




19TH ANNUAL Urban Ecology & Conservation Symposium

MARCH 1 & 2, 2021



Thanks to the following photographers

Cover Photo Credits

Top Row (left to right)

Mason bee (*Osmia lignaria*) returns to cavity nest with pollen – Stefanie Steele, Portland State University

Grey hairstreak butterfly (*Strymon melinus*) on sedum ecoroof test tray – Tom Liptan, fasla

Forest on Saddle Mountain – Theresa Huang, Urban Greenspaces Institute

Middle (Left to right)

Tadpole experiment – Katie Holzer, City of Gresham

Canada Geese (*Branta canadensis*) on Willamette River South Shore – Theresa Huang, Urban Greenspaces Institute

U.S. Fish and Wildlife Service fish sampling in Tryon Creek – Brendan White, U.S. Fish and Wildlife

Bottom Row (left to right)

Ghost pipe (*Monotropa uniflora*) – Jordan Leis, Linfield University

South Waterfront neighborhood enveloped in CS gas and munitions smoke – Juniper L. Simonis, DAPPER Stats

Storm water rain garden Lake Oswego – Kathryn Forester, Herrera Environmental Consultants

19TH ANNUAL

URBAN ECOLOGY & CONSERVATION SYMPOSIUM

Held virtually on
March 1 & 2, 2021

Organized by the
Urban Ecosystem Research Consortium (UERC) in partnership with Social Enterprises

Sponsored by

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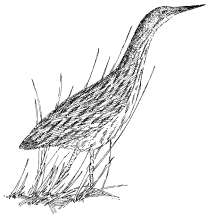

Urban Ecosystem Research Consortium (UERC)
Portland, OR - Vancouver, WA Metropolitan Region

What is the UERC?
The UERC is a consortium of people from various universities and colleges, state and federal agencies, local governments, non-profit organizations and independent professionals interested in supporting urban ecosystem research and creating an information-sharing network of people that collect and use ecological data in the Portland/Vancouver area. Participants come from a variety of fields, including:

air quality	*environmental policy*	*hydrology*	*sustainable development*
climate change	*env. social sciences*	*land management*	*transportation*
conservation biology	*fisheries*	*land use planning*	*water quality*
ecology	*geology*	*land/watershed mgt.*	*wildlife biology*
economics	*GIS / modeling*	*plant ecology*	
env. design	*habitat assessment*	*social sciences*	
env. education	*habitat restoration*	*stormwater management*	

Mission Statement - To advance the state of the science of urban ecosystems and improve our understanding of them, with a focus on the Portland/Vancouver metropolitan region, by fostering communication and collaboration among researchers, managers and community members at academic institutions, public agencies, local governments, non-profit organizations, and other interested groups.

Goals and Objectives
- Provide direction and support for urban ecosystem research
- Create an information-sharing network within the research community
- Track and house available information
- Promote greater understanding of urban ecosystems and their importance

Organizers - The principal organizers span academic institutions, government agencies (city, regional, state and federal), private firms and non-profit organizations. Individuals from the institutions listed below currently serve on the steering committee. The diverse backgrounds and affiliations of those involved have allowed the UERC to bring together many important sectors of the natural resources community. This year we hired event consultant Social Enterprises (http://www.socialenterprises.net/) to help organize our first ever virtual conference.

City of Portland
City of Vancouver
Metro
Portland Audubon
Portland State University
Reed College
U.S. Fish and Wildlife Service
Urban Greenspaces Institute

Web Site – Check out the brand new UERC web site: **http://www.uercportland.org/**. There, you will find background and contact information, a link to sign up on the listserv, announcements about upcoming events, and full details about annual UERC symposia, including downloadable proceedings.

Listserv - Oregon State University hosts a listserv designed for members to share information and facilitate communication among those interested in urban ecology. Anyone can join by going to the UERC web site and following the link "Join Our Listserv."

Advocacy Statement - The role of the UERC is not to provide a political or advocacy platform, but rather to foster communication and collaboration by offering a forum for professionals to exchange and discuss information regarding urban ecology and its application to relevant fields.

2021 URBAN ECOLOGY & CONSERVATION SYMPOSIUM ACKNOWLEDEMENTS

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EVENT SUPPORT

We wish to thank **Hannah Martin**, **Sierra Winegarner**, and **Cory Griffin** at Social Enterprises for their work organizing and executing the event from behind the scenes. We also thank **Chris Dodge**, Portland Audubon, for the cover page graphic design.

2021 Urban Ecology & Conservation Symposium
AGENDA

Monday, March 1, 1:00-5:00 pm

1:00	**WELCOME AND INTRODUCTION: Dr. Olyssa Starry,** Associate Professor, University Honors College, Portland State University
1:15	**OPENING KEYNOTE ADDRESS: Dr. Nalini Nadkarni** Professor of Biology, Forest Canopy Ecologist, University of Utah, Salt Lake City, Utah ***Branching Out: Forests from the Canopy Perspective***
1:50	Q&A
2:00	**BREAK**

DIVERSITY IN ECOLOGY / PORTLAND HARBOR *Moderator: Theresa Huang, Urban Greenspaces Institute*

2:20	Serina Fast Horse	City of Portland	Collaborating with Indigenous Community to restore our landscapes
2:30	Erin Rivers	Utah State University	Looking beyond facility location to evaluate equity in the distribution of green stormwater infrastructure
2:40	Lauren Senkyr	NOAA Restoration Center	Restoring habitat for fish and wildlife injured by contamination in the Portland Harbor Superfund site
2:50	Q&A		

3:00	**NETWORKING AND TOPIC BREAKOUT SESSIONS** **Habitat/Diversity**, moderated by Janelle St. Pierre, Clean Water Services and Theresa Huang, Urban Greenspaces Institute **Tree Dieback**, moderated by Christine Buhl, Oregon Department of Forestry **General Randomized Networking**, moderated by Brendan White, US Fish & Wildlife Service

SENSITIVE SPECIES *Moderator: Aaron Ramirez, Reed College*

4:00	Nicole Ruggiero	Tualatin Soil & Water Conservation District / Biohabitats	Oak Prairie Working Group oak prioritization mapping
4:10	Lea Wilson	City of Portland	Survival and growth of Pacific madrone following four years of establishment care
4:20	Marissa Eckman	City of Gresham	Sensitive amphibian populations persist through time using constructed stormwater ponds
4:30	Katie Holzer	City of Gresham	Tadpoles survive urban pollutants and cages to show conservation value of altered landscapes

4:40	James Holley	Portland State University	Can turtles and humans coexist? An examination of the minimum habitat requirements of Western painted turtles in Oregon
4:50	Q&A		
5:00	**WRAP-UP** *Dr. Aaron Ramirez, Reed College*		

Tuesday, March 2, 8:30 am-12:30 pm

8:30	**DAY 2 WELCOME AND INTRODUCTION: Amy Chomowicz,** City of Portland, Environmental Services
8:35	**OPENING KEYNOTE ADDRESS: PK Das** Architect and Activist, PK Das and Associates, Mumbai, India ***Building Sustainable Ecology Through Participatory Planning***
9:10	Q&A
9:20	**BREAK**

RESTORATION PROJECTS AND PRACTICES *Moderator: Brendan White, US Fish & Wildlife Service*

9:30	Matt Brennan	Clean Water Services	Urban stream uplift and connectivity in Fanno Creek
9:40	Adrienne St. Clair	Metro	Considerations when mixing source populations for plants in restoration
9:50	Erin McElroy	Portland State University	Understory Species Increase Project: the need to seed
10:00	Matt Paroulek & Sarah Wilson	Port of Portland	Enhancing grassland habitat in the middle of the Columbia River
10:10	Q&A		
10:20	**POSTER SESSION**		

WILDLIFE CONSERVATION *Moderator: Joe Liebezeit, Portland Audubon*

11:25	Mary Coolidge & Dave Helzer	Portland Audubon / City of Portland	A successful monitoring and mitigation project to address bird window collisions at the City of Portland′s Columbia Building, 2015-2019
11:35	Valance Brenneis & Rodé Krige	Portland Community College	Wildlife cameras on college campus provide community engagement and research opportunities
11:45	Stefanie Steele	Portland State University	Nest preferences of solitary cavity nesting bees in Portland, Oregon
11:55	Heejun Chang	Portland State University	Putting beavers into urban streams to improve water quality
12:05	Q&A		
12:15	**WRAP-UP** *Lori Hennings, Metro*		

POSTER PRESENTATIONS

Coordinator: Theresa Huang

Author(s)	Title
Aaron Anderson*^, Isabella Messer, Gail Langellotto (Oregon State University)	Gardener Perceptions of Native Pollinator Plants
Amy Baur*, Patrick Hendrix, Glen Leverich (Stillwater Sciences), John Christy (Portland State University), Elaine Stewart (Metro)	Understanding the bio-physical characteristics of a fen ecosystem to inform management and conserve the rare habitat
Matt Cook*^ (Portland State University)	Environmental Conditions Associated with Natural Shade-Tolerant Conifer Regeneration in Forest Park, Portland, Oregon
Christopher Desiderati*^ (Portland State University)	Assessing water quality improvement and treatment effectiveness at a 6-ha constructed wetland in Clackamas County, Oregon
Andrew Gregg* (RestorCap, LLC)	Restoring Habitat for Fish and Wildlife Injured by Contamination in the Portland Harbor Superfund Site
Olivia Helback*^, Olyssa Starry (Portland State University), Joe Liebezeit (Portland Audubon)	Population Density of Free-Roaming Cats in Relation to Feeding Stations on Hayden Island
Joseph Hulbert*, Marianne Elliot, Gary Chastagner (Washington State University)	Forest Health Watch: community science to accelerate research about the dieback of western redcedar in the Pacific Northwest
Joseph Hulbert* (Washington State University)	Exploring the dieback of western redcedar as a symbol for inequities in urban communities
Jane Kleiner* (Nature Play Designs)	Greening of Schoolyards - Creating hands on field stations for students
Ananke Krishnan*^ (Reed College), Drew Meyers, Halee Long, Sarah Foltz (Radford University)	Birdsong in Urban Environments With Differing Vegetation and Building Structures

Jordan Leis*^, Trinity Ronk-Degraffenreid, Nancy Broshot (Linfield College)	Macrofungi in urban and rural forests
Tom Liptan* (Community member)	Ecoroof Soils & Systems Comparisons
Mary Logalbo*^ (West Multnomah SWCD & Portland State University)	Portland's Stormwater Permitting, Policy & Processes: A Stakeholder & Geospatial Analysis
Colin MacLaren* (Portland General Electric)	Harborton Habitat Enhancement Project
James Mitchell*^ (Portland State University)	Trail impact monitoring in Forest Park
Daniel Newberry* (Johnson Creek Watershed Council)	JCWC's Cold Water Restoration Strategy
Evan Ocheltree* (Columbia Restoration Group)	Rinearson Creek Natural Area: A Restoration Project for Portland Harbor Superfund Site
Julian Roth*^, Kylee Church (Portland State University)	Invasive Species Mapping and Community Outreach at Mary S. Young State Park
Juniper Simonis* (DAPPER Stats)	Estimating Federal Agents' Deployment of Lethal Zinc Chloride Gas in Portland OR Using a Bayesian Hierarchical Model
Adrienne St. Claire* (Metro)	Greater Portland-Vancouver Metro Area City Nature Challenge
Evan Suemori*^, Alexadra Vargas (Portland State University)	Stormwater Management at Portland State University with the Uncertainty of Climate Change
Nick Wagner* (ForeSight Drone Services LLC)	Repeat Topographic Surveys Combining Lidar with UAV Structure from Motion Data for Change Detection of Two Landslides

** Primary author*
^ Student presenter

UERC 2021 NETWORKING AND TOPIC BREAKOUT SESSIONS

March 1 from 3-4pm

Join a breakout room discussion with experienced peers from the world of urban ecology and environmental education. *Previous registration is required and Zoom links will be sent to registered attendees before the event*.

1. **Habitat and Diversity**
   What does access to nature look like for you and your community? What kinds of landscapes do we want to support to meet community needs? Do you think we've been focused too much on specific ways of using parks and natural areas? If so, what ways do you think have traditionally been left out? Come join a discussion on what it means to provide meaningful and equitable access to nature for all groups of people.
   Conversation lead: *Janelle St. Pierre, Water Resources Program Manager, Clean Water Services and Theresa Huang, Urban Greenspaces Institute*

2. **Tree Dieback**
   Our changing climate is rapidly altering the suitability of habitat and resilience for some of our most common coniferous tree species. Now is the time for discussion to determine how to move forward to retain species at risk such as western redcedar, grand fir, Douglas-fir and bigleaf maple, and to seek alternative management strategies.
   Conversation lead: *Christine Buhl, Oregon Department of Forestry*

3. **General networking**
   Attendees will discuss obstacles and opportunities in their work. Come to also learn about local mentoring, volunteer, and professional development opportunities.
   Conversation lead: *Brendan White, UERC committee*

Afternoon Keynote Address

Dr. Nalini M. Nadkarni

Department of Biology
University of Utah
Salt Lake City, Utah

Branching Out: Forests from the Canopy Perspective

Canopy-dwelling biota has critical roles in ecosystem processes. The way scientists communicate knowledge about these plants and animals is key to raising awareness about the importance of trees to people and their engagement with the natural world. By developing novel ways to share knowledge, ecologists can be more inclusive and responsive to elements of society that have been underserved by science or who lack access to nature. This talk will provide an overview of how understanding the ecology of plants and animals that live in rainforest canopies might advance ways that people understand and value trees in urban environments.

Biography

Nalini Nadkarni is a Professor of Biology and forest ecologist at the University of Utah. She studies the plants and animals that live in rainforest canopies with support from the National Science Foundation and the National Geographic Society. She has written over 130 scientific papers and three books. She is passionate about sharing her knowledge about trees with all sectors in society. In addition to her contributions to understanding the science of trees, Nadkarni has collaborated with modern dancers, poets, and creative writers to communicate the beauty of forests to arts audiences to convey the importance of trees to public groups who might not otherwise be interested in forests. Mattel has created a "Treetop Barbie" to recognize her efforts to raise interest for field science in young girls. She has brought lectures, conservation projects, and nature imagery to people who are incarcerated in prisons across the country. Her work has been featured in journals ranging from Science and the Journal of Ecology to Glamour and Playboy Magazine. Her recent national awards include a Guggenheim Fellowship, the AAAS Award for Public Engagement, the William Julius William Award for Achievement in Social Justice, and the Archie Carr Medal for Conservation.

Morning Keynote Address

PK Das
Architect & Activist

PK Das & Associates
Mumbai, Maharashtra, India

Building sustainable ecology through participatory planning

Ecology includes people and nature. The two are inextricably entwined; to separate one from the other is to undermine our struggle to achieve ecological sustainability. Mumbai's history of excluding nature from planning and development has led to destruction of its natural waterbodies, forests, and hills. As these conflicts dominate the city landscape, we are intervening and re-envisioning cities through integrating people and nature, particularly in the city edges where it is the most vulnerable. With localized projects, we facilitate maximum community participation using bottom-up neighborhood-based planning approach that focuses on the networks of people and natural places. Our fight is for integrating people and nature, equality, environmental justice, and democratization of the ecology.

Biography

PK Das is the founder of PK Das & Associates. His work includes organizing slum dwellers to improve affordable housing models, engaging in a policy framework for mass housing, reclaiming public spaces and waterfront development, and integrating nature-based urban design into architectural practice.

PK believes that public spaces are the foundation of city planning as they provide physical, social, and democratic wellbeing for the community. Under the pressure of urban development, public spaces are rapidly shrinking. PK raises awareness about the importance of public spaces through his public space projects by emphasizing participatory planning from the very beginning and at every stage of a project.

His work in the expansion of public spaces, the development of Mumbai's coastline, and his slum rehabilitation projects have won him several national and international awards including the first 'Urban Age Award' instituted by the London School of Economics and Deutsche Bank, and the prestigious first International "Jane Jacobs Medal-2016."

Along with other activists, PK is committed to unifying fragmented neighborhoods as well as improving the 'backyards' of the city through planning and architectural endeavors. PK is currently working on transforming over 300 kilometers of Mumbai's open drains and water ways into streams and integrating them into Mumbai's public spaces. He is also working on preparing a comprehensive slum redevelopment and integration plan in Mumbai.

ABSTRACTS SUBMITTED

Gardener perceptions of native pollinator plants

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Isabella Messer, Oregon State University, Email: messeri@oregonstate.edu
Gail A. Langellotto, Oregon State University, Email: gail.langellotto@oregonstate.edu

Native plantings are used in urban areas to improve pollinator habitat. To achieve wide adoption, these plant choices must be attractive to home gardeners as well as to pollinators. We distributed two surveys to identify native Willamette Valley pollinator plants that are aesthetically pleasing to home gardeners. The first survey sought to ascertain baseline attractiveness, and asked gardeners to rank the attractiveness of 23 wildflowers on a 1-5 Likert scale. In second survey, we were interested in how sharing information on the benefits of these plants impacts perceived attractiveness. We asked gardeners to rate the attractiveness of a subset of 11 of these 23 wildflowers both before, and after, being shared information on each flower's attractiveness to bees. Both surveys also included space for open-ended comments. We found a high level of acceptance of native wildflowers by gardeners (over half had mean attractiveness scores of 4.0 or above), and gardeners found native plants significantly more attractive after learning about the bees that visit each plant. Gardeners who identified as "native plant gardeners" found all of the study plants significantly more attractive than non-"native plant gardeners." In the open-ended comments, gardeners stated that they were most negatively concerned with the aesthetics and aggressive growth of flowers. Gardeners felt positively about flower aesthetics and beneficial ecological traits (e.g. pollinator attractiveness, drought tolerance). We identify five species of native wildflowers that Pacific Northwest nurseries might consider marketing as pollinator plants (*Gilia capitata*, *Clarkia amoena*, *Eschscholzia californica*, *Madia elegans*, and *Sidalcea asprella* ssp. *virgata*).

Keywords: Conservation biology, Environmental social sciences, Habitat restoration

Understanding the bio-physical characteristics of a fen ecosystem to inform management and conserve a rare habitat

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Fen-wetland ecosystems are rare nationwide. Their unique groundwater regime and chemistry, along with a floating, vegetated peat mat that may occur, support diverse and rare plant and wildlife communities. A fen's ecological benefits are considered even greater within an urbanized setting through its natural attenuation of runoff and pollutants, though these ecosystem services may diminish should the urban-sourced impacts eventually alter the fen's bio-physical condition. Here we will present how determining a fen's key bio-physical factors and understanding their combined sensitivity to external processes is necessary to define and address potential threats to a fen's conservation. Located within a 100-acre Metro-owned natural area along the lower Willamette River, the last known remaining fen composed of a groundwater-fed lake with a densely vegetated floating peat mat in the region is vulnerable to threats that could alter its fragile biochemistry. Threats include stormwater runoff, groundwater reductions from local pumping, nutrient input from septic tanks, and invasive species. To inform conservation measures, Metro's goal was to assess the fen's watershed inputs and bio-physical condition by studying the site hydrology, water and soil quality, and vegetation. Initial results reveal a unique ecosystem with counter groundwater and surface-water flow directions due to the unique geologic setting, eutrophic lake conditions from high nutrient loading and concentration, acidic water chemistry and soils from parent bedrock materials, and a diverse plant community consisting of 27 taxa of rare plants. Ongoing monitoring of the fen is helping to assess its condition, help detect future trends, and inform preservation of this unique habitat and potential recommendations for restoring disturbed fens elsewhere in the region.

Keywords: Habitat assessment, Hydrology, Plant ecology, Water quality, Land/watershed management

Urban stream uplift and connectivity in Fanno Creek

Matt Brennan, Clean Water Services, Email: mattandmary85@msn.com

Urban streams often present limited opportunities for ecological uplift and connectivity. Infrastructure and social constraints can lead to smaller, disconnected projects with little room for change. Recent ecological improvements at Fanno Creek in Beaverton are the latest in a series of projects that are creating a more connected system from disjointed parts. The Fanno Creek project has been a collaboration between Clean Water Services and Tualatin Hills Parks and Recreation District for both trail (replacement of undersized culverts with a timber bridge) and ecological improvements in an urban natural area. A 1000 foot reach of Fanno Creek was realigned, and the floodplain was graded to provide secondary channels and complex wetland environments. Large wood was utilized to roughen stream banks and bed and to provide habitat in floodplain wetlands. The constructed ecological enhancements at the Fanno project encompass approximately seven acres in a larger, 22 acre revegetation site that extends 3/4 mile from SW Denney Road to SW Hall Boulevard. Immediately downstream of SW Hall Boulevard, the Fanno Creek corridor has been enhanced for over 2 additional miles, linking both recent and older ecological enhancement projects implemented by regional partners. Systematic and intentional revegetation has created an ecological linkage and accelerant between sites and through this corridor. Coupling revegetation with strategic replacement of constricting structures within the corridor has allowed for improved human access to these natural areas while improving the aquatic-riparian interface.

Keywords: Habitat restoration

Wildlife cameras on college campus provide community engagement and research opportunities

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Wildlife cameras have been used to document animal diversity in the Rock Creek Environmental Studies Center (RCESC) on the Portland Community College (PCC) Rock Creek campus for the last five years (2016 – 2020). The RCESC is a 110-acre natural area composed of upland coniferous forest, wetlands, and oak woodland habitat located on the western edge of the Urban Growth Boundary and connected with the Tualatin Mountains via Rock Creek. This area is managed to provide wildlife habitat, floodplain function, and experiential learning for students and the broader community. In 2017, a wetland enhancement project was initiated in partnership with Clean Water Services to restore floodplain hydrology and improve wildlife habitat in the RCESC. As part of the environmental studies program at PCC, faculty and students have engaged in research projects using wildlife camera images to address a range of questions about wildlife diversity, animal behavior, habitat usage patterns, and potential effects of the wetland restoration efforts and development on wildlife. In the pivot to remote instruction during the pandemic, the wildlife camera data has been especially valuable in providing authentic, place-based research opportunities via an online format. In this presentation we will highlight data on species diversity and animal activity patterns over several seasons. This research can be used to help inform local conservation and land use planning efforts. We will also share challenges and lessons learned from using wildlife cameras as a tool in environmental education.

Keywords: Environmental education, Wildlife biology, Habitat restoration

Putting beavers into urban streams to improve water quality

Heejun Chang, Portland State University, Email: changh@pdx.edu

While many different watershed management strategies have been implemented to improve water quality, relatively few studies empirically tested the combined effects of different strategies on water quality in relation to land cover changes using long-term empirical data at the sub-basin scale. Using 10 years of TSS data, we examined how the conversion of wetland, wetland fragmentation, beaver dams, and Best Management Practices (BMPs) are related to wet season TSS concentrations for the 12 sub-basins of the Tualatin River basin in the Portland metropolitan region. We used geographic information systems, Fragstat, and correlation analysis to identify the direction of land cover change, degree of wetland fragmentation, and the strength of the relationship between TSS change and explanatory variables. Our findings show that, regardless of urban development, there was some improvement in TSS concentrations, with increases in wetland size and the presence of beaver dams, particularly during the mid-wet season when flows were highest. Other BMPs effectively reduced TSS concentrations for the early and late-wet seasons when flows were not as high as in the middle wet-season. Aggregated wetlands were more effective for improving water quality than smaller disaggregated wetlands of similar total area when combined with beaver dams and BMPs. The findings offer important practical policy implications for urbanizing watersheds that seek to improve water quality with development.

Keywords: Water quality, Land/watershed management, Hydrology

Environmental conditions associated with natural shade-tolerant conifer regeneration in Forest Park, Portland, Oregon

Matt Cook, Portland State University, Email: cookmat@pdx.edu

Forest Park is a 5,100-acre urban forest located in Portland Oregon. Due to its proximity to urban development the park has been impacted by various anthropogenic stressors including logging, fragmentation, invasive species, air pollution and recreation use. This legacy of land degradation coupled with natural disturbances has resulted in changes to forest structure, composition, and function—threatening the long-term sustainability of the park. Forest Park provides many ecosystem services, and the local community depends on its sustained ecological integrity. Past research in Forest Park had identified a lack of Western hemlock and Western red cedar seedlings and saplings in the most "urbanized" section of the park when compared to a reference old growth section of the park. The successful regeneration of these species is a critical development process that leads towards structurally complex old-growth stand conditions. There is concern from Forest Park stakeholders that past land use history, periodic disturbances, and urbanization have set sections of the park on an altered trajectory towards a deciduous hardwood alternate state. A targeted sampling approach was used to locate juveniles of target shade-tolerant species and to assess the abiotic and biotic factors at those locations. Both species' presence was negatively associated with increased vegetative cover. Western hemlock juveniles were primarily found established on nurse logs. Decreased canopy cover was also associated with higher tree vigor. Further work will involve identifying significant environmental factors associated with presence and vigor of each species to help guide future management efforts.

Keywords: Plant ecology, Habitat assessment, Conservation biology

A successful monitoring and mitigation project to address bird window collisions at the City of Portland's Columbia Building, 2015-2019

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Avian window collisions kill an estimated 365-988 million birds each year in North America. This places collisions among the top three anthropogenic sources of mortality for wild bird populations, after habitat destruction and free roaming cats. A 2019 study indicates a nearly 30% decline in North American bird populations since 1970. Community science monitoring from 2009-2011 documented 69 species of warblers, thrushes, sparrows, hummingbirds, flycatchers, woodpeckers, and hawks that collided with buildings in Portland. Nationwide research shows that over half of all collisions occur at low rise commercial buildings, and that most collisions occur within the first 40-60 feet of a building where birds are most active, and vegetation is reflected in unmarked glass. In phase one, we initiated a yearlong effort to investigate the scope and scale of a known window collision issue at the City of Portland's single-story glass-walled Columbia Building. We conducted twice weekly surveys and recorded collisions observed by building occupants. Phase one collision monitoring indicated a rate of 125-150 strikes per year and an estimated range of 65-115 mortalities per year. Collisions involved at least thirteen avian species and there was no clear seasonal pattern. In 2017, the building was retrofitted with a full-coverage window film featuring a horizontal line pattern. In phase two, we repeated our survey methods for another year, and documented a 94% reduction in window collisions on treated windows, with a post-retrofit estimated range of 7.5-9 strikes per year and an estimated range of 4-7 mortalities per year.

Keywords: Sustainable development, Conservation biology, Wildlife biology

Assessing water quality improvement and treatment effectiveness at a 6-ha constructed wetland in Clackamas County, Oregon

Christopher L. Desiderati, Portland State University, Email: desid2@pdx.edu

Stormwater management is an ongoing challenge worldwide. Constructed wetlands (CWs) have been used as aesthetically pleasing, functional solar-powered engines for attenuating pollution delivered by stormwater to rivers and streams. Efficacy of CWs for pollutant attenuation vary by factors beyond design such as flow rate, pollutant loading, maintenance, and weather. In 2018, the Carli Creek Water Quality Project was completed, a 6-ha integrated creek restoration and CW, the latter consisting of a series of a retention pond and three bioretention cells. The CW drains a highly industrialized and impervious (~90%) catchment via a combined 0.73 ha of treatment area (1:243 ratio versus catchment) and 4070 m^3 of total runoff storage. A partially complete (n=3) sampling campaign has shown average reduction efficiencies for *E. coli*, Nitrate-nitrite, Total Zinc, and Total Solids of 89%, 48%, 21%, and 16%, respectively, across the treatment terrace. Concurrent upstream and downstream sites on the receiving creek also show similar reductions for *E. coli* and Nitrate-nitrite but not Total Solids. These in-stream differences may be due to dilution effects from the treatment terrace so paired mass loading data of these sites will afford a better understanding of the effectiveness of the terrace on improving water quality in the receiving stream of this urbanized catchment. This research shows CWs can effectively reduce certain pollutants from heavily industrialized catchments and that understanding relationships with weather will improve CW design for more effective water quality improvement downstream.

Keywords: Land/watershed management, Water quality, Sustainable development

Sensitive amphibian populations persist through time using constructed stormwater ponds

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Most of the natural ponds that amphibians need to survive in the Gresham area have historically been drained or filled in for agricultural or urban development. Newly constructed stormwater facilities have been attracting pond-breeding amphibians, but are these facilities good habitat or death traps? The City of Gresham re-surveyed ponds originally surveyed twelve years prior to see if frog populations are persisting in urban environments using constructed ponds. These surveys were performed using volunteers to increase levels of community engagement in the city. We found that all four native pond-breeding amphibians (*Rana aurora*, *Pseudacris regilla*, *Ambystoma macrodactylum*, *Ambystoma gracile*) are persisting in constructed stormwater ponds and most species present twelve years ago were still present in their respective ponds. We also found that recently constructed ponds had been colonized quickly. Our volunteers enjoyed the opportunity to get out into ponds during winter and the data we got in return was relatively reliable. In sum, data collected shows that constructed stormwater ponds can support populations through time, even populations of sensitive species, therefore, when designing, constructing, and maintaining stormwater ponds habitat values should be taken into consideration. Additionally, amphibian egg mass surveys are a great way to engage community members in science and local environment.

Keywords: Habitat assessment, Water quality, Land/watershed management

Collaborating with indigenous community to restore our landscapes

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The City of Portland Bureau of Environmental Services and Portland State University's Indigenous Nations Studies Department have formed a collaborative partnership for an innovative project that is reimagining best practices for habitat restoration and community engagement. The project is based on integrating Indigenous Traditional Ecological and Cultural Knowledge (ITECK) throughout the process of restoring a former pumpkin patch into a healthy first foods wetland habitat. Through relationship and trust building, this project has begun breaking ground to reveal the unique possibilities of meaningful engagement with Indigenous people for healing our landscapes, both environmental and social. After two years into the project, a wealth of lessons learned have emerged. In this talk, we will give an overview of these lessons including respecting cultural knowledge, planting design planning, land tending strategies, risk assessment for harvesting, and addressing institutional equity barriers.

Keywords: Land/watershed management, Plant ecology, Habitat restoration, Environmental social sciences

Restoring habitat for fish and wildlife injured by contamination in the Portland Harbor Superfund Site

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The Linnton Mill Restoration Site is a 26-acre multi-species restoration project that is located on a former plywood mill along the Willamette River in Northwest Portland. The former industrial facility located within the Portland Harbor Superfund Site presented excellent opportunities to establish significant and badly-needed habitat for a variety of species, notably endangered salmon species. It also presented significant challenges in working with numerous state, federal and local agencies, community groups, and tribes to ensure the habitat created would thrive in perpetuity.

Keywords: Animal ecology, Fisheries, Habitat restoration, Land use planning, Wildlife biology

Population density of free-roaming cats in relation to feeding stations on Hayden Island

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Free-roaming cats have a devastating impact on wildlife populations with stray/feral cats being the most problematic. In some areas, community members provide these cats with food, water, and shelter often in conjunction with a trap, neuter, return (TNR) program. Regardless of TNR, some studies suggest that feeding stray cats allows them to live longer which increases their impact on local wildlife populations. In contrast, we documented that a constantly available food source correlated to a higher density of cats in urban areas with less wildlife value and where they can be integrated into a TNR program. The Hayden Island Cat Project has utilized TNR, cat adoption, and outreach to humanely reduce the free-roaming cat population since 2014. Many residents on the island provide feeding stations for the cats and actively participate in the TNR program. To determine how feeding might affect cat spatial distribution, camera traps were placed at 20 different stations in urban and natural areas on Hayden island. Additional data from the annual road cat count was used to compare cat density relative to feeding stations utilizing ArcGIS. Coordinates of feeding stations based on a resident survey were overlaid onto the cat location coordinates and a clear density correlation appeared. Camera traps reinforced these findings whereby only a single cat was photographed in the natural area. These results demonstrate that feeding free-roaming cats combined with management actions aimed at humanely reducing cat populations, may lessen the impact on wildlife and be ethically acceptable to local residents.

Keywords: Animal ecology, GIS / modeling, Conservation biology

Can turtles and humans coexist? An examination of the minimum habitat requirements of Western painted turtles in Oregon

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Oregon's native turtle species have undergone population declines over recent decades and are both listed as Sensitive-Critical in the Oregon Conservation Strategy. Exact causes of this decline are not known, but most hypotheses involve habitat loss as the primary cause. To better understand these region-wide declines, I performed local historic data, aquatic vegetation and complexity surveys, and two years (2019-2020) of turtle nesting surveys at sites distributed throughout the Lower Willamette Basin to determine minimum habitat requirements for a self-sustaining turtle population. Western painted turtles (*Chrysemys picta bellii*) are the most common native turtle in this area. This study found that regular human and pet use of wetland areas negatively impacts nesting events and frequency. Data also indicate that hatchlings emerge in the spring as has been shown in previous studies. Further research is required to determine other limiting factors for turtle occupancy. Potential management actions based on our findings include decreasing human and pet access to potential nesting sites and pond shores particularly during the turtle nesting season in June and July, improving nesting substrate at sites, and installing small woody debris structures to improve juvenile brood habitat.

Keywords: Animal ecology, Habitat restoration, Wildlife biology

Tadpoles survive urban pollutants and cages to show conservation value of altered landscapes

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Field surveys show that frogs and salamanders are attracted to urban stormwater ponds, but the relative survival of eggs and tadpoles in these ponds was unknown. This study is the first of its kind to conduct a field-based reciprocal transplant experiment to directly examine the effects of urban stormwater ponds on growth and survival of a sensitive species. We collected red-legged frog eggs from existing populations in Portland and Gresham and transplanted them to outdoor cages in various types of ponds throughout the area. We collected water quality data from each pond throughout the experiment and tracked the growth and survival of the eggs and tadpoles. We found no substantial difference in survival rates among ponds where wild red-legged frogs were breeding. This indicates that eggs and tadpoles raised in urban stormwater ponds did not experience reduced survival, as long as the ponds were places where wild frogs already exist. However, we did find decreased survival in some stormwater ponds where we do not find wild frogs breeding. The elevated mortality appears associated with sediment, dissolved oxygen, and water levels rather than chemical pollutants. This indicates that some stormwater ponds are poor habitat for these frogs, but that wild frogs are generally absent from these sites anyway, so chemical pollutants do not appear to be creating ecological traps for these frogs. This study demonstrates that urban stormwater ponds can provide habitat of similar quality to natural ponds for a species of conservation concern when designs account for habitat needs.

Keywords: Conservation biology, Sustainable development, Water quality

Forest Health Watch: Community science to accelerate research about the dieback of western redcedar in the Pacific Northwest

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The purpose of the Forest Health Watch program (https://foresthealth.org/) is to provide people in the Pacific Northwest with opportunities to contribute to research and learn about forest health simultaneously. The pilot project of the program aims to engage community scientists in research about the dieback of western redcedar and empower them to critically observe the effects of climate change on urban forests and communities. Through multiple methods, including online tools and in-person training events, the program aims to generate open forest health data and connect a network of knowledgeable community scientists. This presentation will summarize the merit of community science, the methods of engagement, the tools for research, and the opportunities to partner and shape projects within the Forest Health Watch program.

Keywords: Climate Change, Environmental education, Plant ecology

Exploring the dieback of western redcedar as a symbol for inequities in urban communities

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Western redcedar is an important component of the cultural and industrial legacies of the Pacific Northwest. However, many recent reports of dieback suggest the species is threatened by increases in climate variability. In this regard, western redcedar may be especially vulnerable to conditions associated with heat islands in the urban environment, and therefore, a candidate symbol to raise awareness about the local consequences of climate change and the inequities in urban landscapes. The purpose of this presentation is to summarize the state of the science in regard to western redcedar health, discuss its merit as a candidate to raise awareness, and share ideas for engaging communities to test hypotheses with an equity lens.

Keywords: Climate Change, Environmental social sciences

Greening of schoolyards: Creating hands-on field stations for students

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Green Schoolyards are dynamic outdoor learning spaces for students that also connect ecological corridors across urban and suburban communities. With students spending approximately 180 school days on campus, as well as using the spaces after hours all year round, Green Schoolyards connect children to natural features. For the next generation of land managers, environmental scientists, early exposure to natural settings allow students to explore, wonder and question natural processes that they can observe all year. This is especially important for students who have no yards at home or means to access nature. "Green schoolyards are nature-filled outdoor spaces that offer students, teachers, parents and community members places to play, learn, explore and grow. Designed with and for the school community, these shared outdoor spaces can also be enjoyed by kids, families and neighbors during out-of-school time." (Children & Nature Network) Environmental professionals can guide school districts' teams to retool campuses as learning labs and field stations right out their back doors. Projects can include native habitat, diverse plant species, integrative stormwater, habitat structures and active learning gardens, environmental educational signage and more. Data kiosks, weather stations and other long-term features allows the school to track observations over time. Dynamic landscapes also allow high school students the opportunities to learn about career focuses learning based on their interests. Students can use state of the art technology to inventory and assess the natural areas on their campus all year. Career ready learning and working with community partners on school campus projects is a win-win for the community.

Keywords: Environmental education, Environmental social sciences, Habitat restoration, Land use planning

Birdsong in urban environments with differing vegetation and building structures

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Urban environments pose a unique set of challenges to wildlife. Notably, animals that use vocalization as a primary means of communication are affected by higher levels of low-frequency ambient noise, which mask vocalizations, and the physical structure of city landscapes, which influences the way sound travels and is absorbed. The majority of current literature focuses on urbanization as a spectrum from rural to urban, and has led to significant findings in understanding birdsong responses to increased ambient noise. However, less is known about how the variation of uniquely anthropogenic organization of structures and vegetation across urban land use types has the potential to influence bird vocalizations. We conducted a preliminary investigation of how variation in physical and acoustic properties within urban environments is related to birdsong, sampling bird vocalizations across four distinct urban environments (suburbs, city parks, college campuses, and downtown business districts) on each coast of the continental U.S. Songs and calls were manually extracted from the recordings with RavenPro, and data on vegetation and buildings was obtained using Google Earth Engine and ImageJ. While data analysis is still ongoing, preliminary results show differences in ambient noise and vegetation cover across different urban environments and suggest accompanying variation in bird vocalizations. Studying urban environments as heterogeneous ecosystems with varying landscapes and soundscapes will hopefully allow for a deeper understanding of how animal communication has adapted to urbanization, and potentially lead to developments towards urban landscapes that enable, rather than hinder, birdsong.

Keywords: Animal ecology, Wildlife biology

Macrofungi in urban and rural forests

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Research in 1993, 2003, and 2013 showed high rates of tree mortality and low rates of recruitment (new trees) in Portland, Oregon's Forest Park. Three control sites in the Mount Hood National Forest were added in 2013; research from 2018 showed the control sites had significantly more live trees, seedlings and saplings than urban sites. Last summer we surveyed the forests in Forest Park and near control sites for macrofungi. All fungi were identified to genus, the nearest substrate (e.g., log or soil), and the nearest vascular plant species. We compared the fungi we identified to those reported as mycorrhizael with vascular plants in the literature. We will report details of our findings.

Keywords: Plant ecology, Habitat assessment, Conservation biology

Ecoroof soils and systems comparisons

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Since the beginning of the ecoroof movement in Portland in 1996, soils have been considered the most important component of a successful ecoroof and indeed they are. Yet, to this date, little direct comparative research exists to distinguish between the available proprietary soil blends for vegetation health, rain management, energy insulation and other attributes. Starting in 2017 the LIVE Center began conducting such comparisons and the results are surprising and encouraging. In 2020 this presentation covered 20 soils, this year the presentation will show results of comparing more than 40 different soils and proprietary systems, focus is on rain management, vegetation health, energy, costs and limited attention to bio-diversity.

Keywords: Sustainable development, Soil science, Land/watershed management

Portland's stormwater permitting, policy and processes: A stakeholder and geospatial analysis

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This research investigates the stormwater permitting, policy and process steps that might better protect stormwater features and enhance stormwater outcomes at the sub-watershed level in the City of Portland's West Hills from a diversity of stakeholder perspectives. In addition to covering barriers and opportunities to improve stormwater outcomes, a key impacting process, the development and redevelopment onsite stormwater management permit special conditions process and response mechanisms for sites deemed infeasible to manage their stormwater onsite, have been mapped and analyzed.

Keywords: GIS / modeling, Land use planning, Land/watershed management

Harborton habitat enhancement project

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The Harborton Habitat Enhancement Project (Harborton) recreated off-channel floodplain habitat and preserved adjacent natural areas for salmonids and other species on 54 acres adjacent to the Willamette River at river mile 3.1. Pre-construction habitat included a 20-acre PGE facility, historic dredge disposal site, and a seasonally flooded wetland that is regionally significant breeding habitat for northern red-legged frog (*Rana aurora aurora*). This wetland was preserved in its entirety; adjacent upland and wetland habitats were modified to create floodplain and a new backwater channel. Site work involved removing 154,000 cubic yards of historic dredge from the floodplain, creating a new stream channel, installing 363 large wood pieces, and planting approximately 84,000 native plants. Earthwork and habitat structures were completed October 2020; plantings were completed January 2021. The new channel, vegetation, red-legged frog habitat and other metrics will be monitored for the next 10 years. Lessons learned from project design, planning, and construction will be shared.

Keywords: Habitat restoration

Understory Species Increase Project: The need to seed

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Urban forest fragments are frequently managed with an aim to reduce invasive species and promote native species diversity. However, natural regeneration of native forest species, including herbaceous understory species that are especially sensitive to site conditions, is often lacking in these environments. Herbaceous understory species are important for nutrient dynamics in forests and they contain higher biodiversity than other forest strata. Many restoration projects implemented throughout the Willamette Valley in Oregon focus primarily on the establishment of the dominant woody species typical of a Pacific Northwest riparian forest. The lack of focus on the herbaceous understory species can be attributed to the relatively high costs and scarcity of plant material as well as limitations in technical information. The Understory Species Increase Project (USIP) is a collaborative effort started by City of Portland's Reveg Program, Clean Water Services, and Metro that aims to fill these knowledge and resource gaps by researching, developing, and amplifying diverse herbaceous understory species. The current project stage examines which species readily establish from seed, using in-situ trial plots throughout the Portland Metro Area, half of which were seeded with a mix of native herbaceous understory species. Data from year 1-4 post-seeding have revealed significantly greater richness and abundance of herbaceous understory species in seeded plots compared to controls, but results vary greatly by site and species. Here, we investigate which herbaceous understory species have the greatest overall success and which environmental conditions have the strongest effect on the germination, establishment, and growth of target species.

Keywords: Plant ecology, Habitat restoration

Trail impact monitoring in Forest Park

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Forest Park is an appropriately named 5,200-acre natural area located in northwest Portland, Oregon. A recent study estimated park usage near half a million annual visits and found "trails" to be the park's most highly valued feature. Unfortunately, many trails were not designed for such traffic as evidenced by slipping hazards, erosion and other ecological impacts. In response to these observations, I partnered with Portland Parks & Recreation to conduct an objective trail impact assessment prescribed by the Forest Park Natural Resource Management Plan (NRMP). I modified methods from past studies to expand on a recently completed trail condition class assessment, which subdivided the Forest Park trail system into four classes of ~250' trail sections. Linear regression analyses indicated grade and distance to drainage features explained soil loss at much higher levels than seen in past trail impact studies in other natural areas. Since average trail grade proved explanatory of soil loss in linear regression models, I developed and compared average grade variables derived in GIS using new and existing methods. I then used these data to define trail sustainability based on recent recreation ecology literature. The collective methods of my research provide a template for expanding objective trail impact assessments throughout Forest Park, while results and recommendations can help prioritize management action, inform environmental reviews and justify funding for trail system improvements.

Keywords: GIS / modeling, Soil science, Sustainable development, Land/watershed management, Hydrology

Johnson Creek Watershed Council's cold water restoration strategy

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Johnson Creek flows 26 miles from Boring, through Damascus, Gresham, Southeast Portland and ultimately to its confluence with the Willamette River in Milwaukie. Like many streams with a significant urban watershed component, Johnson Creek and its resident anadromous fish population are vulnerable to the impacts of climate change. For the past 11 years, Johnson Creek Watershed Council has focused its riparian restoration on taxlots most in need of shade, identified with a Heat Source model. For the past five years, the Council has removed, repaired, or retrofitted six fish passage barriers, focusing its efforts on opening up habitat in tributaries that have high natural cold water potential. Extensive stream temperature monitoring, combined with environmental DNA testing, provide preliminary clues to the benefits of this strategy.

Keywords: Fisheries, Climate Change, Land/watershed management

Rinearson Creek Natural Area: A restoration project for Portland Harbor Superfund Site

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Rinearson Creek Natural Area project is an aquatic, riparian, and upland forest restoration and enhancement project developed in coordination with the Portland Harbor Natural Resource Trustee Council. The habitat values provided by this innovative project can be used to offset Natural Resource Damages (NRD) resulting from past industrial use along the Willamette River in Portland, Oregon. The restoration site encompasses approximately 34 acres along lower Rinearson Creek within the floodplain of the Willamette River and includes the dammed pond, segments of flowing Rinearson Creek, and riparian and upland forests. Rinearson Creek is a perennial tributary that enters the lower Willamette River at River Mile 24, just downstream from the confluence with the Clackamas River within the broader Portland Harbor restoration focus area (NOAA 2012). An earthen dam and water control structure are located on Rinearson Creek within the floodplain of the Willamette River. The Project plan includes modification of the dam then restoring the stream channels along with associated wetland and riparian habitats, and enhancement of upland forest habitats. Restoration at this site involved: lowering and modifying the existing earthen dam; modifying the channel downstream of the dam to allow for fish passage and to improve connectivity to Willamette River during high water events; creating shallow-water habitats along the river for salmonids; improving the channel outlet to the Willamette river to provide shallow water habitats and cold water refugia; creating seasonal and perennial emergent wetland and open water habitats; re-contouring the stream channel to a more natural meander, and adding large woody debris to the restored channel; and enhancing wetland and riparian habitat by controlling invasive species. Rinearson Creek Natural Area is currently in its second monitoring year and some of the highlights of the success are: documented presence of juvenile Chinook and Coho Salmon and nine other species of fish; increased presence of Western painted turtle (non targeted species); control of invasive species and replanting of native plants; improved water quality and water temperature; increased wildlife throughout the site. The Rinearson Creek Project is still in its early stages of maturation and will continue to monitor and treat the site to ensure its continued success as part of the larger Portland Harbor Superfund clean up.

Keywords: Habitat restoration

Enhancing grassland habitat in the middle of the Columbia River

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The Port of Portland initiated a 50-acre grassland enhancement project on Government Island in 2012 to mitigate for future impacts at properties adjacent to the Portland International Airport. One of the primary project objectives was to create a site that provides the habitat structure and function necessary to support grassland associated wildlife, particularly grassland birds and pollinators. Prior to implementation the site was highly degraded and dominated almost exclusively by pasture grass and non-native broadleaf species. The Port began site preparation in 2012 which included herbicide applications and mowing to achieve the bare ground necessary for seeding. In the fall of 2015, the site was seeded with seven species of native grasses and 26 species of native forbs including 2000 hand planted native camas bulbs. Since 2015, site maintenance has been ongoing, utilizing principles of adaptive management and the expertise of site managers. The enhancement efforts were also expanded to the riverbanks and into forested areas within the site to control the spread of weeds from adjacent areas. An extensive seed bank of pasture grasses and other weeds, surrounding degraded habitat, anthropogenic pressures, intermittent flooding and access only by boat add complexity for management of the site. Starting in 2010 and continuing through 2020, the Port has formally monitored bird usage and vegetation composition, as well as partnering with the Xerces Society to monitor pollinator species pre- and post-implementation to track and document the site's progress. The first 50-acre phase of this ongoing project will help inform management strategies for up to 250 additional acres of grassland mitigation on the island.

Keywords: Conservation biology, Habitat restoration, Animal ecology, Plant ecology

Looking beyond facility location to evaluate equity in the distribution of green stormwater infrastructure

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Green stormwater infrastructure (GSI) has long been touted as a multi-purpose approach to stormwater management that offers environmental, economic, and social benefits, and many cities across the U.S. are incorporating GSI into stormwater management plans. There is an underlying assumption that the installation of GSI results in benefits to the communities in which they are located, and as a result, it is assumed that the placement of GSI in marginalized communities creates an equitable distribution of green amenities. However, evaluation of the physical distribution of GSI does not capture the site-specific contexts that can lead to variability in the outcomes of and benefits derived from GSI structures. We hypothesize that conditions of GSI ecosystems are variable within and across cities, producing unique outcomes that may differ across individual facilities, and the potential benefits of GSI are conditional on these outcomes. This study examines the distribution of ecosystem services of GSI in neighborhoods with differing sociodemographic characteristics in two US cities. Thirty GSI facilities were surveyed in Portland, Oregon and Baltimore, Maryland in 2016. At the time of sampling, we found that ecosystem services serving the watershed (infiltration, nutrient removal) were evenly distributed within and across cities, however, ecosystem services serving the viewshed (aesthetics, ecosystem health) were unevenly distributed, with more visible signs of maintenance and care occurring in wealthier and whiter neighborhoods. Our results suggest that maintenance plans may affect the quality of GSI and play a role in determining equitable distribution of benefits derived from GSI.

Keywords: Environmental social sciences, Land/watershed management, Sustainable development

Invasive species mapping and community outreach at Mary S. Young State Park

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Early detection and rapid response of invasive species outbreaks is important in preventing significant damage to the environment and cost to management efforts. Ongoing invasive species management occurs at Mary S. Young Park, a state park in West Linn, Oregon. To better inform volunteer eradication efforts and utilize citizen science, the need to map current and future invasive outbreaks using spatial analysis has emerged. Using Google Maps and ArcGIS, invasive species outbreaks were located and mapped to show species frequency and spatial distribution. We discovered a high frequency of English Holly (*Ilex aquifolium*), and suggest the species poses a high risk of habitat expansion within the Willamette river basin and essential riparian habitat along the banks of the river at the park. The utilization of ArcGIS StoryMap and Google Suite for community outreach builds a baseline system for collecting historical spatial data and facilitates community and volunteer engagement in future invasive species management at the park.

Keywords: GIS / modeling, Habitat restoration, Land/watershed management

Oak Prairie Working Group Oak Prioritization Mapping

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The Intertwine Alliance Oak Prairie Work Group (OPWG), a partnership of more than 30 agency, nonprofit, and community groups, completed a working Strategic Action Plan (SAP) to guide our conservation outcomes for imperiled Oregon white oak ecosystems. The SAP outlines actions for advancing spatial data, land conservation, active stewardship, knowledge, and community education, engagement, and advocacy around oak and prairie conservation. This talk outlines the work that the Oak Prairie Work Group is doing with Biohabitats, Inc. to create a spatial prioritization of oak conservation opportunities across the Regional Conservation Strategy planning area. Identifying high value conservation opportunities in both rural and urban landscapes, and prioritizing those opportunities, is needed to inform investments in land protection, restoration, and education and outreach. Our process includes overlaying mapped oak trees with landcover data and identifying and scoring the presence of oak at two different spatial configurations while also accounting for connectivity between high value habitat cores. Habitat patches are scored separately in rural areas than in urban areas to allow for the variability in habitat quality among these different landscapes and to ensure that corridors and connectivity across the urban matrix is included.

Keywords: GIS / modeling, Habitat assessment

Restoring habitat for fish and wildlife Injured by contamination in the Portland Harbor Superfund Site

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Habitat restoration in Portland Harbor is underway. This presentation will provide an overview of habitat restoration planning efforts led by NOAA and the Portland Harbor Natural Resource Trustee Council. The Trustee Council is made up of representatives from five Tribes and several state and federal agencies. Together these entities developed an ecological restoration plan to restore habitat for natural resources impacted by contamination from the Portland Harbor Superfund Site. The 11 mile stretch of the Willamette River that brings these entities together is listed as a Superfund Site due to high levels of multiple harmful pollutants. This same stretch of the river provides vital habitat to fish and wildlife of special significance to the Tribes and the public, including several runs of endangered salmon and steelhead, Pacific lamprey, mink, Bald Eagle, and many more. To restore habitat for these fish and wildlife, projects (also called restoration banks) were constructed by private companies that intend to sell credits from the projects. This presentation will serve as an introduction to the Alder Creek, Linnton Mill, PGE Harborton, and Rinearson Natural Area restoration projects. Presentations on three of these projects will be provided by the project managers, focusing on their specific restoration projects, lessons learned, and monitoring results. Combined, these 4 constructed restoration projects have restored 165 acres of habitat in a heavily urban and industrial stretch of the mainstem of the Willamette River.

Keywords: Habitat restoration

Estimating federal agents' deployment of lethal zinc chloride gas in Portland Oregon using a Bayesian hierarchical model

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Law enforcement's use of chemical weapons is a threat to human and environmental health, exemplified during 2020 Black Lives Matter protests in Portland, Oregon, where city, county, state, and federal agencies have deployed various chemicals for over 100 days. In July, US Department of Homeland Security (DHS) agents used an exceptionally toxic and unknown weapon to quell free speech in support of Black lives and against federal presence. With significant support from the community, I combined first-hand accounts, print media, videos and photos of munitions, primary literature, and analytical chemistry to identify the weapon as gaseous Zinc Chloride ($ZnCl_2$) from Hexachloroethane (HC) "smoke" grenades. I used hierarchical Bayesian methods to estimate that DHS deployed 26 (25 – 30; 95% CI) HC grenades in July, which, given the toxicity of $ZnCl_2$, was enough to kill 235 (156 – 306) people. Although no fatalities were associated with this $ZnCl_2$ release, it led to acute, delayed, and persistent health issues in the exposed population, including bystanders. Given alignment of novel mass symptoms with prior case histories, however, $ZnCl_2$ is certainly the causal agent. $ZnCl_2$ also significantly defoliated trees whose canopies cover the deployment zone, as expected from prior research. Elevated Zn levels were also detected in stormwater samples, threatening the Willamette River ecosystem. DHS's wanton use of $ZnCl_2$ against protesters has created a human and environmental health crisis that extended well beyond the protests' footprint in downtown Portland and will have lasting impacts for decades.

Keywords: Air quality, Environmental social sciences, Land/watershed management

Considerations when mixing source populations for plants in restoration

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While it is commonly understood that diverse genetics in plant populations assist with ecological or species recovery, genetic theory is difficult to distill into concrete decisions for action. An approach called Regional Admixture Provenance mixes seeds from multiple populations within the same geographic region and has been suggested as one method for establishing genetically diverse populations. However, few studies have examined this technique empirically to see how established populations compare to source populations and target outcomes. We used neutral genetic markers to follow genetic diversity through the production of golden paintbrush (*Castilleja levisecta*) for reintroduction. We tracked diversity from wild-collected source populations, through different production approaches, and into reintroduction. We found that measures of genetic diversity changed during production and that the step at which seed sources were combined affected how populations were represented in final reintroduction sites. We provide suggestions for best management techniques when working with both rare and common species.

Keywords: Plant ecology, Habitat restoration

Greater Portland-Vancouver Metro area City Nature Challenge

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The City Nature Challenge is a worldwide bioblitz and community science project to observe and document as much biodiversity as possible in a 4-day period. This year, the Greater Portland-Vancouver Metro Area will join 416 other cities in 45 countries in the City Nature Challenge for the very first time! All skill levels are encouraged to participate, but individuals or organizations must have an iNaturalist account. Observations must include a photo/video or a sound recording and must be uploaded to iNaturalist between April 30 and May 3, 2021. Observations can be identified on iNaturalist until May 9. Those with identification expertise are encouraged to help verify observations after the observation period. All organizations and individuals are encouraged to follow social-distancing and mask wearing requirements when participating. Join us in this effort to add to the biodiversity knowledge of the Portland-Vancouver area while engaging volunteers to explore and learn about our rich biological heritage.

Keywords: Conservation biology, Ecology, Environmental education

Nest preferences of solitary cavity nesting bees in Portland, Oregon

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Native bees are threatened by habitat loss through urbanization, however there is increasing interest in creating bee nesting habitat in urban areas. Although about a third of our native bees use cavity nests, few studies have examined the role of nest height or cavity size in attracting our lesser known native cavity-nesting bees, or even determined what species are present in the region. To determine what species were present, and whether they showed preferences for nesting at a certain height or cavity diameter, we set up artificial wooden cavity nest blocks across fourteen locations in the greater Portland, Oregon area. Wooden posts were erected with nest blocks at three different heights (0.5, 1.5, and 2.3 meters), and to accommodate a diversity of bee species, cavity diameters ranged from 3.0 to 10.0 mm. The nests were retrieved at the end of the season and the bees and wasps reared in the lab. We found that bees occupied 14% of the cavities, with a total occupancy rate of 27.5% by all bee and wasp occupants. Fifteen species of bees used the nest blocks, including eight genera of *Megachilidae* and one species of *Colletidae*. The diameter most occupied by bees was the 5.0 mm size at 60.2% and included nine bee species, and the different nest heights used varied across species. Nesting preference data will be used to better inform residents of greater Portland how best to provide nesting habitat for cavity nesting bees, and the solitary wasps that use similar nesting sites.

Keywords: Wildlife biology, Conservation biology, Habitat assessment

Stormwater management at Portland State University with the uncertainty of climate change

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As climate change persists, precipitation events are expected to become more severe, resulting in increased stormwater runoff. Therefore, the importance of implementing new and upgrading aging stormwater green infrastructure (SGI) is required to reduce its impacts. Stormwater runoff is water typically from rain that is unable to naturally soak into the ground as a result of high amounts of impervious surfaces. When precipitation events occur, stormwater travels across impervious surfaces collecting soils, pet waste, litter, oil, and grease, which can negatively impact water quality in receiving waters. Additionally, stormwater has human health impacts, specifically through flooding and the contamination of drinking water. Portland State University (PSU), located in the middle of downtown Portland, Oregon is a highly urbanized area with stormwater management needs. To reduce runoff, the university has implemented SGI such as bioswales, rainwater reuse systems, and flow-through planters. However, the effectiveness of these systems has not been analyzed. In collaboration with PSU's Campus Sustainability Office, we are creating a comprehensive inventory of the SGI on campus and determining its effectiveness in reducing stormwater currently and in the future. To do this, we are using the Environmental Protection Agency's Stormwater Management Model (EPA SWMM) to model PSU's buildings along with their various facilities. We will use current and future predicted precipitation data to estimate how stormwater runoff at the university will change with increased rainfall. Finally, we will propose recommendations to the university based on these findings for the next 15-20 years.

Keywords: Climate Change, Water quality, Sustainable development

Repeat topographic surveys combining lidar with UAV structure from motion data for change detection of two landslides

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Repeat topographic surveys are used for detecting changes in dynamic environments. The findings of repeat topographic surveys conducted on two landslides in the Tillamook State Forest of northwest Oregon are presented. Both landslides occurred on steep slopes with histories of industrial forestry. This study was conducted to measure the areas and volumes of erosion and deposition associated with each landslide. Baseline topographic data, captured prior to the landslides, was from free, publicly available Lidar data from state-sponsored manned aircraft surveys. Data from after the landslides was collected using low-cost Unmanned Aerial Vehicles (UAVs) and processed using standard Structure from Motion (SfM) photogrammetry techniques to acquire topographic data. The UAV data acquisition and processing was cost and time effective and resulted in high resolution point-cloud and DEM data for subsequent volume analysis. The difference between the Lidar and UAV datasets was used for cut/fill analysis to identify areas of erosion, deposition, and highlight impacts to the West Fork North Fork Wilson River floodplain and channel using open-source software. Documentation of the methods and 3D results visualizations of volumetric analysis are presented. Application of these economically approachable methods have value in geomorphology, fluvial geomorphology, and river restoration.

Keywords: Geology, GIS / modeling, Land/watershed management

Survival and growth of Pacific madrone following four years of establishment care

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The Pacific madrone (*Arbutus menziesii*) presents a perplexing challenge for tree planting projects in urban areas of the Pacific Northwest. The charismatic evergreen is desirable for its environmental and aesthetic benefits and seeming tolerance of tough conditions. At the same time, survival of individual plants in planting projects is low. In January of 2017, we planted 144 Pacific madrone trees in Baltimore Woods, a restored urban natural area in North Portland. Plots were designed to test irrigation frequency, exposure to light, and size-at-planting on survival and growth. This work is intended to inform planting and establishment protocols that increase the survival of newly planted Pacific madrone trees. Here we share a summary of our findings following four years of establishment care.

Keywords: Plant ecology, Land/watershed management, Habitat restoration

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