

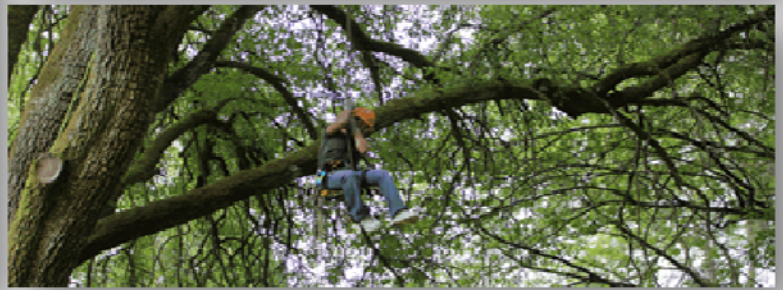
Celebrating



Years



**Proceedings for the
10th Annual
Urban Ecology and
Conservation Symposium
- February 24, 2012 -**



10TH ANNUAL
URBAN ECOLOGY & CONSERVATION SYMPOSIUM

Organized by the
Urban Ecosystem Research Consortium (UERC)

Held at
Smith Memorial Center Ballroom
Portland State University
Portland, Oregon, USA
February 24, 2012

Cover photo credits

Top: Dave Marshall (1947), Tom McAllister

Lower left (clockwise from margin): Escuela Viva Community School depaving and greening, Eric Rosewall; Mt. Tabor Green Street Maintenance Program, Ted Hart; Hoverfly visiting Portland Building ecoroof, Casey Cunningham; Willamette River/Johnson Creek Confluence - Salmon Habitat Enhancement Project, Robin Jenkinson; Night heron, Wikipedia Commons; South waterfront ecoroofs, SW Portland, Casey Cunningham

Lower right: Holy Redeemer Church depaving and greening, Eric Rosewall; Volunteer conducting street tree inventory, Courtesy of PP&R Urban Forestry

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Urban Ecosystem Research Consortium (UERC) Portland, Ore. – Vancouver, Wash. 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:

<i>air quality</i>	<i>environmental design</i>	<i>land management</i>	<i>sustainable development</i>
<i>conservation biology</i>	<i>fisheries</i>	<i>land use planning</i>	<i>transportation</i>
<i>ecology</i>	<i>geology</i>	<i>social sciences</i>	<i>water quality</i>
<i>economics</i>	<i>habitat restoration</i>	<i>soil science</i>	<i>wildlife biology</i>
<i>education</i>	<i>hydrology</i>	<i>stormwater management</i>	

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 citizens 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 have served 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.

<i>Audubon Society of Portland</i>	<i>Oregon Department of Fish and Wildlife</i>
<i>City of Portland</i>	<i>Oregon State University</i>
<i>City of Vancouver</i>	<i>Portland State University</i>
<i>Earthworks</i>	<i>Reed College</i>
<i>Herrera Environmental Consultants</i>	<i>Tualatin Hills Parks & Recreation District</i>
<i>Lewis & Clark College</i>	<i>U.S. Fish and Wildlife Service</i>
<i>Metro</i>	<i>Urban Greenspaces Institute</i>

Web Site – The UERC web site can be found at <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.

CELEBRATING TEN YEARS!

In Recognition of the Founders and Committee Members of the Urban Ecosystem Research Consortium

Founding Members:

Jennifer Budhabhatti, Metro
Lori Hennings, Metro
Mike Houck, Audubon Society of Portland/Urban Greenspaces Institute
Kelli Larson, Oregon State University
Holly Michael, Oregon Department of Fish and Wildlife
Lauri Shainsky, Portland State University
Jennifer Thompson, U.S. Fish and Wildlife Service
Alan Yeakley, Portland State University

2012 Symposium Planning Committee Members

Bruce Barbarasch
Tualatin Hills Park & Recreation District

Amy Chomowicz
City of Portland, Environmental Services

Sean Gordon
Oregon State University, Department of
Forest Engineering, Resources and Management

Lori Hennings
Metro, Sustainability Center

Mike Houck
Urban Greenspaces Institute

Martin Lafrenz
Portland State University, Department of Geography

Noelwah Netusil
Reed College, Department of Economics

Bob Sallinger
Audubon Society of Portland

Cory Samia
Vancouver Water Resources Education Center

Jennifer Thompson
U.S. Fish and Wildlife Service, Oregon State Office

Alan Yeakley
Portland State University, Environmental Science



REED COLLEGE

Metro



We also wish to thank Marjorie Brown, City of Portland and Carrie Belding, Metro for their assistance with the 2012 symposium and the Audubon Society of Portland, Metro, City of Portland and Urban Greenspaces Institute for their financial sponsorship.

History of Steering Committee Members

Served all 10 years:

Lori Hennings, Metro (2003-2012)

Mike Houck, Audubon Society /Urban Greenspaces Institute (2003-2012)

Jennifer Thompson, U.S. Fish and Wildlife Service (2003-2012)

Alan Yeakley, Portland State University (2003-2012)

Served 9 years:

Noelwah Netusil, Reed College (2004-2012)

Bob Sallinger, Audubon Society of Portland (2004-2012)

Served 7 years

Amy Chomowicz, City of Portland (2006-2012)

Served 6 years

Josh Caplan, Portland State University (2005-2010)

Served 5 years

Bruce Barbarasch, Tualatin Hills Park & Recreation District (2008-2012)

Served 4 years

Cory Samia, Vancouver Water Resources Education Center (2009-2012)

Jennifer Budhabhatti, Metro (2003-2006)

Served 3 years

Josh Cerra, Herrera Environmental Consultants (2009-2011)

Stephen Metzler, EarthWorks(2006-2008)

Kelli Larson, Oregon State University (2003-2005)

Lauri Shainsky, Portland State University (2003-2005)

Served 2 years

Paul Ketcham, Metro/City of Portland (2006-2007)

Holly Michael, Oregon Department of Fish and Wildlife (2003-2004)

Year of service

Sean Gordon, Oregon State University (2012)

Martin Lafrenz, Portland State University (2012)

Elizabeth (Liz) Safran, Lewis and Clark College (2006)

Vicky Ridge-Cooney, City of Vancouver (2004)

Karen Wegner, Oregon State University (2004)

With great appreciation for the assistance of:

Carrie Belding, Metro

Marjorie Brown, City of Portland

Cris Holm, Portland State University

Melissa Kennedy, U.S. Fish Wildlife Service

Karen Munday, Audubon Society of Portland/

Tualatin Hills Parks & Recreation

Teri McKenzie, Portland State University

Nancy Pollot, U.S. Fish and Wildlife Service

David B. Marshall

(March 7, 1926 - November 22, 2011)

Oregon lost one of its greatest champions for wildlife in November 2011. David B. Marshall was born and raised in Portland, and became interested in birds at a very early age. His interactions with naturalists such as Stanley Jewett, Ira Gabrielson, and William L. Finley cemented his desire to become a professional wildlife biologist.



Photo by Claire Puchy



Dave Marshall with a young red-winged blackbird at McFadden's Marsh, Benton County in 1947. The marsh is now part of the William L. Finley National Wildlife Refuge, which Dave helped establish years later.

Photo by Tom McAllister

After serving in World War II, he worked for the U.S. Forest Service and for Crater Lake National Park, and then attended Oregon State College, where he graduated with a degree in Fish and Game Management. Marshall fulfilled his dream when he was hired to work with the U.S. Fish and Wildlife Service (USFWS) at the Stillwater National Wildlife Refuge in Nevada, and later at the Sacramento refuge complex and Malheur National Wildlife Refuge. Marshall subsequently worked in the Regional Office of the USFWS as the Regional Wildlife Biologist. During that time, he was involved in the management of new refuges in Hawaii and Alaska, and was instrumental in the establishment of Ankeny, William L. Finley, and Baskett Slough refuges in Oregon's Willamette Valley. He also helped establish the Lewis and Clark refuge on the Columbia River, and additional units to the Oregon Islands refuges.

In 1973, Marshall became chief biologist for birds and mammals in the new endangered species program in Washington, D.C., returning to Portland in 1976 to become the Regional Endangered Species Coordinator.

Marshall retired from the USFWS in 1981 after 32 years of service, but continued to make significant contributions to wildlife and wildlife habitat. Working as a consultant, he authored a number of significant documents for the Oregon Department of Fish and Wildlife, including





Oregon's first plan for nongame wildlife (1986), which was a model for other states. He helped update that document, resulting in the *Oregon Wildlife Diversity Plan* (1993)--the precursor to the *Oregon Conservation Strategy*. Marshall helped assemble the first Sensitive Species List for Oregon, co-authored *Sensitive Vertebrates of Oregon* (1992) and *Species at Risk* (1996), and prepared status reports on the marbled murrelet and other species.

In 1998, Marshall began work on what may be considered his seminal accomplishment--the update of Gabrielson and Jewett's 1940 *Birds of Oregon*. He was the senior editor for that project, the result of which was *Birds of Oregon: A General Reference* (Oregon State University Press, 2003). This is considered the definitive source of ornithological information for Oregon.

Dave Marshall left an amazing legacy and, without a doubt, will be considered one of Oregon's true conservation heroes. Although he is no longer with us, his passion for birds and his life-long commitment to wildlife conservation will continue to inspire us.



The UERC gave a tribute to the Northwest Service Academy at the 2011 symposium...

UPDATE!



www.confluenceenvironmentalcenter.org

What's Going on With Confluence?

At this time last year, Confluence Environmental Center was just an idea. Northwest Service Academy had shut down, and Confluence was writing an Oregon AmeriCorps grant, hoping to rebuild the closest thing our region had had to a conservation leadership development program.

Thanks to the support of many, our first grant application to Oregon Volunteers was successful. Confluence is now running a 20-member Individual Placement AmeriCorps program focusing on health, watersheds, energy and resource conservation, and environmental and garden-based education, with a focus on including low-income communities and communities of color in these efforts. The first cohort of Confluence members began their year in September 2011. The Confluence office is located at 5441 SE Belmont St., Suite E205.

What's Next?

There is a lot to be done to both meet a large community need and to build a healthy and stable organization. We are currently:

- Applying for our 501c3 Nonprofit status
- Building our board of directors
- Identifying high-priority areas for future programmatic work; many people involved in the UERC have been part of this process
- In May we'll learn if our partnership between Confluence, and ReCharge America to run a West Coast initiative to engage AmeriCorps members in more energy conservation work has been funded. If it is, we'll coordinate the Pacific Northwest component of this program.

How You Can Help

- **Apply for an AmeriCorps Member for the 2012-13 cycle.** Members will begin in September 2011. Contact Lara Jones, below, for more information.
- **Serve on the Confluence Board of Directors**, advisory groups, or other efforts to help build the organization. Contact Neil Schulman for more information.
- **Help us develop new program ideas and proposals** that meet important needs in the region. Contact Neil Schulman, below.

For Confluence Organization Development, Future Programming, etc:

Neil Schulman
Confluence Board of Directors
503-929-4028
neil@neilschulman.com

For AmeriCorps Program Information:

Lara Jones, AmeriCorps Program Director
503-719-6779
ljones@confluencecenter.org



2012 Urban Ecology & Conservation Symposium AGENDA

8:00 REGISTRATION

9:00 WELCOME AND INTRODUCTION: Alan Yeakley

9:10 OPENING KEYNOTE ADDRESS: **Jim LaBonte**, Entomologist, Oregon Department of Agriculture
The Undiscovered Country of Urban Invertebrates

BUILDING CONSERVATION TOOLS AND CAPACITY Moderator: *Jennifer Thompson*

9:50 Teresa Burcsu OSU Institute for Natural Resources Mapping and priority setting for The Intertwine Alliance's Regional Conservation Strategy

10:00 Alan Yeakley Portland State University Portland-Vancouver ULTRA-Ex: Evaluating the role of governance in building resilient urban ecosystems

10:10 Howard Silverman Ecotrust Envisioning ecosystem services in the greater Portland region

10:20 Stuart Cowan Autopoiesis LLC The economics of change: catalyzing the investment shift toward a restorative built environment

10:30 Q&A

10:40 BREAK Raffle at 10:55

WATER QUALITY Moderator: *Amy Chomowicz*

11:00 Gretchen Rollwagen-Bollens Washington State University Assessing the role of zooplankton grazing on the development and decline of cyanobacteria blooms in Vancouver Lake, WA

11:10 Ted Labbe Kingfisher Ecological Services Water typing map errors and land use threats to stream habitat in Salmon Creek watershed, Clark County, WA

11:20 Bridget Deemer Washington State University Vancouver Elevated nitrogen and phosphorus concentrations in urbanizing southwest Washington streams

11:30 Torrey Lindbo City of Gresham - Department of Environmental Services Watershed-wide temperature assessment of Johnson Creek

11:40 Jamie Stamberger City of Gresham - Department of Environmental Services Cost/benefit comparison of private residential versus public right of way stormwater retrofits

11:50 Q&A

12:00 LUNCH , DISCUSSION GROUPS & INFORMAL POSTER SESSION *Raffle at 1:25*

You are invited to participate in lunchtime discussions around various topics, at your option. Details will be provided at the symposium. Posters will also be available for viewing during this time.

1:30 AFTERNOON KEYNOTE ADDRESS: Steven Whitney, Program Officer, Bullitt Foundation
Urban Research and the Future of Cascadia: Perspectives from a Funder's Perch

VEGETATION AND HABITAT *Moderator: Sean Gordon*

- | | | | |
|-------------|-----------------|---|---|
| 2:10 | Kevin Tyler | Clark County - Department of Environmental Services | Floodplain restoration as a holistic, cumulative basin approach to mitigating stormwater impacts in Whipple Creek, Clark County, WA |
| 2:20 | Jennifer Karpis | City of Portland - Bureau of Environmental Services | Young tree monitoring: metrics for planting program success and fodder for long-range planning |
| 2:30 | Toby Query | City of Portland – Bureau of Environmental Services | Now that you've found ivy, what are you going to do with it? Three years of test plots on the timing and control of <i>Hedera helix</i> |
| 2:40 | Britta Orwick | Portland State University | Non-native magnificent bryozoans (<i>Pectinatella magnifica</i>): increased occurrence in the Pacific NW? |
| 2:50 | Q&A | | |

3:00 BREAK

3:15 AUDIENCE PARTICIPATION: Celebrating the 10th Annual Symposium *Moderator: Cory Samia*

Please share stories about what you have gained by attending UERC symposia, such as ways you or your organization have benefited from making connections, networking or exchanging information.

WILDLIFE AND WATERSHEDS *Moderator: Mathew Dorfman*

- | | | | |
|-------------|------------------|---|---|
| 3:30 | Andrew Dietrich | Portland State University | Identification of development-related impacts on stream-associated amphibian communities in forested refugia of the Portland, Oregon region |
| 3:40 | Susan Barnes | Oregon Department of Fish and Wildlife | Building a conservation plan for native turtles along the Columbia Slough, Portland |
| 3:50 | Susan Barnes | Oregon Department of Fish and Wildlife | Living with American beaver & beaver relocation – a practical summary guide by ODFW |
| 4:00 | Shannah Anderson | City of Portland – Bureau of Environmental Services | Johnson Creek Acquisition Strategy: Investing in a Natural Area Network |
| 4:10 | Q&A | | |

4:20 WRAP UP: Closing remarks by Lori Hennings

4:30 – 6:00 POSTER SESSION AND SOCIAL

POSTER PRESENTATIONS

AUTHOR(S)	TITLE
Manar Alattar	Novel method for treatment of micro-aerobic compost leachate using black soldier fly larvae
Leslie Bliss-Ketchum, Catherine de Rivera and Kerry Rappold	The influence of artificial light on wildlife use of undercrossing structures
Nancy Broshot, Conor Colahan and Eric Weinbender	Western red cedar sapling growth and survival, six years later
Casey Cunningham	Ecoroof research underway in the City of Portland
Sarah Eastman	Graywater reuse: a guide for Oregon homeowners
Danielle Fuchs	A collaborative approach to developing neighborhood street tree management plans
Sean Gordon, Mark Stephan and Paul Thiers	Across the river: A comparison of approaches to water quality in two cities, Portland OR and Vancouver WA
Robin Jenkinson	The Johnson Creek - Willamette River Confluence Salmon Habitat Enhancement Project
Bailey Johnston and Todd Rosenstiel	Plant species composition effects on greenroof stormwater retention in Portland, Oregon.
Ashley King and Brian Zahora	Bringing salmon back to Salmon Creek by educating and engaging the community
Tammy Lee, Gretchen Rollwagen-Bollens and Steve Bollens	Environmental influences on cyanobacteria harmful algal blooms in Vancouver Lake, Washington
Monte Mattsson and Robert Richardson	Ross Island Natural Area: Monitoring terrestrial arthropods
Jason Niedermeyer	Using the ethology of urban wildlife to teach students about the nature of science
Connie Ozawa, Alan Yeakley, Denisse Fisher de Leon and Chad Armstrong	Long-term management of urban riparian greenspaces in the Portland-Vancouver metropolitan area
Sarah Pettigrew	The difference in acclimation to humans between <i>Sciurus griseus</i> and <i>Sciurus carolinensis</i> by the means of a human provided food source in an urban park
Hannah M. Prather, Nancy E. Broshot and Todd N. Rosenstiel	Anthropogenic influences on epiphytic biodiversity across the Portland urban airshed
Meenakshi Rao	Can trees mitigate the health impact of urban air pollution? A modeling study in Portland, OR

AUTHOR(S)	TITLE
Kassie Ridley, Jacinda Mainard, Meenakshi Rao and Linda George	Assessment of Ecosystem Services of I-205 Friends of Trees Planting Project
Gretchen Rollwagen-Bollens, Marion Dresner and Steven Braun	Portland-Vancouver Ultra-Ex: How do field-based water quality research experiences for K-12 teachers impact understanding and appreciation for urban ecology and stewardship?
Gretchen Rollwagen-Bollens, Tamara Holmlund Nelson, Anne Kennedy, Bonnie Lock, Meagan Graves, Stephen Bollens and Brian Tissot	Partners in Discovery GK-12 project at WSU Vancouver: Building scientist-teacher collaborations to support student learning and inquiry skills
Lisa Rosenthal	Hummingbird dominance over a feeder: vigilant behavior of hummingbirds when occupying an urban residential feeder
Jeff Schnabel	Clark County Stream Health Report
Lauren Senkyr, Jennifer Hughes, Jennifer Peers and Jennifer Thompson	Restoration planning for the Portland Harbor Superfund Site
Alexander Stauch	Eradication of <i>Ludwigia peploides</i> ssp. <i>montevidensis</i> from the Blue Heron Wetlands of northeast Portland, Oregon.
Paul Thiers, Heejun Chang, Sonia Singh, J. Alan Yeakley, Stephen M. Bollens, John Harrison, Gretchen Rollwagen-Bollens, Noelwah R. Netusil, Michael Kincaid and Alexander Walker	Effects of Land Cover and Governance on Water Quality in the Portland-Vancouver metropolitan area
Christa von Behren, Andrew Dietrich and Alan Yeakley	Community composition of urban riparian vegetation



MORNING KEYNOTE ADDRESS

James R. LaBonte

Taxonomic and Survey Entomologist
Oregon Department of Agriculture
Salem, Oregon

The Undiscovered Country of Urban Invertebrates

Terrestrial macroinvertebrates (hereafter simply "invertebrates") are non-aquatic animals without backbones that are visible without a microscope, such as worms, slugs, and insects. They represent the vast majority of animal species diversity, are in every terrestrial habitat, fill almost every ecological role, and are the most abundant multicellular organisms. Without an adequate contingent of these animals, ecosystems would collapse and we would become extinct. Despite their importance, we are surprisingly ignorant of the "undiscovered country" of invertebrates.

There are probably at least 10,000 species of invertebrates in the Portland-Vancouver metropolitan area. While some of these organisms are familiar, most are obscure creatures about which very little is known. There are undoubtedly many un-described species in this area. For instance, I've found one genus and several species of beetles new to science in the Willamette Valley and western Oregon and even have a beetle and a worm named after me.

Unfortunately, mainly due to global commerce, about 10% of the Portland/Vancouver invertebrate species are exotic. Some of these species can cause ecological and economic damage, although others, such as the cinnabar moth, have been intentionally introduced to control exotic invasive weeds. Harmful species include: a recently detected European ground beetle that threatens native ground beetles and endangered butterflies, a Southwestern bark beetle carrying a disease lethal to walnut trees, European earthworms whose actions favor exotic weeds and displace native earthworms, and intentionally introduced ladybird beetles preying upon and competitively displacing native ladybird beetles. Introductions of new major pests, such as the gypsy moth, would have huge ecological and economic consequences.

Local native invertebrates are extremely diverse and abundant. Among these are: the world's largest flea; rain beetles (males fly at night during the fall and winter with a body temperature warmer than humans); the region's largest beetles, crickets, and moths; hermaphroditic snails who shoot "love" darts at each other; pseudoscorpions (like tiny scorpions without tails), the only organisms with poison glands in their pincers; beetles which capture elusive prey by rapidly extending their "tongues"; and Oregon's only glowworms. Complex interactions abound. A common millipede, which is a key decomposer, has bright yellow spots to warn potential predators that it can release cyanide (enough to kill other insects) while a defenseless caterpillar which feeds on bleeding heart imitates this coloration for its own protection. However, no defense is perfect: there is a ground beetle with special adaptations for eating the millipede without being affected by the cyanide.

The Portland/Vancouver metro area offers rich opportunities for discoveries about its fascinating invertebrates since we have only the most limited understanding of these creatures. With little more than an alert mind and sharp eyes, anyone can go into their backyard, local parks, or natural areas and learn something new to science about our urban invertebrates. As I have found, there are few more rewarding activities than the exploration of this "undiscovered country."

James R. LaBonte – Biography

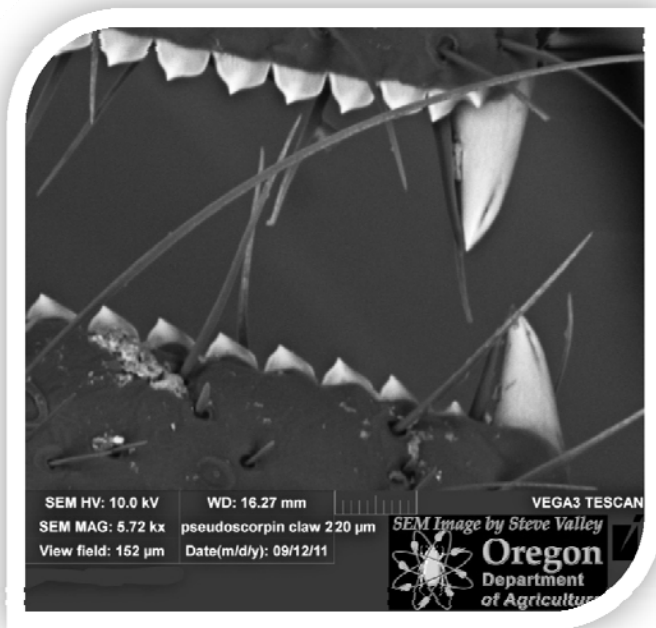
James R. LaBonte was born in Portland, Oregon. He received his B.Sc. and M.Sc. degrees in Entomology from Oregon State University (OSU). He is married to Diana N. Kimberling, an entomologist, and lives in Dallas, Oregon. While he has worked in entomology most of his career, he has also been the buyer for a dry sundries wholesaler, a business manager for a Japanese-language business and tourism guide, and a business manager for a psychiatric and substance abuse practice management firm.

Jim began his entomological career as an insect survey technician with the Oregon Department of Agriculture (ODA) in 1980. He left the ODA in 1986 and returned in 1997

while completing his graduate studies at OSU. Jim has been a survey entomologist, the lead taxonomic entomologist for the ODA, and the curator of the ODA insect collection since 2004. His responsibilities include oversight of all identifications performed by ODA entomological staff, directing and overseeing the activities of the entomological laboratory, the entomological imaging systems, all activities related to curation and maintenance of the entomological museum, developing proposals for funding related to identification and imaging projects as well as various

surveys (especially for exotic wood boring insects) and developing survey protocols for funded projects.

Jim has published over twenty peer-reviewed articles on a wide array of topics. His personal research focuses on the biology and systematics of Carabidae (ground beetles) and he has discovered several new species of this family in Oregon. His applied taxonomic expertise is with western North American and introduced insects, especially Coleoptera and some groups of Hymenoptera. He is the Western Region identifier for the joint USDA APHIS and Forest Service's "Early Detection and Rapid Response" (EDRR) survey for exotic woodboring insects and is also responsible for the identification of wood boring insects from USDA CAPS surveys in the APHIS Western Region.





AFTERNOON KEYNOTE ADDRESS

Steven Whitney
Program Officer
Bullitt Foundation
Seattle, Washington

Urban Research and the Future of Cascadia: Perspectives from a Funder's Perch

Any objective review of the leading indicators of global ecological health leads to just one conclusion: we're in a heap of trouble. It appears that perpetuation of humankind beyond the next few hundred years will require a radical transformation in the way we live, how we steward our natural capital, and how we measure human well-being. Further, with global population now topping 7 billion, and an increasing share of us living in metropolitan regions, it will be essential that we learn how to get urban sustainability right. Indeed, the world is searching for new models and innovations that can help lead the way – in planning, design, governance, economics, technology, transportation, human health, equity, and more.

Fortunately, in the northwest corner of the North American continent is a region – Cascadia, which places a premium, on innovation and is known for its enlightened leadership. Its leadership in science, technology, commerce, health, and culture, exert a disproportionate national, and even global impact relative to its size and population. Boeing, Amazon, Starbucks, Nike, Tektronix, Microsoft, Red Hook, Widmer, Pearl Jam and other iconic brands all attest to this fact; as does the world class teaching and research conducted at our region's major universities.

Cascadia can similarly provide global leadership in the quest for political and economic models that successfully reconcile our obligation to sustain healthy and resilient natural systems, with our understandable desire for health, convenience, and prosperity. Regional leaders can devise new urban priorities and policies that will not only confront the sustainability challenges here at home, but also establish replicable models that will be emulated throughout the world. Urban research can underpin these regional innovations by more effectively illuminating core problems, investigating potential remedies, and advancing viable solutions. And, professionals engaged in urban research can embrace their unique responsibility as civic leaders by crafting research agendas intended to inform public policy, not shy away from it. There is evidence this leadership is already beginning to emerge in Cascadia, and there is exciting work underway. Indeed, there is reason for hope.

Steven Whitney - Biography

Since 2000, Steve Whitney has served the Seattle-based Bullitt Foundation as a Program Officer, most of that time responsible for grants and other activities in the areas of aquatic and terrestrial conservation. More recently, with a shift in the Foundation's focus to issues of urban sustainability, Steve has narrowed the scope of his work to the protection of natural capital and ecosystem service values in the major metropolitan regions of the Pacific Northwest. He works with leading practitioners in the field, and supports or directly participates in innovative projects in Alaska, British Columbia, Washington, Oregon, Idaho, and Montana. He also is very active in the broader philanthropic community, especially through the Consultative Group on Biological Diversity (a national association of environmental foundations), where he just completed a six-year board term – three as board president.

Prior to joining the Bullitt Foundation, Steve spent fourteen years on the staff of The Wilderness Society, first as director of its National Parks Program in Washington D.C., and later as Northwest Regional Director, and Deputy Vice President for Regional Conservation. During his time at The Wilderness Society, and in a prior position with the National Parks Conservation Association, he regularly testified before Congress and served in a leadership capacity for a number of major conservation initiatives.

Notably, Steve was the founding chair of the Everglades Coalition and, in partnership with the state of Florida, led state and national environmental organizations in a campaign to restore and protect that unique and internationally significant subtropical ecosystem. He also had a hand in successful efforts to protect nearly seven million acres of the California Desert as designated wilderness or national parks, and in the establishment or enhancement of national park areas or wild and scenic rivers throughout the United States. Upon his return to the Pacific Northwest in 1993, Steve helped lead the environmental community's efforts to resolve the longstanding battle over the destruction of the region's old-growth forests, and to ensure the timely and effective implementation of the Northwest Forest Plan.

Steve's early career included time as a coastal land planning and development consultant in Florida and Washington State, and as a congressional aide to then Representative Leon Panetta of California. He has served on the City of Alexandria, Virginia's Environmental Policy Commission; on the governing boards of the Washington Environmental Council, Earth Share of Washington, Earth Ministry, and the Cascade Youth Symphony; and on the Advisory Council for the Washington Environmental Alliance for Voter Education.

Steve holds a Bachelor of Science degree from Utah State University's College of Natural Resources, and a Master's degree in Architecture and Urban Planning from the University of California, Los Angeles.



ABSTRACTS SUBMITTED

Manar Alattar

Portland State University - Biology Department, 1719 SW 10th Ave. SRTC 2 rm 246, Portland, OR 97201
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Novel method for treatment of micro-aerobic compost leachate using black soldier fly larvae

Micro-aerobic Composting, also known as Bokashi Fermentation, produces large amounts of acidic leachate rich in organic acids, alcohols and amines. Methods for treating such leachates have focused on microbial processing through aeration or anaerobic storage. We explore a novel treatment method which uses Black Soldier Fly Larvae (BSFL) to process the leachate. The larvae are able to tolerate the toxicity of the leachate as they feed on it, neutralize its acidity and decrease the concentration of organic acids, alcohols, organic N and toxicity. This method will potentially allow for the recirculation of the treated leachate back into fermentors which will increase the extent of degradation of organic matter. There is also evidence suggesting that larvae processed liquids may be valuable as agricultural liquid fertilizers.

Keywords: Soil science

Shannah Anderson

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Natural area acquisition for watershed health

The City of Portland manages stormwater as a resource as a directive of the Portland Watershed Management Plan (PWMP). In November of 2007 the Grey to Green Initiative was launched to accelerate principal elements of PWMP implementation, including purchasing 419 acres of natural area. BES is participating in natural area acquisition to protect watershed functions including groundwater recharge, hydrologic absorption, floodplain connectivity, and cooling capacity, to preserve habitat, and to support the recovery of sensitive wildlife. Natural area preservation also reduces reliance on piped systems to manage stormwater. Without protection of natural areas, development can lead to the loss of critical natural infrastructure such as forest canopies that intercept rain, streams and tributaries that moderate flows and provide aquatic habitat, uplands that support groundwater recharge, and vegetated areas that filter pollutants. This presentation will discuss the origin of Grey to Green's acquisition program, criteria used to identify acquisition candidates, and case study natural areas that support watershed health. To date, the Bureau has acquired 289 acres under this program umbrella.

Keywords: Conservation biology, Land/watershed management

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Living with American beaver & beaver relocation – a practical summary guide developed by ODFW

American beavers, dubbed by many “nature’s engineers”, are an important part of a healthy ecosystem. While the list of ecological benefits resulting from beaver presence and activity is long, there are also challenges to “living with beaver”, experienced by even those involved in habitat restoration efforts. ODFW recently developed a technical guidance document to aid in public education about beaver and the benefits they provide, but also to address the most common questions about and management challenges related to beaver activity. ODFW’s “*Living with Wildlife – American Beaver*” document describes beaver ecology, ecological benefits, and tips for viewing beaver. It also explains how to prevent conflicts and solve common problems, from herbivory to flooding. Applicable regulation, permit requirements, and control (non-lethal and lethal) options are described. ODFW has also defined suitable beaver habitat and developed guidelines for relocating beaver. The aim of these resources is to promote and attain conservation of American beaver throughout Oregon.

Keywords: Conservation biology, Environmental education

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The economics of change: catalyzing the investment shift toward a restorative built environment

This presentation will focus on the current “investment ceiling” within the real estate industry and our proposed changes that will redefine the current economics of real estate, prompting an investment shift toward restorative buildings and infrastructure. By integrating complex systems analysis, ecological economics and practical market experience, the presenters in this session will review new methodologies to assess, monetize and demonstrate the value of social and environmental benefits inherent in green buildings and infrastructure. The value captured by these benefits is identified by avoided externalities (e.g. zero impact on watershed) and positive externalities created through the restorative design principles of a Living Building (e.g. habitat/soil regeneration, elimination of toxics in material supply chain, beauty, water conservation, etc.). Our team has created a prototype modeling tool for the purpose of demonstrating how the incorporation of these additional monetized benefits into a real estate proforma may begin to positively alter investment decisions in the built environment. A new policy framework coupled with an enhanced real estate investment model is a pathway to drive billions of dollars towards a truly sustainable built environment, with exceptional benefits for our local economies and ecosystems. This investment shift has the potential to completely transform the built landscape in the coming decades and allow Living Buildings and Communities to proliferate. We will focus on the core concepts and themes identified in a research report developed in partnership between Jason Twill, Earth Economics, Autopoiesis, and Cushman and Wakefield, and funded through a grant from the Bullitt Foundation.

Keywords: Economics, Land use planning, Sustainable development

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The influence of artificial light on wildlife use of undercrossing structures

Artificial light has been found to severely disrupt behavior of migratory birds, sea turtles and bats among other species, however little research has been conducted regarding terrestrial mammals. There exists a growing need to understand how artificial light may alter normal activity of wildlife, in particular as we attempt to mitigate habitat fragmentation in the face of expanding urbanization. An important mitigation of habitat fragmentation by roads are wildlife crossing structures. Some crossing structures are proposed as dual-use, meaning use by foot or bike traffic, as well as to provide passage for wildlife. Dual use structures would likely include artificial light. The presence of humans will alter use by wildlife, but it is important to understand the additional influence of artificial light in reducing effectiveness of the structure to mitigate habitat fragmentation. This research is being conducted at a crossing structure that is currently not dual-use. The undercrossing in this experiment is a bridge structure that has been separated into three sections, each ~30 meters long. On a weekly basis each section is subjected to either high ~10 foot candles (fc), low ~5 fc, or no light and sand tracking data is collected. Light treatments are rotated to account for unequal use of each section by wildlife. After three weeks all lights are turned off for one week before rotations begin again. A strong avoidance response is developing in deer mice detections and possible avoidance trends for Mink and Vole. Data collection will continue this spring.

Keywords: Land use planning, Transportation, Wildlife biology

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Western red cedar sapling growth and survival, six years later

In 2005, western red cedar (*Thuja plicata*) seedlings were planted in Forest Park in Portland, Oregon to ascertain whether mammalian predation had a role in low seedling recruitment in the park. Nine study sites, three in each section (urban, middle and rural) of the park were located along an urban-rural land use gradient. At each site, 27 seedlings were planted. Each tree was randomly assigned to one of three groups: deer exclusion, rodent exclusion or control. Each was measured prior to installation of exclusion devices (March 2005). Tree height, width, basal diameter, percent of branches grazed and mortality rate has been measured annually. Preliminary results for the measurements made in summer 2011 showed that trees in the middle and far sections of Forest Park grew significantly more in terms of height, width and basal diameter than trees in the city section. Control trees grew significantly less than trees protected by rodent or deer exclusion devices. Trees in the far section had significantly more grazing by deer and elk than those in the city section, although trees in deer exclusion devices had significantly less grazing. Seedling mortality at the sites ranged from 3.7% to 70.4%. Mortality did not appear to relate to predation. More results will be presented at the conference.

Keywords: Conservation biology, Habitat restoration, Plant ecology

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A GIS assessment of beaver activity in urban parks and open spaces in the Tualatin Hills Park and Recreation District

I collected GIS data on the presence of beaver (*Castor canadensis*) in properties of the Tualatin Hills Park and Recreation District, Washington County, OR, in the spring of 2011. These data, including both stream conditions (including streambank condition, vegetation cover, large woody debris, beaver and nutria presence, and major canopy and shrub spp.) and points of classified beaver sign (including dams, lodges, chews, and human mitigation installations), were used to produce weighted activity density estimates, statistical correlations, and spatial statistics for activity clusters, in pursuit of the development of a predictive habitat model for beaver in the urban ecosystem. While statistical analysis failed to isolate any habitat-selection criteria for beaver activity, the data set produced by this survey has much unexploited potential for analysis, and also serves as a prototype for a more comprehensive study.

Keywords: Animal ecology, Land/watershed management, Wildlife biology

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Raising awareness about window hazards for urban bird populations in the city of Portland: volunteer-based BirdSafe Portland surveys have monitored window strikes at 21 buildings and recovered 36 native bird species, while engaging building owners and occupants in monitoring and reporting

As many as one billion birds die in the US annually as a result of window collisions at homes and high-rises. Unmarked glass is ubiquitous in the built environment, and is invisible to birds, who perceive reflections as continuation of habitat. Strikes may result in death upon impact, or cause internal hemorrhaging which often results in delayed mortality. Intensive research at collision sites suggests that one out of every two collisions results in fatality (Klem 1990). Portland sits along the Pacific Flyway, a major north-south bird migration superhighway, and hosts 209 species of birds. Night-migrating songbirds are susceptible to fatal light attraction, a poorly-understood luring of birds toward artificial lighting, where they may strike buildings or become entrapped by light, eventually succumbing to exhaustion. Portland Audubon has raised awareness about this hazard by coordinating BirdSafe Portland programs, including dawn surveys conducted by volunteers at 21 Portland-area buildings, as well as engagement of building owners and occupants. Thirty-six native species have been documented on survey; 86 species of collision-victims have been admitted to the Wildlife Care Center during the same survey period, primarily from residential locations. A new LEED (Leadership in Energy and Environmental Design) pilot credit provides an opportunity to meet Bird Collision Deterrence guidelines (by reducing light spill, treating glass façades, and monitoring for 3 years). Lights Out programs, underway in 22 US cities (including Portland), are beginning to prove effective at saving money and electricity, reducing carbon emissions, and reducing the luring of migratory birds into cities.

Keywords: Conservation biology, Sustainable development, Wildlife biology

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Ecoroof research underway in the City of Portland

Stormwater management has been studied by the City of Portland's Ecoroof Program since 1998 while more recently, habitat, energy savings, green job creation, and lighter-weight designs are being addressed. Additionally, cost studies are underway associated with the various systems and materials used by recipients of the Ecoroof Incentive. This poster will cover the progress and future plans of the City's various ecoroof research and monitoring efforts, with a particular focus on recent bird and insect monitoring comparing ecoroofs to traditional roofs and ground-level green spaces.

Keywords: Sustainable development, Water quality, Wildlife biology

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Envisioning ecosystem services in the greater Portland region

What services does nature provide to people of the greater Portland region? What are they currently, and what might they be in the future? Regional resilience depends on the choices we make: as governments, businesses and citizens. Although there is substantial research on the negative environmental impacts of urban areas (e.g. asphalt's effect on watershed health), there is less information on the social and environmental benefits of healthy ecosystems resulting from improved land use practices and site specific applications that seek to enhance ecosystem services that could be promoted and implemented in cities throughout the Pacific Northwest. Ecotrust is producing a set of maps and associated white paper that combines new and existing analyses of ecosystem services in the greater Portland region. The specific ecosystem services included in our project are carbon sequestration, local food productivity, and stormwater filtration. We are analyzing two scenarios: one that describes a *current* state of ecosystem service productivity in the Portland region and one that describes *potential* productivity. We will present drafts of our analyses and maps that attempt to quantify benefits from existing and potential services and will request feedback from the UERC participants on how the maps and analyses could be improved and made more useful for those working on enhancing and protecting ecosystem service productivity within the greater Portland region.

Keywords: Land use planning, Sustainable development

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Elevated nitrogen and phosphorus concentrations in urbanizing southwest Washington streams

In southwest Washington, rapid population growth and associated land use change have resulted in elevated stream nutrient concentrations. To evaluate the extent and nature of human alterations to stream nutrient concentrations in this region, we compiled four water years of total phosphorus (TP) and dissolved inorganic nitrogen (DIN) data from two long-term monitoring programs. We also quantified watershed characteristics likely to affect aquatic nutrient loading, and tested for correlations between these characteristics and stream nutrient concentrations. Average nutrient concentrations in study streams were significantly elevated relative to EPA recommended nutrient criteria in all sites for DIN ($n=13$; $P<0.05$) and in nine out of 14 sites for TP ($P<0.05$). Of the watershed characteristics investigated, percent “impervious” (+) and percent “forested” (-) were the best predictors of [TP] ($R^2= 0.41$ and 0.64 , respectively, + and - indicate the slope of the regression). Percent “developed” (+) and percent “forest and woody wetland”(-) were the best predictors of [DIN] ($R^2=0.75$ and 0.73 , respectively). In urban streams, mean dry season [DIN] was significantly higher than mean wet season [DIN] ($P<0.05$), but this pattern was reversed in less urban watersheds. Urban streams also had significantly higher [DIN] than non-urban streams ($P<0.05$). The strong relationship between [DIN] and “developed” land uses suggests that, as Clark County’s population continues to grow, targeted N management will become increasingly important. The strong negative relationship between “forest and woody wetland” and both [TP] and [DIN] suggests that this land use type is particularly important in reducing stream nutrient loading.

Keywords: Water quality

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Identification of development-related impacts on stream-associated amphibian communities in forested refugia of the Portland, Oregon region

Human development and alteration of landscapes often dramatically impacts the ecology of neighboring aquatic systems, modifying hydrology, stream channel morphology, water temperatures, stream pH and other variables that have been found to correlate with amphibian populations. Within stream communities, amphibians serve an important role as both predator and prey species to aquatic and terrestrial biota, particularly in headwater streams without fish. Thirty-seven first through third-order streams were sampled in the Portland, Oregon metropolitan area and Clark County, Washington regions during the summer of 2011. Streams were selected based on the presence of adequate habitat for stream-obligate amphibians, which require perennial flow and a forested riparian buffer. Amphibians were captured, identified and measured along 30-meter stream transects using an active-cover search (ACS). Development-related environmental variables measured in situ included water temperature and conductivity, stream substrate composition and riparian vegetation communities. Currently, GIS delineation is being conducted to define landscape-scale variables that will be included in further analysis. Stream-obligate species were recorded at eleven of the sampled streams while stream-facultative species were detected at fifteen streams. Detection of both obligate and facultative species only occurred at nine sites, six of which were located within Forest Park and all of which occurred in heavily-forested areas with little surrounding development. Streams where amphibians were detected had relatively lower average water temperatures, lower average water conductivity and higher average proportions of coarse substrate material. Further work will elucidate existent correlations between amphibian abundances, community diversity indices and development-associated environmental parameters grouped into a priori models.

Keywords: Conservation biology, Land/watershed management, Water quality

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Linking soil biogeochemistry to urban characteristics: how is soil organic matter content affected by urbanization in the Pacific Northwest?

In undisturbed ecosystems, differences in above- and below-ground vegetation and microbial community, temperature and precipitation, local topography, and texture and composition of parent material inform soil processes. Dynamic equilibria in the biogeochemical pools and fluxes in such systems are reached over decades or centuries. However, anthropogenic influences shift the inputs, disturb the structure and alter the biochemistry of soil. Studies in diverse cities show a variety of responses of soil organic carbon accumulation and depletion following urbanization, suggesting that cities differ in their capacity to accumulate soil organic matter (SOM). Here we examine the drivers of SOM formation at the neighborhood, city and regional scale in Portland, Oregon and the Pacific Northwest. Within Portland, neighborhoods have a distinct urban character, and distinct tree and shrub community composition, however they are not distinguishable in terms of SOM. In Portland, neither vegetation structure nor urban factors appear to influence SOM accumulation and SOM levels are statistically indistinguishable from Pacific Northwest soils, in contrast to other temperate cities. Our results suggest that environmental conditions influencing SOM content in urban ecosystems may reflect regional or biome scale processes; a biome-sensitive perspective on the effect of urbanization on soil processes may therefore prove productive.

Keywords: Soil science

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Volunteer Stewardship Motivation Survey in Portland and Vancouver, Year 1

In trying to understand some of the social benefits accrued through volunteer participation in restoration in the Portland and Vancouver areas through an ULTRA project, PSU graduate students and faculty, USFS designed and conducted a survey. We wanted to understand who comes to these events, and what do they get out of participation? Participants in volunteer stewardship events were surveyed during the late winter and spring of 2011 in Portland and Vancouver. A total of 14 events organized by either Portland Parks and Recreation or Clark County Public Utilities, with 141 people, were sampled. Volunteer's overall motivation to participate were either explicitly environmental (e.g., I do this work because it helps benefit the environment) 43%, or social (e.g., I came to this event to meet people), 31%. A significant number of participants want to make a contribution to improving their local environment. We analyzed the related environmental attitudes and behaviors of participants. We determined that frequent participants indicated that their experience helped them develop an increased sense of caring for nature. These participants also indicated that they participated in these stewardship activities because it involved them in doing something useful. Lastly, frequent volunteers tended to be people who spend their spare time outdoors. These findings point to the value of continuing to provide well-structured experiences for volunteers in restoration. In addition, providing volunteers with science-based evidence of the efficacy of invasive removal could increase the impact to backyard practices. We plan revisions and another survey this winter and spring.

Keywords: Environmental education, Environmental social sciences, Habitat restoration

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Graywater reuse: a guide for Oregon homeowners

As concerns about sustainable water use increase, options for water conservaton including graywater reuse are being investigated. Household graywater in Oregon is defined as degraded water from sinks, showers and washing machines. Examples of degradation include increases in salinity, nutrients, trace elements, temperature, and bacteria, including pathogens. New rules for graywater use in Oregon went into effect in 2011. The Oregon Department of Environmental Quality (DEQ) needed a reader-friendly guide for homeowners interested in installing graywater reuse systems. The guide details step by step instructions for planning, permitting, building and operating a graywater system. It also includes examples of systems for subsurface irrigation and for a plant treatment system, that treats graywater to meet testable criteria before it's reused. Important goals for this project include helping homeowners to understand and comply with the DEQ's rules, and to build systems that are safe and easy to maintain.

Keywords: Environmental education

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Patch dynamics in planted systems: pollination facilitation, phenological synchronization and pollinator resource connectivity in the urban greenway

Connected heterogeneous patches with high plant diversity have been shown in natural systems to support effective pollination for many pollinator groups. A heterogeneous urban habitat patch matrix can therefore possibly play a large role in facilitating pollinator movement, diversity and abundance in the built environment. I hypothesize that urban patches used by pollinators (active patches) will have higher plant diversity, be within 300 meters of neighboring patches, further from roads and that the diversity and ratio of native to non-native species as well as individual species traits (type and abundance of flowers) will affect pollination facilitation. In addition, I hypothesize that the phenology of selected plant species will show alterations based on proximity to the urban center (urban heat island effect) and type of patch, and will affect pollinator assemblages in all systems. I will use bioswales, raingardens, 'backyard and schoolyard habitat sites', and city parks as patches of varying size and species composition, characterize the abiotic conditions of each patch, measure species diversity and determine connectivity between patches using a classic fluorescent dye pollen tracking method and determine pollinator assemblages in selected patches. I expect to find that reduced levels of plant diversity within patches will result in reduced diversity of pollinators and thus, decreased pollination services. This research will contribute to ecological theory regarding patch dynamics and urban landscape connectivity as well yield practical information for urban land managers interested in maximizing the ecosystem service potential of green spaces.

Keywords: Plant ecology

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A collaborative approach to developing neighborhood street tree management plans

Portland Parks & Recreation Urban Forestry conducted volunteer-led neighborhood street tree inventories in 2010 and 2011 in order to inform the creation of neighborhood street tree management plans. Participating neighborhoods were Concordia, Eastmoreland, Kenton, Overlook, Sellwood-Moreland, and St. Johns. Over 165 neighborhood volunteers spent 2,000+ hours gathering and entering street tree inventory data. Urban Forestry staff analyzed the data and presented the analysis, along with some management suggestions, to the neighborhood tree teams at a tree plan symposium. During the summit, the neighborhood tree teams and Urban Forestry staff collaborated to come up with visions, goals, and objectives for street tree management in each neighborhood. The tree plan visions encapsulate the desired futures each neighborhood group is working towards. The goals guide intent and provide directions for action. Objectives are concrete steps, organized as short-term, long-term, and ongoing, that define attainable actions in support of the goals and over-arching vision of the tree plan. The goals and objectives were informed by the findings of the tree inventories. Each neighborhood got to customize their vision for the tree plans, emphasizing what matters most to each community. Each tree team also defined several objectives that can lead to immediate as well as long-term management actions for their street trees. Urban Forestry has deemed this collaborative tree plan process successful because neighborhood volunteers are now empowered to manage their street trees successfully. Urban Forestry hopes to repeat this process in 2012 to keep increasing the number of neighborhoods with street tree management plans.

Keywords: Environmental social sciences, Land use planning

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Across the river: A comparison of approaches to water quality in two cities, Portland OR and Vancouver WA

As part of the Portland Urban Long-term Research Area (Ultra-Ex) project, we are investigating the interactive relationships between local ecosystem change and policy change using a comparative case study of water quality management between the Portland/Metro and Vancouver/Clark County regions. Eighteen semi-structured interviews have been conducted with local government staff and are being supplemented with a review of related documents. Six themes are being compared: strategic approach, current policies, policy instruments, historical drivers, institutional adaptation, and biophysical and social information use. As a contribution to the socio-ecological systems theory that is emerging from the NSF Long-term Ecological Research program, we are contributing to the understanding of when, how, and how effectively scientific information about the environment makes its way into policy and management decisions and how this information is balanced with non-scientific information or pressures. We are also interested in understanding how policies and institutional structures affect how cities and counties respond to sudden or gradual changes in the ecosystem.

Keywords: Environmental policy, Environmental social sciences, Water quality

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Depaving paradise: research findings, plans and opportunities with Depave

Depave is a Portland-based organization that removes unnecessary pavement, re-greens neighborhoods, reduces stormwater runoff, creates community, and restores habitat for people and wildlife. Depave was launched in 2007, and since then, has done over 20 depaving projects, using volunteers and hand tools to reclaim hundreds of thousands of square feet of pavement throughout the city for plants, animals, bugs, greenery, and stormwater. Our team combines the vision of artists, designers, scientists, engineers, contractors, educators, planners, policy-makers, and farsighted property owners. So far, those property owners have included schools, churches, non-profits, a private architecture firm and a co-housing community. We focus on sites that offer the greatest combined human and environmental benefits, with a particular emphasis on increasing access to growing things for children. In this session, we will report on the findings of our general research about soil conditions beneath pavement, and about the findings of soil testing we have done at our sites. Then we will engage the audience in a discussion about what additional types of research they would want to see done on these unique sites, and what partnerships and resources Depave can mobilize to make that research happen.

Keywords: Environmental education, Habitat restoration, Land/watershed management

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Mt. Tabor stormwater green street stewardship

The goals of this project are to: 1) develop ecosystem services curriculum for Middle School (MS) students that pertain to Stormwater Green Street (SGS) functions, and 2) determine how effective MS students are at different SGS maintenance activities. Our hypotheses are that: 1) students will show the biggest increase in ecological knowledge and behavior that are involved in outdoor as compared to indoor activities, and 2) students will be more effective at trash removal than weeding. Pre- and post-assessments will be administered in four different classes/treatment groups (outdoors, control, indoors, both outdoors/indoors). Outdoor curriculum involves field trips (Cascade and coastal mountains, Willamette Valley wetlands), labs (plant, soil, and water), and students' home stormwater facility design, while the indoor activities cover the same areas but are based in the classroom. MS maintenance effectiveness is determined by measuring the number of trash items and percent weed cover in Mt Tabor MS facilities compared with proximal and similar facilities. Preliminary results suggest greater percent weed cover and garbage at the Mt. Tabor facilities. Assessments suggest that students learn to measure and differentiate between resilient and degraded watersheds. Moreover, students have shown an increase in environmental literacy and their understanding of Low Impact Developments are coupled with negative value judgments on poor stormwater management practices. If this pilot study is successful, we estimate that scaling up to reach 38 Portland middle and high schools within a 15 minute walk of 536 SGS facilities could save Portland over \$240,000 a year.

Keywords: Environmental education, Sustainable development, Water quality

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The Johnson Creek - Willamette River Confluence Salmon Habitat Enhancement Project

In September, 2011, 150 logs and 200 boulders were used to enhance habitat for threatened salmon runs in Johnson Creek, where it flows into the Willamette River in Milwaukie, Oregon. Engineered log jams were constructed to provide cover and shelter for fish, and a fish passage barrier was removed by backwatering an exposed sewer pipe with a constructed riffle, so that fish can move freely up Johnson Creek all year round. Additional project elements will include six acres of riparian forest restoration, beginning winter 2012, and an interpretive overlook and trail on the southern bluff which is scheduled to be constructed in June, 2012. This poster will show before-and-after photos of the habitat enhancement work, feature construction highlights and lessons learned, and will describe the next phases of restoration at the mouth of Johnson Creek.

This project was funded and made possible by individual donors to the Johnson Creek Watershed Council, the Klein family, ODS Companies, the City of Milwaukie, the Oregon Watershed Enhancement Board, PGE, The Nature Conservancy, the FishAmerica Foundation, the NOAA Restoration Center, the Jubitz Family Foundation, a Metro Nature in Neighborhoods Capital Grant, and the River Network/Miller Coors.

Keywords: Fisheries, Habitat restoration, Land/watershed management

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Plant species composition effects on greenroof stormwater retention in Portland, Oregon

A variety of mechanisms are used to help control surges in stormwater during rain events in urban areas. Greenroofs can help to retain and detain stormwater during these events and improvement of these parameters may be possible by varying plant species composition. Utilizing design storm specification as set by the City of Portland, simulated storm events on four outdoor greenroof plots are used to quantify the retention and detention capabilities of the plots. Of the four plots, two are composed of sedum species only while the other two include sedums as well as herbaceous species of fescue, thyme, sage, and heuchera. Soil properties including soil organic matter and soil bulk density will be combined with plant properties such as fine root density to better understand the components that may affect the retention and detention capabilities of the greenroof plots. An irrigation regime will be employed during the summer months to encourage plant development and root growth which will allow for differentiation between soil mediated or plant mediated water retention and detention capabilities. Though the research is still ongoing, initial results suggest that a combination of succulent and herbaceous plant species including sedum, heuchera, thyme, sage, and fescue are able to detain and retain more water than typical greenroofs composed of only sedum species. This could mean that a slight change in species composition in greenroofs around Portland could increase their detention and retention capabilities which would positively contribute to the stormwater management goals in place from the City of Portland.

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

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Young tree monitoring: metrics for planting program success and fodder for long-range planning

In 2008, the City of Portland Environmental Services bureau embarked on an ambitious tree-planting effort with city, state, and nonprofit partners. Three years in, this Grey to Green initiative has helped plant two-thirds of the 26,000+ newest members of Portland's urban forest. These trees will help improve community livability and watershed health while contributing to clean rivers and the city's 33% tree canopy cover goal. Post-planting monitoring programs help measure program success and provide the basis for estimating future canopy benefit from today's planting investment. Trees planted by Friends of Trees (FOT) volunteers were inspected by FOT volunteers twice during the summer following planting. Trees planted by city contractors were assessed by city staff in late summer for two years following planting. Data collected include species, planting location, site conditions, and condition rating. Based on Friends of Trees monitoring data from previous years, we expected to see high survivability overall (>95%); however, rates may vary for street tree versus yard tree plantings, by species, and with site conditions. Lessons learned from monitoring may influence species and site selection and will inform future tree planting strategies vis-à-vis the city's watershed health, climate action strategy, and tree canopy cover goals.

Keywords: Land/watershed management

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Manufacturing ecosystem services: adopting the ecosystem services framework for the planning, design, and management of the built environment

Although momentum in the field of ecosystem services has been building for many years, exploration of the framework in the urban context is a recent development. This paper seeks to assess the current state and future possibilities of the urban ecosystem services model. In academic ES literature, there is a distinct emphasis on the preservation of natural resources as the determining factor in the provisioning of ES. This emphasis poses problems for the adoption of the framework in urban planning, design, and management because urbanization is impossible without the transformation of natural resources, the act of transformation being antithetical to that of preservation. To a limited degree, the grey ES literature attempts to grapple with the challenge of providing ES in the highly disturbed and manufactured conditions that are typical of cities. None of the existing literature, however, explores the significant role of manufactured ecologies in the provisioning of ES in the urban environment. The science of urban ecosystem services needs to take an action oriented approach because we are, every day, in spite of incomplete information, planning, building, and managing cities. Although many frameworks exist for sustainable urban design (eg. green infrastructure), frameworks that embrace the premise that ecosystem function can be created, they are markedly more narrow than the ES framework in the services they seek to provide. By examining both the ES and sustainable urban design frameworks, we seek to understand the potential for synthesis and lay the foundation for a future comprehensive framework.

Keywords: Environmental policy, Land use planning, Sustainable development

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Bringing salmon back to Salmon Creek by educating and engaging the community

StreamTeam is a volunteer-driven stream restoration and environmental education program of Clark Public Utilities. Since the program's inception in 1992, thousands of volunteers have come together to plant over 620,000 native trees, remove non-native plants, monitor water quality and wildlife and engage the community in bringing salmon back to Salmon Creek. In 2006, the program decided to coordinate community monitoring as a way to educate, engage and empower participants. In addition to plant survival monitoring, the program developed a water quality monitoring program as well as a wildlife monitoring program in partnership with local agencies and organizations. The team now monitors water quality in three streams, bird response (breeding birds and waterfowl) to stream restoration, and spawning fish. In 2011, the Eradication Nation was created as a community-based coalition focused on removing non-native invasive plants from Clark County watersheds. Currently the program is focused on monitoring and treating Japanese knotweed and garlic mustard. Not only do these programs provide data, but also a higher level of engagement many volunteers are seeking.

Keywords: Environmental education, Habitat restoration, Wildlife biology

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Water typing map errors and land use threats to stream habitat in Salmon Creek watershed, Clark County, Washington

Though in common use for regulating land use along streams, Washington Department of Natural Resources (WDNR) water type maps reveal high rates of error. The WDNR water type maps frequently under-represent the extent of fish-bearing waters, show streams in the wrong locations, and/or do not show them at all. Consequently, the effectiveness of existing regulations to protect headwater and downstream aquatic biota and habitat is compromised. Salmon Creek Watershed Council, Wild Fish Conservancy, and Kingfisher Ecological Services are undertaking a three-year effort that partners trained citizen volunteers with biologists to field-truth and update the WDNR maps for Salmon Creek. Initial results reveal 17.5 miles of previously-unmapped stream, 9.1 miles of new fish-bearing stream, as well as over 50 previously-undocumented road crossing barriers to fish passage. Using this information, we are working with willing private landowners to identify potential aquatic habitat restoration opportunities. Results are being compiled and distributed via online interactive maps and public presentations to improve citizen and land use planner awareness, and strengthen stream habitat protection safeguards on private lands in urbanizing Clark County.

Keywords: Fisheries, Land use planning, Land/watershed management

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Environmental influences on cyanobacteria harmful algal blooms in Vancouver Lake, Washington

Despite ongoing research worldwide, understanding environmental and ecological factors influencing seasonal toxic blooms and plankton community dynamics remains a challenge for ecologists and natural resources managers. An observational study over 3.5 years (2007-2010) measured several environmental components (i.e. nutrients, temperature, and pH), and quantified phytoplankton community composition in Vancouver Lake, Washington. Additionally, intracellular and extracellular toxin concentrations were measured during summer months of 2009 and 2010. Sampling was performed weekly during summer months, biweekly spring and fall, and monthly during winter months. Non-metric multidimensional scaling revealed significant annual differences in overall phytoplankton community composition. Abundance and biomass of phytoplankton during summer months were dominated by *Microcystis* and *Anabaena* in 2007, and *Anabaena* and *Aphanizomenon* in 2008 and 2009. Environmental factors influencing community composition varied each year contributing to observed interannual variation. Our results suggested that orthophosphate concentrations contributed to each annual cyanobacteria bloom, especially of diazotrophic species. A separate analysis, using principal components analysis, examining microcystin concentrations indicated that intracellular concentrations were influenced by orthophosphates, and that extracellular concentrations were not associated with any environmental variables. Future work includes analyzing environmental influences on toxin and non-toxin producing cyanobacteria populations. Implications of our results will provide new population level insights in understanding environmental influences on plankton community dynamics and persistence of seasonal cyanobacteria blooms.

Keywords: Water quality

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FrogWatch: Citizen science at the Oregon Zoo

In 2011, Oregon Zoo founded a FrogWatch USA chapter, a national citizen science program encouraging community stewardship by training volunteers to recognize and report information on frogs and toads. FrogWatch USA was initiated in 1998 by the U.S. Geological Survey. The National Wildlife Federation assumed administrative responsibility in 2002. In 2010, which marked the first full year that the Association of Zoos and Aquariums managed the program, more than 128 volunteers participated nationally, monitoring 215 sites, contributing to a network that together provides a large scale, long term dataset. For Oregon Zoo's inaugural FrogWatch year, we focused our efforts on involving our youth volunteers. We recruited ZooTeens who had indicated they wanted to be involved in conservation activities over the winter and spring. By letting the teens self-select, we were able to get longer term, highly engaged volunteers. Trainings were conducted in early April 2011 with 12 attendees; 100% passed the certification exam and participated in data collection. Two locations on zoo grounds were registered & monitored. Only three species of frog occur in Portland, and their calls are easily distinguished making species identification straightforward. In addition to species calling intensity, data were collected on wind speed, current temperature and precipitation, and recent temperature and precipitation. Data were collected on 16 nights between 4/14/2011 & 8/25/2011. Only Pacific chorus frogs were reported during the 2011 season. In the future we hope to expand our FrogWatch program to off zoo grounds sites and to include the adult volunteer population.

Keywords: Conservation biology, Environmental education, Wildlife biology

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Watershed-wide temperature assessment of Johnson Creek

Johnson Creek begins in rural Clackamas and Multnomah Counties, but also drains urban portions of the cities of Happy Valley, Damascus, Gresham, Portland and Milwaukie. In addition to these city and county governments, the US Geological Survey, Oregon Department of Environmental Quality (DEQ), Oregon Department of Agriculture, Metro, East Multnomah and Clackamas SWCDs, and Johnson Creek Watershed Council coordinate watershed-scale scientific investigations through an Interjurisdictional Committee (IJC). During summer, Johnson Creek doesn't meet state water quality standards for temperature (17.8°C/64°F). In 2006, DEQ adopted a Total Maximum Daily Load plan to reduce stream temperatures, primarily by protecting and planting streamside vegetation. Temperature monitoring combined with riparian assessment provides data to adaptively manage water quality improvement strategies in the Johnson Creek watershed. Over the past five years, the IJC has collected continuous summer temperature data at 30 mainstem and tributary locations. In addition to identifying tributaries contributing warmer or cooler water, data was also collected at several instream ponds. Geographic analysis of temperature data focused on two metrics – the frequency and magnitude of high temperature. Results indicate that temperature exceedances have varied over recent years, with 2009 having the greatest frequency and magnitude - one mainstem Johnson location had a 7-day maximum average of 27°C and a tributary had 117 days above the standard. During summer months, some ponds increase tributary temperatures by 5°C/9°F. Based on this information, some jurisdictions are working on plans to address private and public instream ponds, in addition to implementing re-vegetation efforts in the watershed.

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

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Ross Island Natural Area: Monitoring terrestrial arthropods

Human-disturbed landscapes exhibit drastically altered species assemblages when compared with undisturbed equivalent habitats. A terrestrial arthropod biodiversity study was performed at Ross Island, a heavily disturbed 161.9 ha island in the Willamette River *ca* 1 km south of downtown Portland, Oregon. Ross Island has endured industrial resource exploitation since 1926, with restoration efforts initiated since the City of Portland acquired 18 ha of the northern part of the island in 2007. During two sampling periods (6-10 September and 13-18 October 2011) pitfall traps were used to collect ground-dwelling arthropods, and an aerial trap was used to sample aerially dispersed arthropods. September's pitfall trap captured 263 individuals representing 39 identifiably distinct taxa and October's pitfall trap captured 212 individuals representing 25 distinct taxa. September's aerial trap captured 27 individuals representing 10 distinct taxa, and October's aerial trap captured 35 individuals representing 16 distinct taxa. Specimens were sorted to lowest possible taxonomic unit and a Shannon-Wiener Diversity Index showed decreased diversity from September to October for pitfall collections, and an increase for aerial collections. This study supplements data collected in 2009, and subsequent surveys will be valuable in assessing changes taking place on Ross Island as restoration efforts continue and succession of habitat occurs. Expanding the trapping regime, as well as sampling more frequently over all seasons will contribute to understanding biological and ecological functioning within the Ross Island landscape. Partnership between researchers and managers could greatly inform ecological consequences of restoration activities.

Keywords: Habitat restoration, Land/watershed management, Wildlife biology

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Towards an interdisciplinary study of urban soils in the Portland/Vancouver Urban Long Term Research Area

While efforts to integrate social and biophysical sciences are growing more popular (notably through interest in *coupled human and natural systems* and *sustainability science*), environmental social science methods/theoretical frameworks such as *urban political ecology* and more biophysically oriented urban ecology research often remain strangers in the field. In this presentation, I draw on a review of literature and my own doctoral research conducted in Oakland, California, to develop a proposal for interdisciplinary research on urban soils in Portland/Vancouver that will draw on insights from both the biophysical and social sciences. The project will contribute to ongoing research taking place in the Portland/Vancouver Urban Long Term Research Area both by creating a baseline geochemical map of the region and by revealing linkages between soil quality and social processes such as urban planning and urbanization. Results will also be useful to local urban agriculture groups and environmental organizations and agencies involved in soil stewardship and management. Pending funding, soil will be sampled across Portland/Vancouver metro area and analyzed for various soil chemical characteristics, notably organic and inorganic contaminants and other indicators of soil quality. Data will be mapped and analyzed using GIS and geostatistics. Results will then be qualitatively interpreted using historical records, maps, and land use plans in order to relate soil data to the spatial and social processes that have defined urban development in the Metro Region.

Keywords: Environmental social sciences, Land use planning, Soil science

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Urban horticulture and air quality: selecting bamboos for cleaner air

Plants emissions of carbon into the atmosphere in the form biogenic volatile organic compounds (BVOCs) can negatively impact air quality in urban settings. Some emissions of BVOCs increase ground-level ozone near cities, and BVOCs can seed the formation of aerosol particles in the atmosphere. BVOC emission from plants can vary by form, function and degree to which they are emitted, and therefore the role that plants play in an urban airshed is species dependent. In order to better understand the way that plant emissions alter air quality, the diversity of BVOCs from plants must first be characterized. Comparisons between biogenic emissions from plants have been difficult in the past, as emissions surveys have tended to focus on a limited number of compounds and analytical techniques have lacked the ability to detect or separate compounds. Additionally, closely related species tend to emit similar compounds, making the underlying reasons that plants emit BVOCs difficult to elucidate. We have identified the bamboos as a novel system for studying BVOC emission, because they emit a diverse range of compounds, and emissions of isoprene are widely variable across species. An average of 75-196 individual compounds per leaf were identified using two-dimensional gas chromatography with time-of-flight mass spectrometry (GCxGC TOF-MS) from 12 species of bamboo. We found significant differences in overall compound composition amongst species that did and did not emit isoprene. Overall, BVOC composition varies significantly amongst species of bamboo and different species may differentially impact urban chemical ecology and atmospheric chemistry.

Keywords: Air quality

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Neighborhood Tree Stewards: growing advocacy for Portland's urban forest

The urban forest is a green infrastructure that supplies all Portland citizens with a wealth of benefits including environmental, economic, and aesthetic. Because the urban forest is a shared resource, it is important for the public to be aware of the benefits of trees and understand their responsibility in caring for and maintaining them. In order to educate citizens about the urban forest the Neighborhood Tree Liaison program was established in 1997 as a joint effort by the Urban Forestry Commission and Portland Parks & Recreation. Since then, with the help of community partners including the Urban Forestry Commission, the Bureau of Environmental Services, Friends of Trees, and Portland State University, the newly named Neighborhood Tree Steward training has developed into a robust seven day survey course. Participants learn a little about a lot of urban forest subjects including, but not limited to tree biology and identification and the City's rules and regulations. Participants graduate from the training armed with the tools and resources they will need to be lead advocates for trees in their neighborhoods. Tree Stewards are also encouraged to identify and work on a tree project in their community. Past Stewards have hosted pruning workshops, created brochures, and established tree teams as a part of their neighborhood associations. The Neighborhood Tree Steward program continues to evolve with the addition of a monthly workshop series to focus on subjects like pruning and tree identification. The Neighborhood Tree Steward program has been successful in promoting tree advocacy throughout Portland.

Keywords: Environmental education

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Using the ethology of urban wildlife to teach students about the nature of science

Science is a subject students in the United States have struggled with since the end of the space race. Since then it has become less tangible, and therefore less engaging. This isn't to say that science has stopped being engaging, it's just that our education system has largely ignored the kind of science students find tangible and engaging: ethology. Networks like Animal Planet have seen viewership steadily increase in the past decade, illustrating a public desire for learning about animals and their behaviors. This attraction to ethology was used as the impetus for the generation of an animal behavior course that allowed high school students of all ability levels a window into the nature of science. Since its inception, student enrollment in the class has increased and the course has extended its reach beyond the school's walls. This was first done through the production of a city-wide science festival where over the past two years over 100 high school students presented professional-style posters on field research they had conducted on local urban species ranging from squirrels to crows to deer. Some of the research has been taken to professional conferences, where in the past two years different students have presented at National Mammalogist's conference and the Urban Ecosystem Research Consortium. Most excitingly, experienced students have used the ethology they've learned in local elementary schools to facilitate the inquiry based science instruction that has been correlated with an increase in the test scores of 5th grade students.

Keywords: Animal ecology, Environmental education, Wildlife biology

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Non-native magnificent bryozoans (*Pectinatella magnifica*): increased occurrence in the Pacific NW?

In an urban environment new invasive species threats may go overlooked. But occasionally non-native species do get reported, and follow-up occurs. During the summer of 2011 a large bloom of magnificent bryozoans (*Pectinatella magnifica*) was spotted in Vancouver Lake and reported to Washington State University-Vancouver by the concerned citizens. Subsequent discussions and interviews with natural resource agencies and partner organizations throughout the Pacific NW were held to better understand the threat of *P. magnifica* as a potential invasive species. Those discussions have uncovered a plethora of anecdotal evidence, leading us to believe this rare non-native bryozoan may not be as rare as U.S.G.S. reports in their Nonindigenous Aquatic Species (NAS) database. Records outside of its native range, east of the Mississippi river, are only within the last two decades. Early recorded occurrences place *P. magnifica* in the lower Columbia River in the late 1990s. Why does the magnificent bryozoan's population density appear to be on the rise? Will expected climactic changes increase the abundance and dispersal abilities of this warm-water loving species in the Pacific NW? To determine the current distribution of *P. magnifica* further interviews and discussion will be held with natural resource agencies and partner organizations. The NAS database will be updated with new occurrences that these conversations uncover. By sharing the recent findings on *P. magnifica* distribution in the Pacific NW we hope to generate interest about this rare species in our region and explore opportunities for further investigation.

Keywords: Conservation biology

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Long-term management of urban riparian greenspaces in the Portland-Vancouver metropolitan area

We are examining the policies and management strategies that affect riparian vegetation in municipalities in the Portland Vancouver metropolitan region. This project builds off our past work and is now integrated into an NSF-funded Urban Long Term Research Areas – Exploratory (ULTRA-Ex) project, the Portland-Vancouver ULTRA-Ex. The PV ULTRA-Ex project examines natural resource conditions and the role of governance for a pair of cities, Portland, Oregon and Vancouver, Washington, which have developed over the past three decades under contrasting policy regimes at the state, regional, and local levels. In our part of the PV ULTRA-Ex research, we are analyze policies in the cities of Portland, Hillsboro and Oregon City for the period 1990-2008, identifying their similarities and differences, and comparing these policies against the on-the-ground changes that have occurred. (We are also performing a similar analysis for three urban areas in Clark County, Washington, although those results will not be complete by the time of the symposium.) We analyze both losses and gains in absolute terms to understand (a) the extent to which changes have occurred, (b) the relative balance of riparian area losses (due to development) versus riparian area gains (due to restoration and mitigation), and (c) identifiable patterns of losses or gains. We interpret the observed changes by considering factors such as development pressure, property ownership, parcel size and intended land use.

Keywords: Environmental policy, Land/watershed management, Sustainable development

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The difference in acclimation to humans between *Sciurus griseus* and *Sciurus carolinensis* by the means of a human provided food source in an urban park

The western gray squirrel (*Sciurus griseus*) is one of the native tree squirrels that inhabits Oregon. This squirrel has encountered competition with other species, particularly the eastern gray squirrel (*Sciurus carolinensis*), which has consequently caused the western gray squirrel to leave most urban parks that the eastern grays now dominate. In this study, I tested if the reason for the lack of western gray squirrels in parks was due to human interaction. I wanted to see if the squirrel's preferred distance from the footpath that ran through the park was more distant for western gray squirrels as opposed to eastern gray squirrels. In Fircrest Park, located in Salem, Oregon, populations of western and eastern gray squirrels live sympatrically. Placing piles of shelled, unsalted peanuts at different distances from the footpath, in both the northern and southern areas of the park, the amount of peanuts taken by the two species was observed. My data did not support my hypothesis that eastern gray squirrels would take a higher number in all situations than the western gray squirrel. This indicates that human interaction may not necessarily have an impact on the lack of western gray squirrels and that the behaviors of eastern gray squirrels may be the main cause of this decline.

Keywords: Animal ecology, Conservation biology, Wildlife biology

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Anthropogenic influences on epiphytic biodiversity across the Portland urban airshed

Urban forests are a rapidly emerging model system for examining the potential impacts of global change on forest health and biodiversity. Characterization of epiphytic lichens and bryophytes are a well-established tool for assessing the impacts of air pollution and anthropogenic influence on plant community structure and function. In this study, I present initial results of a ground and arboreal epiphytic community analysis that extends along an urban to rural transect from the urban forest of Forest Park, Portland, Oregon to rural Estacada, Oregon. As predicted, ground-based surveys indicated a shift in epiphytic lichen communities with distance from city center, consistent with our understanding of airshed dynamics. To understand the various mechanistic drivers impacting epiphytic biodiversity and the resulting effects on ecosystem processes, studies are currently underway to monitor atmospheric concentrations of canopy nitrogen dioxide (NO₂) on vertical distribution and function of arboreal epiphytes, as well as exploring the potential impacts of air pollution on nitrogen fixation of arboreal bryophytes in the Pacific Northwest. This work will improve our understanding of anthropogenic influence on both ground and arboreal epiphytic communities and clarify the impact of urban Portland on regional ecosystem services.

Keywords: Air quality, Plant ecology

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Now that you've found ivy, what are you going to do with it? Three years of test plots on the timing and control of *Hedera helix*.

English Ivy (*Hedera helix* or *H. hibernica*) is an aggressive evergreen vine and is the target for removal in restoration sites in the Pacific Northwest. Ivy smothers groundcovers and climbs to the canopy of trees, dampening the regeneration of trees and weakening mature trees through disease and weight. Seven permanent test plots (.1 acre each) tested herbicide applied at different seasons and compared it to hand pulling and a control at Rocky Butte. Data showed that summer was the most effective time to spray herbicide and after 2 sprays and 3 years, cover of ivy dropped from 100% to 21%. Spring and winter sprays were least effective, showing 70% and 73% ivy cover respectively after 3 years. Two fall spray plots were initially successful, but after 2 years, ivy increased in cover (final ivy cover 31% for Plot C (glyphosate mix), 88% for Plot D (2% triclopyr Year 1, and mix Year 2)). Hand pulling ivy dropped coverage from 95% to 28% after one year, but increased to 78% after 3 years of no treatment. Native plant cover decreased in all plots except for hand pulling (from 6% to 15%) and winter treatment (11.1% to 11.8%). Monitoring on restoration sites showed best results were achieved with a summer and follow up fall spray in consecutive years using a 4% glyphosate, 2% triclopyr, and 2% surfactant. Future research includes understory species replacement.

Keywords: Conservation biology, Habitat restoration, Plant ecology

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Can trees mitigate the health impact of urban air pollution? A modeling study in Portland, OR

Studies show that urban air pollution leads to increased mortality and morbidity (Pope, Ezzati & Dockery, NEJM 2009). In particular, our study of Portland using BenMAP (a modeling tool for health impacts of air pollutants from the EPA) showed a 10% increase in mortality in the Portland Metro area, attributable to fine particulate matter (Rao et al, UERC 2011 poster). In this study, we examine the role of urban trees in mitigating air pollution. Trees remove air pollutants through the process of dry deposition. i-Tree Eco, a modeling program from the US Forest Service, estimates the amount of air pollutants removed by modeling dry deposition, taking into account factors such as species and age of tree, wind speed, and wind direction. As a first step, we estimate the number of trees at the census tract level based on satellite imagery of the canopy cover in the Portland area. Using i-Tree Eco, we then estimate the amount of pollutants removed by the trees in each census tract and determine the reduced concentration levels of these pollutants. Using BenMAP we then estimate the health benefits in terms of reduced mortality and morbidity attributable to this reduction in pollution by the urban canopy at the census tract level. Taking these results as a baseline, we model the strategy of planting additional trees in areas with high pollutant levels and high population density to see if it is effective in reducing mortality and morbidity.

Keywords: Air quality, Land use planning

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Assessment of Ecosystem Services of I-205 Friends of Trees Planting Project

Portland State University has partnered with Friends of Trees (FoT) and Oregon Department of Transportation (ODOT) to determine the ecosystem services from FoT tree plantings adjacent to the I-205 multi-use path. The path extends 16.5 miles from Portland International Airport to Gladstone and includes 17 planting sites. This project demonstrates an approach to modeling changing ecosystem services of approximately 3,000 trees, including 39 tree species, as they mature. Growth rate equations for crown width, diameter at breast height (DBH), tree age and height were used to predict tree size at 5, 10, 20 and 40 years of age. When growth equations weren't available for trees at the species level, we moved up taxonomic classification levels to find the closest fit. Assessment of ecosystem services provided at the above ages includes estimating carbon dioxide (CO₂), volatile organic compounds (VOCs), nitrogen oxides (NO_x), ozone (O₃), and particulate matter (PM) uptake as well as rainwater interception. Modeling of benefits was carried out using ArcGIS 9.3 and the UFORE (US Forest Service) i-Tree suite. The ecosystem services provided are assessed by planting site, by tree, and tree age.

Keywords: Air quality, Hydrology

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The Intertwine Alliance's Regional Conservation Strategy

In November, 2010 The Intertwine Alliance launched an effort to create a Regional Conservation Strategy and Biodiversity Guide for the Portland-Vancouver metropolitan region. The region sits at the confluence of the Willamette and Columbia Rivers, a landscape which supports a rich diversity of wildlife and habitats. Today however, many of our local wildlife populations are experiencing serious long-term declines and only remnants of some historic habitat types remain. To protect, restore and manage the region's urban and rural landscapes – to retain their ecological values and biodiversity – there is a need to update and synthesize the myriad of existing initiatives into an integrated strategy that will provide a description of our region's biodiversity and a roadmap to desired future conditions. Expected outcomes of the Regional Conservation Strategy include: 1). creation of a set of complementary documents describing historic, existing, and desired future conditions for wildlife across the region's urban and rural landscapes; 2). engage diverse partners on the benefits and urgency of conservation by providing a document that inspires participation across jurisdictional political and neighborhood boundaries; 3). describe how this initiative nests within broader state and federal biodiversity initiatives; 4). place the Regional Conservation Strategy within the context of the Intertwine Alliance and build connections with traditional and non-traditional partners; 5). identify and access new funding sources at the local, regional, state, and federal levels; and 6). synthesize existing data and build on existing work.

Keywords: Environmental policy, Land/watershed management, Wildlife biology

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Assessing the role of zooplankton grazing on the development and decline of cyanobacteria blooms in Vancouver Lake, WA

Since 2007 we have been investigating the factors that influence the development of intense seasonal cyanobacteria blooms in Vancouver Lake – a large, tidally-influenced shallow lake in the lower Columbia River flood plain. Over two complete bloom cycles (May – October) in 2008 and 2009, we conducted bi-weekly dilution experiments and grazer incubation experiments to concurrently measure cyanobacteria/algal growth rates, microzooplankton (ciliates, dinoflagellates) community grazing rates, and mesozooplankton (copepod and cladoceran) clearance and ingestion rates. From April to June of both years, algal/cyanobacterial growth rates were maximal and microzooplankton grazing rates were relatively low. By contrast, from mid-June to mid-July (immediately preceding each year's cyanobacteria bloom), both algal growth rates and microzooplankton grazing rates were often negative, suggesting a “trophic cascading” effect may have led to conditions which promoted rapid cyanobacteria growth. Algal growth rates rapidly increased back to maximal rates after the cyanobacteria bloom began, and remained high during the bloom from late July to early September. However grazing rates of both microzooplankton and copepods also increased markedly as the bloom progressed, such that by September/October of 2008 and 2009 grazing rates were approximately equal to algal growth rates. This suggests grazers may have contributed to the rapid decline in cyanobacteria abundance, and demonstrate that zooplankton grazing may play an important role in the overall development and decline of cyanobacteria blooms.

Keywords: Water quality

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Partners in Discovery GK-12 project at WSU Vancouver: Building scientist-teacher collaborations to support student learning and inquiry skills

The “Partners in Discovery of the Columbia River Watershed” GK-12 project pairs WSU Vancouver Environmental Science graduate students (Fellows) with 6th-9th grade science teachers in 5 SW Washington school districts for year-long, one-on-one partnerships. Our goals are to bring the Fellows’ research and expertise into the classroom and to support the Fellow-teacher partners as they teach science through authentic inquiry, particularly to connect kids to their place in the watershed. Over the past 18 months we have focused explicitly on the nature of the collaboration between the Fellows and teachers, and how the development of that working relationship influences students’ abilities in scientific inquiry. Each Fellow-teacher pair jointly identifies specific needs among their students, e.g. ability to define testable hypotheses, or ability to use data as evidence of a scientific explanation. The pairs then together develop course activities/lessons that address these identified needs, examine student work and assessment results, and jointly reflect on what additional steps may be needed to improve those skills. We will present two examples of these collaborative projects conducted in 7th grade life science classes: a 3-month module to research and write a comprehensive management plan for a local animal, and a 1-week activity to develop an informational brochure for homeowners on Lacamas Lake explaining the importance of macroinvertebrates to lake and river ecology. We are conducting qualitative, case-study investigation of these partnerships to assess directly how the scientist-teacher collaboration is impacting student learning and ability to conduct inquiry.

Keywords: Environmental education, Water quality

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Portland-Vancouver Ultra-Ex: How do field-based water quality research experiences for K-12 teachers impact understanding and appreciation for urban ecology and stewardship?

As part of the Portland-Vancouver Ultra-Ex effort, we are assessing the impact of school-based urban ecology field experiences on K-12 teachers' and students' understanding of and appreciation for ecology and stewardship. In July 2011, 10 K-12 teachers from the Portland and Vancouver areas participated in separate week-long immersive research projects investigating the potential impact of human development on water quality and riparian vegetation diversity. The Portland teachers examined Balch Creek, Johnson Creek and Miller Creek, representing a gradient of potential impact from urbanization. The Vancouver teachers focused on water quality in Salmon Creek, from upstream to downstream, reflecting a gradient from low to high urbanization. Both groups of teachers first examined information on land use and urbanization in their watersheds, and then developed their own hypotheses to test. In Vancouver teachers' hypothesis was that water quality in Salmon Creek decreases as the degree of urbanization increases. Vancouver teachers then visited 5 sites on the main stem of Salmon Creek where they measured water quality (temperature, turbidity, water flow, nutrient concentrations) and macroinvertebrate diversity. Teachers then processed, analyzed and made preliminary interpretations of the data, and concluded that their hypothesis was supported. As a follow-up to the research experience, teachers were asked to incorporate their experience into their curriculum for the subsequent school year. We will bring all the teachers and their students together in Spring 2012 to share their results and assess how the experience may have impacted their ecological knowledge and attitudes toward their urban streams.

Keywords: Environmental education, Water quality

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Building a conservation plan for native turtles along the Columbia Slough, Portland

Protecting Oregon's two native turtle species in Portland's waterways is of great interest to natural resource agencies and to Portland's citizens. We developed a conservation plan that incorporates the distribution of turtles, estimates of habitat suitability, and evaluation of threats and conservation opportunities for turtles in the Columbia Slough and nearby aquatic habitats. We conducted field surveys during 2011 to better understand the current distribution and habitat relationships of turtles. In addition to well-known sites, we often observed native turtles in narrow water courses, water quality facility ponds, and sloughs and ponds in numerous golf courses. We used these data to develop an initial habitat suitability model to help inform management recommendations and to update a conceptual model of turtle-habitat relationships. Using all available data sources, we identified "turtle conservation areas" that can provide the basis for long-term conservation of these remarkable animals within the urban boundaries of Portland. The broad array of habitats that turtles occupy in Portland provides enormous opportunities for continuing collaborative conservation and education.

Keywords: Conservation biology, Land use planning, Wildlife biology

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Hummingbird dominance over a feeder: vigilant behavior of hummingbirds when occupying an urban residential feeder

Hummingbirds are territorial and solitary birds, and they aggressively protect nectar sources. They also exhibit a distinctive display of self attentive behavior. In other species there exists an instinct for assurance while feeding, producing vigilant behavior, but because of the hummingbirds' self-attentiveness, it is unknown whether their vigilance is elevated when competition exists for a food source. I conducted an experiment to evaluate the effect of food and competition on hummingbird vigilance. In order to conduct the investigation, I videotaped two species of hummingbirds, *Rufous* and *Celypte anna*, that routinely draw sugar water from feeders at an urban residence in Salem, OR. I recorded from the time the hummingbird landed on the feeder to the second it flew off. I analyzed each video, calculating the total time the hummingbird was at the feeder and the number of check-ups within that particular time frame. A comparison was then done between the hummingbirds that first arrived and those that did subsequently. My results reveal clear equivalence between the check-ups at a feeder and the duration of time in which the hummingbird was drinking. The range in time the hummingbirds were present on the feeder varied, however the average time between each check-up was consistent throughout all visits.

Keywords: Animal ecology, Wildlife biology

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Clark County Stream Health Report

Clark County's streams and rivers play an important role in the lives of our citizens. Like many municipalities, Clark County faces significant stream health challenges, and takes seriously the responsibility to promote stewardship and public awareness. The success of this effort hinges on presenting scientific information in ways that make sense to the general public. The Clark County Stream Health Report is an important tool to help people learn about conditions in their own watershed, overall trends in stream system health, and ways we can work together to make a difference. Clark County stream health is rated based on calculated metrics for three widely used indicators: water quality, biological health, and stream flow. Good indicators provide a reliable picture of conditions, respond consistently and predictably to changes, and must be able to clearly represent very complicated processes. The 2010 report compiles results from nearly 900 water quality samples, 125 macroinvertebrate samples and 19 stream flow datasets collected from over 80 locations county-wide by Clark County, other agencies, and citizen volunteers. Stream health is presented in color-coded score cards and maps, allowing readers to easily find information by subwatershed, by indicator, or for an entire watershed. Additional tables and maps depict significant land-use impacts. Additionally, the report provides descriptions of county programs and activities aimed at protecting and enhancing our natural environment. Readers can find contacts that encourage stream improvement at home and through volunteer opportunities.

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

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Restoration planning for the Portland Harbor Superfund Site

Portland Harbor was listed as a Superfund Site in 2000. Portland Harbor is a highly industrialized section of the Willamette River (RM 1 to 11.8) that also provides important habitat for sensitive, threatened, and endangered species, including salmon, bald eagle, river otter, and many others. The Portland Harbor Natural Resource Trustees have determined that restoration within Portland Harbor is the highest priority for restoration by potentially responsible parties. Over the past few years the Trustees have developed a portfolio of potential restoration opportunities in the Harbor and elsewhere in the Lower Willamette River's urban ecosystem. The geographic boundaries of restoration planning for Portland Harbor are based on guidance from an expert panel and literature review on the habitat needs of juvenile Chinook salmon, a species for which the Trustees have information indicating injury. The portfolio was developed by working with partners throughout the greater Portland area to identify high priority restoration opportunities. Their proposed projects were screened using criteria designed specifically to evaluate possible benefits to potentially injured species from the Superfund Site. Through this process, it has become clear that there are many opportunities within the Portland Harbor area that could benefit potentially injured species and water quality, ultimately restoring at least partial health and function to a dynamic area of the Willamette-Columbia system that is critical for juvenile Chinook and other species. The Trustees will soon be seeking public comment on the Draft Portland Harbor Programmatic Environmental Impact Statement and Restoration Plan, which is based on this approach.

Keywords: Environmental policy, Habitat restoration

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Mapping and priority setting for The Intertwine Alliance's Regional Conservation Strategy

In November, 2010, when The Intertwine Alliance launched the Regional Conservation Strategy (RCS) and Biodiversity Guide (RBG) for the Portland-Vancouver metropolitan region, no land cover map or regional conservation priority map adequately covered both the urbanized and rural portions of the Intertwine geography. Conservation priorities were either identified at a larger regional scale which typically excluded urban areas (e.g., state conservation strategies and Willamette Synthesis), were localized priorities that abruptly ended at jurisdiction boundaries, or were regional though based solely on expert opinion (e.g., Natural Features). The goal of the RCS was to add regional perspective to the local efforts, to have a shared vision that could facilitate cooperation on protecting the remaining valuable habitat. A data driven approach is meant to complement rather than replace local knowledge, by validating what we know and expanding to areas we know less well. With limited funding available for conservation activities and a diverse set of stakeholders, there is a need for a regional priority setting that can assist jurisdictions, agencies, and non-profits make more efficient and effective conservation decisions. The RCS Technical Working Group hired the Institute for Natural Resources to develop a land cover layer at a spatial resolution appropriate for highly fragmented areas (5m vs the typical 30m), then to develop a conservation priority model that addressed both aquatic and terrestrial conservation needs. The resulting model was reviewed and merged with expert opinion to fill data gaps and produce a final product for the RCS and RBG.

Keywords: Conservation biology, Environmental policy, Land/watershed management

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Effects of vegetation changes on at-risk butterfly populations in urban parks

From 2005 through 2011 monthly seasonal observations of butterflies were carried out in Powell Butte Nature Park because it contains the best habitat of any of Portland's Parks, having a extensive junctional zone between forest and grassland which supports the greatest diversity of different species. Fluctuations in sparse populations of Satyr Anglewing and Red Admirable butterflies were observed which were linked to removal of their caterpillar's plant food--Stinging Nettles. Fluctuation of Satyr Anglewings has varied from 0 to 12. Fluctuation of Red Admirables has varied from 1 to moderate (too numerous to count). Suppression of Nettle picking for exotic dietary purposes, and other reasons for destruction of these plants has resulted in a small restoration of these species. With the advent of improved electronic cameras field photocollection was successfully performed during the last 3 years, allowing this display of Portland's 2 most spectacular medium-sized butterflies. Another example of the effects of vegetation change in the park is the expansion of the population of colorful medium-sized day-flying Ranchman's Tiger Moths, as a result of the recent planting of Lupines to prevent erosion of soil denuded during the beginning construction of Portland's new water reservoir. Field photocollection of this species as well as others was performed.

Keywords: Conservation biology, Habitat restoration, Plant ecology

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Cost/benefit comparison of private residential versus public right of way stormwater retrofits

The City of Gresham designed and implemented a combination downspout disconnection and outreach/education program to help meet stormwater and pesticide reduction requirements of their NPDES permit with Oregon DEQ. The program targeted two neighborhoods over two summers (n=1,135), where average home participation rates of 7% (n=75) were enough to reduce runoff by 2.1 million gallons per year, meeting the DEQ pollutant reduction goal for Johnson Creek with approximately \$30K in labor and materials (.01/gallon managed). In year two, education elements that included offering natural gardening consultation by appointment, rain garden grants, and native trees and shrubs were offered to all contacts (n= 415/802 or 52% participation) to provide a higher pollution reduction return on the labor investment. These contacts resulted in 30 natural garden appointments, four rain garden installations, and installation of 300 native trees and shrubs. If this approach is applied to the remaining 4,000 Gresham homes in disconnection suitable areas, an estimated additional 9.3 million gals per year will be managed and will also result in about 150 high quality educational interactions with Gresham residents. This approach is contrasted with the use of public street rain garden retrofits for pollution reduction which diverts a higher concentration of pollutants per gallon but at a significantly higher cost, with little educational benefit. This presentation uses City of Gresham data to analyze and compare the costs and benefits of each approach.

Keywords: Economics, Environmental education, Water quality

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Eradication of *Ludwigia peploides* ssp. *montevidensis* from the Blue Heron Wetlands of northeast Portland, Oregon

The Blue Heron Wetlands are located in a residential area of northeast Portland. In the past five years an aquatic weed began to rapidly increase in range and density across three of the four ponds. The plant was identified as *Ludwigia peploides* ssp. *montevidensis*, an aquatic primrose native to Central and South America. In the spring of 2010, the Blue Heron Wetland Restoration Project was established to eradicate this exotic species. The project's goal is to eradicate *montevidensis* by the conclusion of the 2016 year. In the fall of 2011 a scientific study was implemented to quantifiably compare the efficacy of two herbicides. A triclopyr and glyphosate based herbicide were each applied on three 8m x 8m plots, with three plots receiving no treatment, acting as controls. Baseline biomass samples and percent cover data were collected. The results of the study will be available by mid-summer 2012 and will assist in the herbicide selection for widespread applications. The eradication plan includes two years of widespread chemical application followed by two years of volunteer pulls coupled with a monitoring program. The removed plant biomass will be treated on site to reduce costs and prevent further spread of *montevidensis* through transport. *Ludwigia peploides* in the BHW is one of two known infestations in the state of Oregon. Complete eradication is necessary to prevent further spread of *montevidensis* within the waterways of Oregon. Eradication methods will be tested and developed to assist in future eradication efforts of this invasive aquatic.

Keywords: Plant ecology

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Planning vegetation management with wildlife in mind

Restoration practitioners are increasingly asked to modify the timing and manner of treatments to accommodate life history needs of wildlife. To complicate matters, practitioners may get different guidance depending on the agency or individual consulted. The biologists providing the advice do their best to keep up with increasing interest and questions but are not always coordinated with each other. As we scramble to provide and implement “perfect BMPs”, we need to accept that they will change with our ecological understanding and the restoration project context. Rather than following detailed, prescriptive BMPs that attempt “one size fits all”, it may be worthwhile to explore situation-specific best practices by answering a few questions and adjusting vegetation management accordingly. With an understanding of the plants, animals and abiotic factors involved, practitioners can achieve habitat goals and avoid many risks to wildlife. I will provide a preliminary set of questions and examples of their application.

Keywords: Habitat restoration, Plant ecology, Wildlife biology

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Restoring retired agricultural land to a diverse wet prairie: A seeding comparison study

Currently, restoration professionals are debating about the best techniques to restore diverse prairie wetland plant communities. In this study, we wanted to determine which seeding approach would give us the most diverse plant communities over time at a new restoration in Western Oregon. Three seeding treatments 1) grass first, 2) forbs first and 3) grass and forbs together were established in a 142 hectare area. Treatments were monitored during the growing seasons of 2009 and 2010 using a visual percent cover estimate of all species in randomly selected 1 m² microplots. Treatments were replicated three times. The two hypotheses tested in this study were H1: The seeding treatment, forb first, will have the highest native plant richness and grass first will have the highest native plant abundance and H2: The grass first treatment will have the biggest increase in native plant abundance over one year and the biggest decrease in native plant richness. Using a single factor ANOVA with significance at the 5% level, no statistical differences resulted between treatments in native plant abundance for both 2009 and 2010 with p-values at 0.4640 and 0.0990 respectively. However, statistical differences resulted between treatments in native plant richness for both 2009 and 2010 with p-values of 0.0016 and 0.0036 respectively. There were no significant differences between years (2009-2010) for native richness in the grass first, grass and forb or forb first treatments (p-values= 0.09126, 0.37390, 0.54672 respectively) or for native abundance in the grass first and forb first treatments (p-values=0.06487 and 0.67044). However, there were significant differences between years for native abundance in the grass and forb treatment (p-value= 0.02907).

Keywords: Habitat restoration, Plant ecology

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Effects of land cover and governance on water quality in the Portland-Vancouver metropolitan area

We investigated how land cover and water governance affect water quality in two adjacent metropolitan areas across the Columbia River. While the Portland, Oregon and Vancouver, Washington metro areas share common biophysical characteristics, they have different land development history and water governance structures, providing a unique opportunity for examining a coupled socio-ecological system. Mixed methodologies, including a text analysis of government documents, econometric analysis, and a spatial analysis of water quality, allowed us to analyze differences in water quality as they related to land cover change and water governance. The differences in water governance in both places are quantified by the frequency of water quality monitoring efforts, degree of citizen involvement in stream monitoring, and spatial and temporal extent of riparian restoration. Land cover change in each monitoring site is quantified by using 1993, 2001, 2006 USGS national land cover data. Changes in water quality are then related back to aforementioned water governance and land use measures. Our preliminary results show that, while the spatial pattern of land development and water governance history differ across the four studied watersheds, there are no substantial differences in changes in water quality. This is likely to result from a combination of a long-term legacy effect of land development and a relatively short history of riparian restoration in both Portland and Vancouver region, suggesting that a long-term water quality monitoring effect is needed to identify the effectiveness of alternative land development and water governance structures on the improvement of water quality.

Keywords: Environmental policy, Land/watershed management, Water quality

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Likely effects of increasing human population densities in migration corridors: a review with implications for salmon management

This review examines the effects of environmental factors associated with human population density on salmon migration in both freshwater and nearshore marine environments. Anadromous fishes such as salmon migrate, to varying degrees, through both freshwater and marine corridors. Historically, anthropogenic influences have been extensive in freshwater habitats and while resource extraction activities have been intense in places removed from population centers, in general these influences have been concentrated where regional human densities are greatest. However, climate change models based on current data predict that ocean conditions have begun to change and are becoming more variable throughout the world. These predicted shifts in climate include greater changes in precipitation patterns as well as the intensities of flood and drought cycles. With respect to salmon migration there are two general categories of effects: 1) as travel corridors (e.g. predation, dam passage) influencing the timing, route choice and direct mortality of both out-migrating juvenile salmon and returning adults, and 2) as rearing, developmental and resting habitats characterized by indirect and synergistic effects on survival and fitness (e.g. temperature, food quality, mate selection). In this review similarities and differences in anthropogenic effects on salmon migration within and between regions are compared, and the Willamette River, OR considered as a case study.

Keywords: Animal ecology

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Envisioning a regional ecosystem for ecosystem research, innovation and action

In the digital age, healthy virtual ecosystems of inquiry, innovation and collaboration provide fertile ground for the development of visions, policies, strategies and partnerships to improve the human condition and quality of life. Vibrant ecosystems in Silicon Valley and Silicon Forest launched revolutions in the way we gather and use information, interact, trade and express ourselves. Similar revolutions await our relationship with the natural world. The Portland metropolitan region is wired and ready for a virtual ecosystem of environmental activists, natural and social scientists, planners, artists, financiers, political leaders and property owners. We need only apply the fundamentals of innovation and social networking to realize significant gains in watershed restoration, protection and stewardship. The purpose of this presentation is to provoke the emergence of an "ecosystem" that will convert research into innovation and innovation into actions to improve and protect the health of watersheds in the Portland-Vancouver metropolitan region. The presentation includes a systems map of existing elements of such an ecosystem, and contemplates features and functions that will encourage innovation, collaboration and action. The research (yet to be undertaken) builds on efforts and activities, including UERC, ULTRA-EX and Intertwine.

Keywords: Environmental policy, Land/watershed management, Sustainable development

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Community composition of urban riparian vegetation

Riparian vegetation provides many valued services, including bank stabilization, stream shading, and nutrient buffering. Urban structures and processes can dramatically change riparian areas, altering the vegetation communities and their abilities to provide these surfaces. It is unclear how specific urban features acting at different spatial scales contribute to these changes. The purpose of this study is to identify relationships between specific urban features at local and landscape scales and community composition of riparian vegetation. Vegetation was surveyed at 36 sites in the metro area of Portland, Oregon and Clark County, Washington during the summer of 2011. Urban features, including riparian buffer width, forest connectivity, and surrounding impervious surface area will be quantified at different spatial scales using GIS. Ordination will be used to determine relationships between local and landscape features and vegetation composition. Preliminary results are shown.

Keywords: Land/watershed management, Plant ecology

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Floodplain restoration as holistic, cumulative basin approach to mitigating stormwater impacts in Whipple Creek, Clark County, Washington

Clark County in 2006 assessed Whipple Creek and identified opportunities for capital construction and restoration. The assessment included a geomorphic evaluation of the processes driving channel formation and stability. Interfluve Inc. concluded that land clearing at the turn of the century and subsequent agricultural use and urbanization continue to destabilize the channel, degrading the stream, floodplain, and associated wetlands. Several projects were recommended to remedy this ongoing disturbance, including stormwater infrastructure improvements and habitat rehabilitation projects. Of particular interest was a project to stabilize vertically migrating headcuts and floodplain disconnection on a critical conservation property acquired by the county. An ensuing reach-level analysis in 2008 recommended treatments to preserve and restore floodplain function and associated wetlands, including grade-stabilizing rock substrate, valley-spanning log jams, and large woody debris placements. The county financed the project with \$850,000 in federal stimulus administered through the state's revolving fund. Interfluve designed the project to provide channel stability, promote floodplain retention of storm flows, and restore riparian habitat on 3,500 feet of Whipple Creek. Project benefits included increased channel complexity and split-flow conditions, 5-6 acre-feet of runoff detention, and nearly 5 acres of riparian planting (7,500 plants). A soft-path placed on the construction access provides additional recreational amenities. The project was constructed in 2010 by Aquatic Contracting LLC and is functioning well to date. In developed watersheds, floodplain and channel restoration projects contribute to a holistic, cumulative basin approach to mitigating stormwater impacts.

Keywords: Habitat restoration, Hydrology, Land/watershed management

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Portland-Vancouver ULTRA-Ex: Evaluating the role of governance in building resilient urban ecosystems

Our NSF-funded Urban Long Term Research Areas – Exploratory (ULTRA-Ex) project examines the role of governance for a pair of cities, Portland, Oregon and Vancouver, Washington, which have developed over the past three decades under contrasting policy regimes at the state, regional, and local levels. We ask three research questions: (1) How do differences in local and state levels of governance and policy affect the resilience of both social and ecological landscapes? (2) How do alternative land use planning strategies affect the provision of ecosystem services in response to different disturbance factors? And (3) How effectively do the processes and outcomes of monitoring ecosystem services provide a usable feedback loop in an urban socio-ecological system? We address these questions by assessing the multiple pathways through which human actions, governance systems, and the built and social infrastructure affect ecosystem services provided by landscape vegetation pattern and regional water quality. Our approach includes three focused projects (water quality, stormwater management and urban riparian greenspace conservation) that are tied together by three cross-cutting theme efforts (landscape scale development patterns, civic ecology and environmental education). Our preliminary findings indicate a great deal of variation in levels of civic engagement within each municipality, but the differences between municipalities and states are less clear. Social engagement in environmental issues appears to be high both in Portland and in Vancouver, however environmental conditions such as water quality appear to be controlled more by past land use legacies and local landscape conditions than by variations in citizen engagement.

Keywords: Environmental social sciences, Sustainable development, Water quality

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Back to the Future: Revisiting 'The Projects' to Advance Environmental Literacy.

In the 70's, 80's and 90's free, off-the shelf environmental education materials like Project Learning Tree (PLT), Project Wild, and Water Education for Teachers (WET) were all the rage in classrooms, outdoor schools and nature centers around the country - including Oregon and Washington. Hundreds of thousands of formal and nonformal educators joined the train-the-trainer style workshops, often after hours and on weekends, to learn how to use these "science based" activities for K-12 students. Did it work? And what lessons have we learned about this approach to environmental education? Do these "classic" low budget, kid-friendly activities have a place in today's more rigorous environmental science and STEM programs?

Keywords: Environmental education, Plant ecology, Wildlife biology

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