ENVIRONMENTAL SCIENCE & MANAGEMENT

Discovery Starts Here

How do we sustain wildlife movement corridors in Oregon?

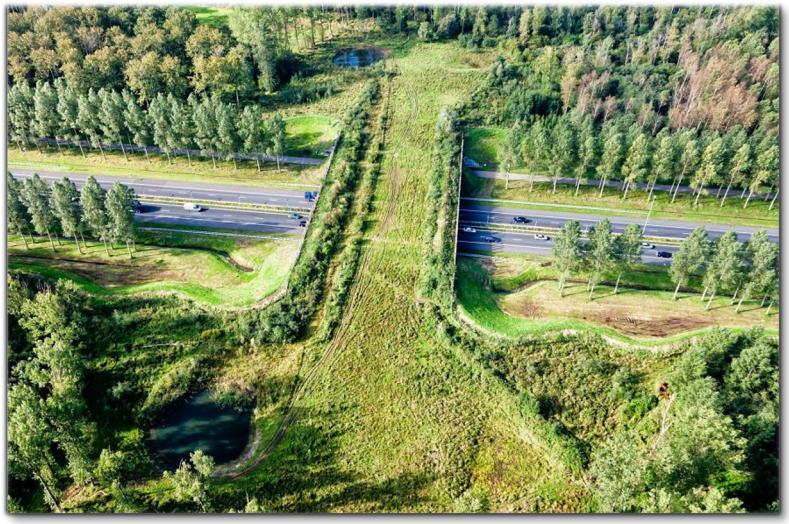
Protecting and enhancing Oregon's fish and wildlife habitats is the core of the Oregon Department of Fish and Wildlife's (ODFW) mission. However, prioritizing specific areas to ensure that animals can move among habitat patches is a tricky proposition, especially when doing so for the array of species managed by the state. As of now, there is no toolbox for figuring out how to mitigate Oregon's increasing development and transportation pressures on wildlife movement. ESM Professor Cat de Rivera aims to change that as PSU's lead for the Oregon Connectivity and Assessment Mapping Project (OCAMP). The ODFW project is supported by PSU and the Samara Group LLC, with funding from ODFW, US Fish & Wildlife Service, and the Oregon Department of Transportation. The OCAMP collaborators are developing the toolbox and a map of prioritized areas needed to direct on-the-ground efforts for habitat enhancement and conservation and to support wildlife movement throughout Oregon.

Oregon Connectivity Assessment & Mapping Project

Go-to approaches of building movement and connectivity maps are based on structural connectivity or the dispersal and movement needs of a single species or relatively small assemblages of multiple species. These approaches, however, often limit the inclusion of barriers to movement such as highways or development, are inadequate for the diversity of Oregon's habitats and aren't as effective as species-specific models for multiple species. To remedy these

Newsletter Contents:

limitations, the OCAMP team is identifying habitat and movement needs for 54 species of Oregon's mammals, birds, reptiles, and amphibians, as well as a few invertebrate species that were carefully selected through a new participatory process with experts in each of Oregon's ecoregions. The 54 species were chosen to represent a diversity of movement strategies, habitat associations, bioregions, and sensitivity to anthropogenic threats. Many of the species also are conservation priorities for the state.



The team is developing new approaches and employing state-of-the-art modeling to all aspects of the project. In addition to developing the participatory species-selection process, the team is using an approach for identifying both suitable habitat for animal movement and barriers to their movement developed by PSU Geography professor Dr. Martin Lafrenz. The team is also using Omniscape, a connectivity modeling algorithm that identifies a spectrum of permeability for movement that ranges from high quality corridors between core habitats to fragmented but permeable landscapes and discrete barriers. To ensure that habitat and barriers to movement are adequately represented, PSU statistics Professor Dr. Taylor Rodriguez and his team are developing novel approaches for assessing the accuracy of the habitat and the movement maps. Such validation is rare in connectivity projects. One of the biggest challenges will be to determine how to combine the single-species maps into one composite map that highlights priority wildlife corridors and represents movement needs for all wildlife in Oregon into the future. The composite map will be a powerful tool used by Oregon's agencies to aid statewide planning and prioritization efforts, ensuring maintenance of functional habitat connectivity.

Professor de Rivera, the PSU project lead, highlighted several additional notable elements of this large project. "This opportunity is exciting because we know our work will directly help mitigate barriers to wildlife movement and advance priority conservation planning in Oregon." ODFW staff are heavily involved with all aspects of the project, including wildlife connectivity coordinator Dr. Rachel Wheat who is overseeing OCAMP. This engagement between academia and ODFW, as well as the diverse group of stakeholders that guide OCAMP, ensures the team's work will translate to effective products for management. Moreover, the frequent (twice weekly) interaction among the interdisciplinary team of ecologists, geographers, and statisticians is helping advance each field in unique ways. "Finally", says Professor de Rivera, "it's fun and rewarding to work with both current and former students." She points to ESM alumna Dr. Leslie Bliss-Ketchum (BS 2007, PhD 2019), co-owner of Samara Group, as an integral part of both the ecology team and the outreach that is helping to build statewide support for the project.

A Note from the Chair

Dr. Max Nielsen-Pincus

PSU's "FlexFall" quarter started with a mixture of excitement and anxiety. Not only did we start another quarter remotely amidst a global pandemic, we did so in the lead-up to the national election, struggles for racial and social justice, and in the aftermath of Oregon's Labor Day wildfires. The fires blanketed Portland in smoke, causing hazardous air quality and evacuations throughout much of Clackamas County. With this backdrop, I interpreted FlexFall to simply mean that students, faculty, and colleagues give each other a little extra flexibility as we simultaneously navigate remote teaching and learning, socially distanced research, and, for nearly all of us, the removal of the physical boundaries between work, school, home, and family. Success, I wrote to our students in September, would require us to support each other, be flexible and forgiving, while also setting appropriate expectations and communicating clearly. Although there have been challenges, I am pleased to report that generally FlexFall has been a success. In this note I aim to bring you up to speed on some recent exciting developments happening in ESM.

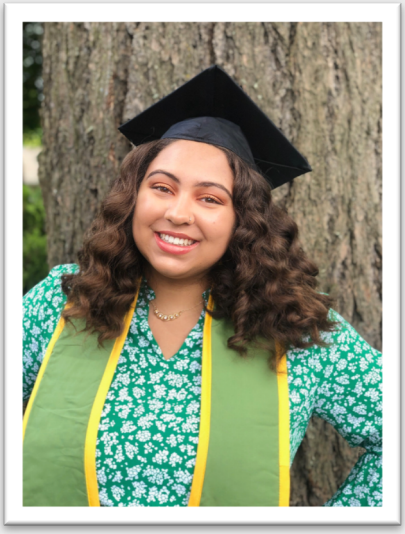
Two years ago, our faculty completed a substantial revision to the environmental science bachelor's degree program. The revisions set a new course for the environmental science degree with two tracks, a science track and a management track. The revised degree focuses on understanding the interactions among the physical, biological, chemical, and human components of the environment. Students also identify the anthropogenic drivers of environmental problems, their impacts to human and biological communities, analyze the relative merits of different policy solutions, and explore the advantages and limitations of various public and private environmental management approaches. I am happy to report that we now have over 250 environmental science majors in the two tracks. Combined with nearly 180 environmental studies majors, we recorded 431 majors during the 2019-2020 school year. Our next curricular endeavor is a revision to the environmental studies degree.

Our faculty have always had active research programs, and despite the pandemic the past year has been no different. ESM research resulted in 63 new peer reviewed publications archived in the Web of Science in 2019 and 2020, and a pipeline of new research answering questions about:

- Connectivity of Oregon's diverse array of wildlife habitats (see cover article)
- Hydrologic effects of Oregon's Labor Day wildfires
- Wildfire risk management in urban interface communities in the western US
- Carbon dioxide mitigation from alternative land management strategies
- Microplastics in coastal and marine organisms, and more.

ESM principal investigators logged over $1.4 million in research expenditures offering experience in the lab and the field for undergraduate and graduate students, and supporting research staff, post-docs, and faculty from ESM and other departments.

Alumni in Focus



Angela Arrington

Angela completed her B.S. in Environmental Science with a minor in sustainability in Spring 2020. Along with being an ESM Alum, Angela also participated in the Louis Stokes Alliance for Minority Participation in STEM (LSAMP) and the Green Council within the student sustainability center.

She has now transitioned into a master's program at the University of Oregon studying public administration with a focus on environmental policy and natural resource management. She works part time as the student club director for the Museum of Natural and Cultural History and recently joined the NAACP Environmental and Climate Justice Committee in Eugene.

Angela's passion for environmental sustainability and justice have encouraged her to pursue a degree in public policy where she feels she can use her background to incorporate science into policy making.

Our students remain the single most important part of our community, and our student group, the Association Environmental Science Students (AESS), continues to actively engage our community in the virtual environment. Even though there are no snacks provided this quarter, AESS continues to host weekly Friday seminars over Zoom, with presentations by faculty, students, and outside professionals. This fall AESS and our alumni group partnered to host a virtual meet and greet for students and alumni. The event was attended by 9 alumni and a full zoom screen of students ranging from undergraduate freshman to doctoral candidates. I was so impressed to hear about all the amazing work our alumni do, and was energized by seeing students and alumni discuss an array of careers, career pathways, and work-life experiences.

This fall we continued our efforts to improve justice, equity, diversity, and inclusion in ESM. We identified four major action domains (curriculum, research, recruitment and retention, and professional development and training) around which to develop a working action plan. Over the coming months, we expect to engage more broadly with our community of students, partners, and alumni as we continue to work on these issues.

Another exciting piece of news is the coming remodel of Science Building One (SB1). Last summer, the Oregon Legislature authorized $60 million for the renovation of SB1. Combined with a generous gift from donors Christine and David Vernier, the project will overhaul the face of PSU on 10th Avenue. Project design is underway, and the renovation will require a complete move out of SB1 and renovation of some spaces in the Science Research and Teaching Center (SRTC) to consolidate research activities in SRTC. Following completion, the Vernier Science Center will be a hub for science teaching and interactive learning. Get ready, construction starts soon!

The cover article in this newsletter highlights a new project being led by Professor Catherine de Rivera to map the connectivity of Oregon's wildlife habitats. Other highlights include updates about Aneesha Gharpurey (ESM Senior and intern at USGS), Britta Baechler (PhD Candidate and Research Manager for the Ocean Conservancy), and Angela Arrington (recent Environmental Science graduate, SeaGrant Scholar, and now grad student at the University of Oregon). Their accomplishments are but a few of the highlights of our impressive community, and they reinforce for me the importance of training a new generation of environmental scientists and managers who understand the interactions and feedbacks between natural and human systems, and who can assess and implement solutions to environmental challenges, cognizant of their social and ecological implications.

Faculty Update

Sarah Carvil, Senior Instructor MEM/PSM Coordinator

Sarah teaches environmental policy to undergraduate and graduate students, as well as a series of professional courses for graduate students focused on project management, proposal development, and writing productivity. She also manages the MEM and PSM programs, including project development for incoming graduate students and student teams. Her work in ESM is informed by academic research at the intersection of natural resource management and pollution control in the U.S. West, as well as work experience in state government as a legislative analyst and regulatory agency staff member.

Catherine de Rivera, Professor

Cat is committed to broadening the education and research opportunities for graduate and undergraduate students in ESM. Her research focuses on how changes to habitat connectivity and abiotic conditions affect populations, communities, and ecological function, and she works with her students and colleagues to combine ecological theory with modeling and experiments, while requiring her students to conduct real projects with community partners. Cat is currently chair of the Oregon Invasive Species Council, and she serves as an associate editor for *Managing Biological Invasions* and editorial board member for *Scientific Reports*. Cat continues to teach courses like the Ecology and Management of Bio-Invasions and Advanced Science Communications.

Marion Dresner, Emeritus Professor

Marion has been busy writing a book on environmental history. In a series of stories about journeys to redwood forests, Paleolithic decorated caves and Neolithic standing stones,

Graduate in Focus

Britta Baechler

Britta is enrolled in PSU's Earth, Environment and Society PhD program and will be graduating in Fall term, 2020. She is advised by Dr. Elise Granek in the Applied Coastal Ecology Lab.

Britta originally hails from Homer, Alaska, and earned her undergraduate degree in Biology at Lewis & Clark College. She has worked in various fisheries and marine conservation roles, including as a shellfish fishery manager in the Bering Sea/Aleutian Islands region of Alaska, and as the Marine Protected Area Coordinator in Saipan, Northern Mariana Islands. Britta's dissertation work focused on determining the ecological and social dimensions of microplastics in Pacific Northwest bivalves. Her broad interests at the intersections of plastic pollution, fisheries, and fishing communities have been longstanding, but her graduate work solidified that she wants to continue to pursue these intersections in her career going forward. Britta currently works for Ocean Conservancy as the Senior Manager for Ocean Plastics Research; in this role, she is working to develop a policy-relevant ocean plastics research agenda and contribute new insights to the growing body of scientific literature on ocean plastics.

Undergrad in Focus

Aneesha Gharpurey

Aneesha is an Environmental Science and Management undergrad and an Intern with the UPP (USGS-Oregon Water Science Center and Portland State University Partnership). As a San Francisco Bay Area native, she chose to attend PSU for its urban campus and facilitation of students into environmental agencies.

During her freshman year, she participated in a National Science Foundation (NSF) Research for Undergraduates Internship (REU) with the Center for Climate and Aerosol Research Center (CCAR), where she aided a master student's research in Dr. Linda George's Sustainable Atmosphere Research Lab (STAR Lab) in studying black carbon emissions from diesel locomotives. From this experience, Aneesha became an author of the abstract "Diesel Emissions Profile for Railyards in Portland, Oregon" which was accepted for the 2018 American Geophysical Union Conference (AGU), in Washington D.C, where she presented her findings during the undergraduate poster session.

Currently, Aneesha is beginning her Honor's College Thesis, advised by Dr. Jeffrey Gerwing, in which she will be researching inequity experienced among minority and low-income communities during wildfire seasons in the Pacific North West. She is set to graduate in Spring 2021 from the Portland State University Honors College and College of Liberal Arts and Science. Post-graduation she is would like to become an environmental consultant or work with environmental justice organizations and communities.

through England's Lake District, Oregon's Coastal Trail, along the Columbia and Klamath Rivers, the contrasts between exploitation and conservation and restoration are made. Stories about people working to protect and restore natural ecosystem resilience, pods of cooperatively hunting orca, native bumblebees in community gardens, are interwoven.

Patrick Edwards, Senior Instructor, Environment Professional Program Director

Pat's research is focused on macroinvertebrate indicators of stream sediment and the effect of ecological restoration on aquatic communities. He is active in K-12 science education and environmental citizen science. Pat teaches Introduction to Environmental Systems and Natural Science Inquiry at PSU, among others.

David Ervin, Emeritus Professor

David is Professor Emeritus of Environmental Management and Economics at Portland State. He maintains an active research program with federal funding on the sustainability aspects of genetically engineered crops and turfgrass systems, with emphasis on pest resistance management, the valuation of ecosystem services generated by natural capital stocks, and the varied motivations for businesses to pursue sustainability programs.

William Fish, Associate Professor

Bill's research has centered on chemical processes in water and has included the chemistry of aquatic humic materials, contaminated groundwater at Department of Energy sites, fertilizer-derived cadmium in Oregon agricultural soils, management of urban runoff in Portland, and currently, advanced biological N and P removal in waste-water. He has a split appointment between ESM and Civil and Environmental Engineering (CEE), and is currently teaching Environmental Systems I (with the challenge of three remote lab sections) and Water and Wastewater Treatment for CEE.

Linda George, Professor, University Studies Director

Linda's Sustainable Atmospheres Research (STAR) Lab, focuses on identifying, measuring and modeling sources and impacts of urban air pollution. Lab members collaborate with urban planners, epidemiologists and transportation engineers, as well as community groups. The STAR lab has an extensive array of air pollution monitoring equipment, and is funded by the USFS, EPA and the City of Hillsboro. Currently, Linda is on leave from teaching to direct the University Studies program, but she typically teaches Environmental Chemistry and Air Quality.

Jeff Gerwing, Associate Professor

Jeff's current research interests are focused on supporting the management and restoration of urban forests in and around Portland. Jeff incorporates considerations of equity and justice into his courses in Sustainability (Freshman Inquiry), Forest Ecology, & Environmental Literacy.

Kelly Gleason, Assistant Professor

Kelly's research focuses on the interactions and feedbacks of hydrology, climatology, and ecology under a changing climate system. Specifically, her research uses a multi-modal approach to evaluate how disturbances such as forest fire, drought, and climate change, alter hydroclimatological mechanisms and influence regional-scale water resources. She has recently secured funding from NASA, US Army Corps of Engineers, and the National Science Foundation to investigate forest fire effects on snow hydrology and downstream water resource availability. Kelly also teaches environmental data analysis, watershed hydrology, and is preparing a new snow hydrology course.

Kris Freitag, Acting Director of the Rae Selling Berry Seed Bank & Plant Conservation Program

Kris has been holding down the fort in a very quiet lab, without the usual undergraduate interns and student volunteers. Luckily, she has been able to set up a stereo microscope on her kitchen table for seed processing, supplementing her computer station in the living room. Between her efforts and Ed's, this year the Seed Bank has fulfilled agreements with Federal, Tribal and corporate entities to enhance preservation efforts for six sensitive plant species of our region. Kris was also able to take volunteers into the field in late summer

to monitor populations of the endemic Gorman's aster. Considering where our monitoring sites are located, it is fortunate that this ridgetop species benefits from fire!

Elise Granek, Professor

Elise's Applied Coastal Ecology (ACE) Lab collaborates with agency partners to examine presence and effects of pharmaceuticals, microplastics, and forestry herbicides and pesticides in estuarine and marine species. Additionally, the ACE lab has engaged in outreach, including developing an exhibit on marine plastics for the Oregon Coast Aquarium (on display March 2019-present). This fall one new PhD and three new MEM students were welcomed into the lab. Elise also continues to teach Coastal and Marine Ecology as well as Marine Conservation and Management.

Ed Guerrant, Retired Director of the Rae Selling Berry Seed Bank and Plant Conservation Program.

In addition to the more prosaic, like continuing to maintain the seed bank database, Ed is looking forward to 2021 as a celebration of his 25th year working with the endangered western lily. His work with the rare species began with an experimental reintroduction project that continues today, and he has added a demographic study of the sole population on federal lands, and an associated augmentation experiment.

Melissa Haeffner, Assistant Professor

Melissa's research focuses on the topics of water justice, sociohydrology and hydrosocial systems. To determine where water in/justice currently exists, Melissa and her students examine inequality in four indicators of water security: safety, affordability, reliability, and availability. Melissa uses Oregon as a case study in the courses she teaches including Environmental Justice and her Freshman Inquiry class on Humans and Nature where her students have developed the Oregon Water Stories website: www.oregonwaterstories.com.

Amy Larson, Senior Instructor

Amy teaches Biological Concepts I and II, Teaching Everyday Science, Research Methods in Environmental Science, and Environmental Success Stories. She is also the coordinator for the Environmental Sustainability curriculum cluster. She draws on her background in marine ecology, where she has done research on community ecology of coastal ecosystems, focusing on chemical ecology, invasive species and predator-prey interactions.

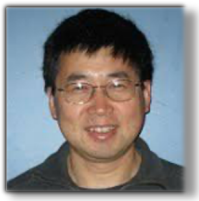
Jennifer Morse, Associate Professor

Jen's research in biogeochemistry spans a variety of ecosystems and topics, with an emphasis on human-dominated ecosystems and climate impacts, including greenhouse gas emissions in farm fields and restored wetlands, phosphorus in urban soils, nitrogen cycling in upland forests, and carbon cycling in urban streams.

In 2020-21, Jen is on sabbatical, working on manuscripts, writing new proposals, and incorporating dimensions of justice, equity, diversity, and inclusion in her teaching and research. Jen usually teaches Ecosystem Restoration, Environmental Systems II, and Watershed Biogeochemistry.

Max Nielsen-Pincus, Associate Professor & Department Chair

Max's research focuses on the human dimensions of natural resource management and is focused on issues like wildfire risk, watershed management, and marine reserves. Max serves as an Editorial Board Member for the journal Society and Natural Resources, and is also working on a book to accompany ESM's Introduction to Environmental Management course. Max began as department chair in August 2020 and will serve a three-year term.



Yangdong Pan, Professor

Pan's research focuses on assessing environmental conditions in freshwater ecosystems using biological assemblages, particularly algae as indicators. His work has developed partnerships with watershed councils, tribal nations, and state and federal governments, while also keeping an active research program in China. Pan also teaches stream ecology, environmental risk assessment, and two environmental data analysis courses.

Arick "Kit" Rouhe, Instructor

Kit teaches online courses for non-major and lower division ESM majors courses as a core member of ESM's instructional faculty. A focal point of Kit's teaching perspective is environmental history and a sense of place, which he highlights in the course *Portland's Environment* (ESM 100). Kit's graduate research focused on factors that lead to cyanobacterial blooms in freshwater systems, and he brings these factors into his teaching about freshwater systems and the impacts of pollution on those systems for humans and the natural world. Kit continues to conduct water quality sampling in Oregon lakes during the summer.

Mark Sytsma, Emeritus Professor

Mark retired in 2018 but has maintained an active project portfolio dealing with lakes and aquatic invasive species. Projects include providing technical assistance to the Oregon Department of Agriculture for invasive plant management, and conducting invasive plant and animal early detection surveys with funding from the Corps of Engineers, Seattle City Light, and BPA. He serves on the boards of the Whidbey Island Conservation District and the Washington Lake Protection Association and continues to participate in several coordinating organizations focused on aquatic invasive species management in the Columbia Basin. He also continues to advise doctoral students working on ecosystem services provided by urban lakes and management of marine invasive species associated with shipping.

Brian Turner, Instructor

Brian "BTO" Turner has an adverse reaction to saying no, and thus has taught a wide variety of courses with the department, including research and field methods, data analysis and management, wetland ecology, science communication, and sustainability. As an ESM instructor, Brian's teaching is informed by his research on the assessment and control of aquatic invasive species. He is also involved in a range of science communication and outreach activities.

Support Environment Science and Management at PSU

Visit giving.psuf.org/esm to make a donation or learn about planned giving options at www.psuf.org/gift-planning-options

Honor Role of Donations

Donations to the ESM by alumni and friends are a crucial way to support students and faculty members in the teaching, research, and community service activities. We are honored and humbled by the generous contributions received by our programs, including the Environmental Science and Management Fund, the Berry Botanic Garden Plant Conservation Endowment, the Center for Lakes and Reservoirs, among others.

Providing a gift to the Department of Environmental Science and Management is a powerful way to support the future of our department. The PSU Foundation is an excellent resource if you are considering providing support to ESM in your will or any other form of planned giving. Visit psuf.org or call 503-725-4478 for more information. The following is a list of contributors to ESM programs from January 1, 2019 - November 1, 2020. We apologize for any unintended errors or omissions, and are also grateful to our anonymous donors.

$500 or greater

Center for Plant Conservation
Willamette Partnership
Clackamas River Water Providers
Dick Lycan
Gay Greger
Joan Horstkotte
Laurie Meigs
Liza Lilley
Marsh Hieronimus
Patti Schleuning
Quinsey Family Foundation
Rachel Witmer

$250 to $499

Oregon State Federation Of Garden Clubs
Dave Morthland
Jay Walters
Linda George
Lorali Reynolds
Marna Tallman
Melissa Haeffner
Pamela Johnston
Patricia Stenaros
Sylvia Giustina

$100 to $249

The Portland Garden Club
Angela Strecker
Anthony Vengarick
Barbara Manildi
Burton Lazar
Carol Putnam
Catherine deRivera
Cheryl McCaffrey
Christine Ebrahimi
Claude Phipps
Dayne Freitag
Diane Waggoner
Donald Zobel
Elise Granek
Elisabeth Dally
Elizabeth Evans
Gary Rule
Jane McConnaha
Janet Webster
Janice Dodd
Jen Morse
Jennie Morgan
John Bondurant
Keith Karoly
Margaret Eickmann
Meenakshi Rao & Bennett Battaile
Raj Sarda
Rebecca Brown-Thompson
Stan Geiger & Marilynn Stribling
Stephen Wille
Steven Sullivan
Yvonne Hajda
Wendy Lee

Up to $100

Eastmoreland Garden Club Unit 1
Ann Rasmussen
Audrey Moser
Beverly Koch
Candy Puterbaugh
Caroline Skinner
Catherine Dalziel
Dave Freitag
Elizabeth Stanek
Gerald Erickson
Gerald Van Deene
Jane Hartline
Janet Dorow
Janet McLennan
Jerry Anderson
Judith Roberts
Katherine Lintault
Kay Pollack
Linda Minor
Marta Lansing
Martin Skinner
Max Nielsen-Pincus
Michael Dawson
Paul Slichter
Reid Ozaki
Ron Klump
Susan Schilke
Tammi Harper

ESM CO-OP Employment Info for Students and Employers

To learn more visit PSU CO-OP website

For Alumni and Friends

ESM Student CO-OP positions provide full or part time employment to qualified undergraduate ESM students for a period totaling between 1000 and 2000 hours (6 to 12 months full time equivalent). Our goal is to select a pool of top ESM students who meet criteria so that employers can select and place students in positions with appropriate academic training and career interests. CO-OP employers set appropriate wages, and are not committed to on-going employment after the CO-OP position is over. Selected CO-OP students prepare for their CO-OP experience through a university sponsored CO-OP training program. During CO-OP employment students remain matriculated at PSU, but take a reduced course load (or no courses in the case of full-time CO-OP employment) allowing them to immerse themselves in their employment. CO-OP positions allow employers a low-risk opportunity to fill needed positions and offer an integrated learning experience that enhances both the academic experience and career development for students.

If you believe that offering a CO-OP position might make sense for your organization, please reach out to the ESM Department Chair at maxnp@pdx.edu.

For Students

ESM CO-OP positions may offer you a great opportunity to gain work experience and network in your chosen field. You can earn up to a year of work experience from ESM's CO-OP program prior to gaining your Environmental Science or Environmental Studies degree. The ESM CO-OP program is new, so a limited number of positions will be available. To find out if you are qualified and indicate your interest, please visit the PSU CO-OP website.

CONNECT WITH US

pdx.edu/environmental-science
See "Departmental Accomplishments" for recent achievements & publications

facebook.com/PortlandStateESM

https://www.linkedin.com/in/esm-psu-0643a374/

Portland State University

Department of Environmental Science and Management
College of Liberal Arts and Sciences
PO Box 751
Portland, OR 97207

https://www.pdx.edu/environmental-science