread across

several weeks and were filmed from above. We divided recordings into 5-minute bins and scored the total number of visual peers directed at the cone with the right or left eye, and time spent grasping the cone with the right, left or both feet. The results, despite a small sample size, suggest that left and right crossed red crossbills use both eyes equally to investigate new items placed in the cage – a potential difference from the apparent visual lateralization in other species.

31. Thermal metabolic study of Pacific Cod (*Gadus macrocephalus*) using otolith stable isotope chemistry [FWCS Undergraduate Mentorship Program]

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As ocean temperatures increase and marine heatwaves become more frequent, there is growing concern for the survival of Pacific Cod (Gadus macrocephalus) in the Gulf of Alaska. In 2020, the fishery closed for the first time in recorded history. Extreme temperatures can lead to increases in metabolism, resulting in changes to foraging because cod need to consume more food to survive. However, there is currently no method for measuring metabolic rate in the field. The aim of this study is to test if age-1 Pacific Cod metabolic rate can be determined in situ using otolith chemistry. To do this, cod were reared in a laboratory under different temperatures and swum in a swim tunnel to determine metabolic rate. This experiment has two parts, both of which investigate cod otoliths. The first examines carbon and oxygen stable isotopes in the otolith. Theoretically, cod under higher metabolic stress should have less of the heavier carbon isotope, ^{13}C, in their otolith because carbon obtained from food is isotopically lighter than dissolved inorganic carbon in the water. This comparison has been done for other fish, but not for Pacific Cod. ^{18}O isotopes are higher when environmental temperatures are lower. Quantifying these isotopes involves micro-milling an otolith and then running continuous flow isotope ratio mass spectrometry. The second part of the experiment involves counting otolith increments to determine growth rate. These rings grow daily and can be seen under a microscope after polishing a cut section. By calculating growth rate, we can test if growth is correlated with metabolism. The experiments so far have found no clear relationship in observed metabolic rate and otolith ^{13}C values in the fish reared under normal ocean temperatures (2-8°C). The rest of this study will begin to include fish grown in more extreme temperatures (up to 14°C).

32. Habitat and Distribution Analysis of Freshwater lamprey in Oregon's Goose Lake Basin

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Lampreys are a unique lineage of jawless fishes (order: *Petromyzontiformes*) that play significant roles within ecosystems, and cultural contexts, yet many species have been historically disregarded as nuisances or unimportant. The Pacific Northwest holds nearly one quarter of the 41–45 lamprey

species found worldwide. Among these diverse lampreys, a relative hotspot for under-described endemism can be found in south-central Oregon and northern California. One endemic, and one native species found in the region, Goose Lake lamprey (*Entosphenus subsp*.), and Pit-Klamath Brook lamprey (*Entosphenus lethophagus*) inhabit the endorheic (closed) Goose Lake Basin. Little is currently known regarding distinctive biological or life history traits, habitat preferences, or spatial distribution, yet the basin they inhabit faces threats from widespread fragmentation, and desiccation due to human activity and climate change. To begin addressing foundational conservation questions and concerns, my research will inform habitat associations and distribution patterns using a lamprey database comprised of several general fish sampling surveys conducted over the last century. This data- centric analysis will leverage site collected habitat variables and remote sensed spatial data though two biologically relevant analysis at differing scales. Larval lamprey abundance from two detailed studies with overlapping sample sites will be used to analyze smaller scale habitat data through a generalized linear model. Presence-absence lamprey data from four studies with overlapping methods will used to analyze larger scale habitat data, and spatial distribution, through a spatially aware stream network statistical analysis toolset. Habitat associations at sub-reach scales will likely remain unclear without detailed field sampling. However, the results from this work will provide valuable insight regarding where these species live, and why, which will be useful for any future research or conservation efforts.

33a. Diet and Philonema infections in reservoir-rearing juvenile Chinook salmon (*Oncorhynchus tshawytscha*) [undergraduate poster]

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Juvenile Chinook salmon hatched above Willamette Valley Project dams often rear in reservoirs for several months prior to outmigration and grow significantly larger than their stream rearing counterparts. Understanding the feeding ecology of juvenile Chinook salmon in reservoirs is important for understanding growth rates, survival, migration timing, and disease dynamics. The purpose of this study was to analyze dietary patterns of wild juvenile Chinook salmon from Lookout Point Reservoir. Our main objective was to assess relationships between prey consumption, surface temperature, and fish size. We opportunistically evaluated parasitism, as there was a significant presence of the parasitic nematode, *Philonema*. Stomach contents revealed high rates of piscivory from July through the end of September. Piscivory decreased as water surface temperature decreased, beginning in late September and continuing through December. Zooplankton and arthropod consumption increased significantly in November and December, corresponding with the decrease in surface temperature as well. Our results show rarely documented widespread piscivory in freshwater phase juveniles. This finding is key, as fish represent a high quality dietary component that could contribute to the accelerated growth rates observed in reservoir juveniles. In addition to describing dietary patterns, we found *Philonema* infections in 42% of the fish we sampled, a much

higher prevalence than the infection rates previously described in juvenile Chinook salmon. The dietary consumption patterns identified in this study may contribute to explaining mechanisms of rapid growth in reservoir juveniles. However, our study also elucidates a previously understudied risk of reservoir rearing in the form of heavy nematode infection.

33b. Fins not Fingerprints: Using Photographic Identification to Track the North Eastern Pacific Population of White Sharks, *Carcharodon carcharias* [undergraduate poster]

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Clear estimates of population abundance and survival are critical for successful management and protection of ecologically important species. White sharks are top predators and serve a key role in many marine ecosystems all over the globe. The North Eastern Pacific (NEP) population of White sharks is a small and genetically distinct population segment that has been monitored using photographic identification for over 30 years, yet we still know little about our local top predators. The purpose of this research is to continue the close monitoring of this ecologically significant and potentially vulnerable population using photo ID. Photos taken from 2019 through 2022 of individuals' unique dorsal fin morphology were used to construct a mark-recapture data set to estimate annual abundance and survival. This work provides the most recent evaluation of the NEP population of white sharks, and will contribute to the responsible management of this unique population.

34. Do the Feathered Fear the Felines?

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Predation of birds by domestic cats (*Felis catus*) is a cause of direct mortality, yet how cat presence indirectly influences birds is less clear. The ecology of fear hypothesis proposes that behavioral and physiological costs of predator avoidance have long-term impacts. Cat abundance is associated with human density. Urban birds that have experience with cats are more likely to recognize cats as a threat. Predator presence can reduce parental activity at the nest, and as a result, lower parental investment. Activation of the stress response elevates corticosterone and mobilizes resources to promote individual survival at the cost to reproduction. Birds that have higher circulating corticosterone reduce parental investment, which in turn, can lead to lower reproductive success. We will experimentally expose urban and rural breeding western bluebirds (Sialia mexicana) and house wrens (*Troglodytes aedon*) to a cat model, while a subset will receive no cat exposure. Pre-exposure, we will capture adults for a baseline blood corticosterone level during the nest building stage and place a thermocouple in the nest to record incubation bouts. We will expose experimental nests to a cat model <2 meters away for 15 minutes and record nest defense behaviors. We will re-capture adults days later for a post-exposure baseline corticosterone level. We hypothesize that 1) urban birds will be more aggressive in their nest defense compared to rural birds, 2) females of predator-exposed

nests will show increased duration of time off the nest, and 3) corticosterone will be elevated post-exposure in comparison to pre-exposure and control nests. We will continue to monitor nests to document reproductive success. This work is necessary to understand the indirect impacts that an abundant, non-native predator may have on breeding bird behavior, physiology, and reproduction. This unique predator-prey dynamic calls for investigation as outdoor cats are ever-increasing while songbirds are declining.

35. Diversity of riparian spiders in the Lookout Creek basin, H.J. Andrews Experimental Forest, Oregon [FWCS Undergraduate Mentorship Program]

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The ecology of spiders in riparian ecotones is complex and little is known about their diversity and distribution, especially in headwaters systems of the Pacific Northwest, USA. This work aims to describe the structure and diversity of spiders in riparian ecotones from five headwater streams located in the H.J. Andrews Experimental Forest, Oregon. We sampled spiders from 7 transects perpendicular to the stream channels 1, 5 and 10 meters apart to each other covering a stream reach of 25m. We collected samples during July and August of 2022 using a combination of methods including random searches with an entomological net, pitfall traps, and sticky traps. Collected spiders were preserved in ethanol and their identification is currently ongoing. We hypothesized that a higher richness and abundance of spiders will occur in sites closer to the stream than those collected further away due the proximity and availability of aquatic food sources.

36. Disentangling the seasonality of decomposition rates in aquatic and riparian systems [undergraduate poster]

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Nutrient cycling is a critical component to understand the carbon budget in freshwaters. Decomposition rates are foundational to understand pathways of organic matter and carbon cycling in river networks, but much complexity exists due to seasonality and spatial contexts (e.g., elevation). Current models of nutrient cycling do not capture the dynamics of decomposition at these finer scales. Here, we aim to close this gap in knowledge by analyzing how decomposition rates along a river system change between seasons and across an elevation gradient. We used a cotton strip assay approach to analyze changes in dissolved oxygen and tensile strength loss as a metric for decomposition rates. We conducted our surveys in 18 paired sites (riparian vs aquatic) along the mainstem of Lookout Creek, H.J. Andrews Experimental Forest, Oregon. Overall, decomposition rates were higher in aquatic than riparian areas. Aquatic decomposition rates increased as elevation decreased in both the dry and wet season. Also, in-stream decomposition rates were higher in the dry compared to the wet season likely because of temperature. However, the opposite occurred for decomposition rates in the riparian zone. Our findings will allow the refinement of future predictive

models of nutrient cycling at the watershed level. This is a critical component needed to understand how natural systems shift as the climate continues to change.

38. In-depth characterization of bondlines in cross-laminated timber made with preservative-treated lumber

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Mass timber construction projects are rapidly increasing in North America but this technology encounters durability issues in termite-prone areas. To combat this issue, chemical treatments must be incorporated into mass timber elements to prevent termite attacks. However, pressure treatment is either unfeasible for large panels or may cause problems with bondline integrity if done prior to layup and we sought to investigate this problem. Douglas-fir 2 x 6-inch lumber or untreated cross laminated timber (CLT) panel sections, were treated with one of three different preservative systems, pressure treatment with borates, pressure treatment with an all-organics preservative system (PTIP+IPBC) or dip treatment with propiconazole, tebuconazole and imidacloprid + borate (PTI). Treated and untreated lumber was used to manufacture CLT panels using one of two resins, melamine formaldehyde (MF) or Polyurethane (PUR). To determine if the preservatives cause a negative interaction with the adhesives, Dynamic Mechanical Analysis of MF and PUR adhesives between treated veneers was conducted. Further supporting scans from FTIR were done to back up resin and preservative interaction. The positive effect of preservative in the wood can have a negative effect on the resulting curing strength of the adhesive. This can have major consequences in the construction of CLT panels and their overall performance. Results indicates a negative interaction with preservatives and adhesive curing ability. Organic preservatives had the least effect on curing ability compared to other preservatives.

39. [withdrawn]

40. Identifying and locating sensing and signaling receptors in *Ceratonova shasta* with immunofluorescence staining

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Myxozoans are spore forming endoparasites, responsible for significant fish diseases including whirling disease, enteronecrosis, PKD, hamburger gill disease and soft flesh disease. Compared with their free-living cnidarian relatives, myxozoans have significantly reduced genomes, and parallel loss of many biological functions. They have, however, retained an organelle called the nematocyst, consisting of a tubule that discharges explosively when triggered by host contact. In free-living cnidarians, nematocysts are used for capturing prey and deterring predators, but in myxozoans they are used in attaching to their hosts to begin infection. The precise factors that trigger myxozoan nematocysts remain largely unknown, but we propose that an understanding of the host-sensing

mechanism could lead to a method for blocking the parasites and preventing infections. We are investigating how a myxozoan salmon parasite, *Ceratonova shasta*, senses the fish host and fires its nematocysts We sequenced and assembled genomic and transcriptomic data from C. shasta and searched for sensing and signaling genes known from the model free- living Cnidaria, *Hydra*. Analysis suggests that *C. shasta* has a homologous P2X chemoreceptor and a TRPA mechanosensor. We designed an antibody that binds to P2X and are using immunofluorescence staining to confirm the presence of this receptor and visualize its location on the spore.