

URBAN ECOLOGY & CONSERVATION SYMPOSIUM

Sharing Data, Making Connections

Organized by the

Urban Ecosystem Research Consortium (UERC)

Held at

Smith Memorial Center, Portland State University

Portland, Oregon, USA

January 24, 2003

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(middle row) Wetlands--Lori Hennings; Wetland Botany--Metro Archives.

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Bird-Watching in the Suburbs--Terry Kem.*

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About the Urban Ecosystem Research Consortium (UERC)

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.

Background: The UERC is an informal group of individuals working throughout the Portland/Vancouver metropolitan area on natural resource-related studies, projects and programs. The group formed to promote networking, partnership-building and the exchange of information related to urban ecology and its application to natural resource conservation, natural area management, environmental planning, habitat restoration, and the social sciences. The following is a list of UERC goals and potential working groups:

- Provide direction and support for urban ecosystem research (*Applied Research Working Group*)
- Create an information-sharing network for data collection and application (*Planning and Coordination Working Group*)
- Track, house and provide access to information (*Data Management Working Group*)
- Promote a greater understanding of urban ecosystems and their importance (*Outreach Working Group*)

How to get involved in the UERC: The UERC's mission and goals will be met through the voluntary efforts of interested individuals. To participate or find out more, you can:

- Add your name and information to the list of UERC contacts; send an e-mail to Jennifer_Thompson@fws.gov for details.
- Join the list-serve hosted by Oregon State University to exchange information and receive notices about upcoming events by subscribing yourself at <http://www.lists.oregonstate.edu/cgi-bin/lyris.pl?enter=urban-erc>
- Visit the web site hosted by Portland State University for more information about the UERC at <http://www.esr.pdx.edu/uerc/>

Symposium Organizing Committee:

Jennifer Budhabhatti, Metro Parks and Greenspaces
Lori Hennings, Metro Long-range Planning
Mike Houck, Audubon Society of Portland
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

Symposium Sponsors:

Metro
Oregon Department of Fish and Wildlife
U.S. Fish and Wildlife Service
Audubon Society of Portland
Oregon State University, Geosciences
Portland State University, Center for Lakes & Reservoirs
Portland State University, Environmental Science & Resources

Symposium Agenda

<i>TIME</i>	<i>SPEAKER/FUNCTION</i>	<i>TITLE</i>
8:00-9:00	<i>Social</i>	Registration and Poster Setup
9:00		Welcome and Introduction – Alan Yeakley
9:10	Kathleen Dean Moore	Keynote Address: The Dance of World Renewal
		Physical Processes – Lauri Shainsky (moderator)
9:40	Kazuhiro Sonoda	Watershed Sources of Nutrient Input to an Urbanizing Stream in Northwestern Oregon
9:50	D. Torrey Lindbo	Student Watershed Research Project
10:00	Martha S. Mitchell	Assessing Riparian Corridor Conditions in Alluvial Environments of the Portland Basin
10:10	Amber E. Marra	Spatial Distribution of Stormwater Facilities within the City of Portland
10:20	<i>Break (hosted)</i>	
		Plant Ecology – Holly Michael (moderator)
10:40	Alan Yeakley	Controls on Native Plant Diversity in Urban Riparian Areas in Northwestern Oregon
10:50	Tina Merrels	Rapid Assessment of Invasive Plants at Smith and Bybee Lakes Wildlife Area, Portland, Oregon
11:00	Toby M. Query	Tree and Shrub Research Plots: An Assemblage of Two Research Objectives
11:10	Nancy E. Broshot	The Response of a Forested Community (Forest Park in Portland, OR) to Urbanization
11:20	Paul D. Ries	Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planning
11:30	Patrick Hendrix and Curt Zonick	Plant Community Monitoring at Metro Greenspaces
11:40	Lori Hennings	Birds, Bugs and Plants: Research to Support Regional Urban Planning and Policy Decisions
11:50	<i>Lunch (not hosted)</i>	
		Animal Ecology – Lori Hennings (moderator)
1:20	Michael T. Murphy	The Nature of the City: Vertebrate Diversity within Portland Parks and Greenspaces
1:30	Amber J. Keyser	Western Bluebirds: Ecology, Genetics, and Conservation
1:40	John C. Hak	Prioritizing Scenarios of Conservation for the Portland Metro Area's Terrestrial Vertebrates
1:50	Laurie J. Dizney	Zoonotic Disease Load in Urban Parks Small Mammal Fauna is Inversely Proportional to Biodiversity
2:00	Elaine M. Stewart	Integrating Wildlife Objectives and Restoration Efforts at Smith and Bybee Lakes Wildlife Area, Portland, Oregon
2:10	Julie Reilly	Considerations of Urban Restoration at the Tualatin Hills Nature Park
2:20	Virginia L. Butler	Where Have All the Native Fish Gone? Archaeological Fish Records Highlight Historic Changes to Portland Basin Fish Populations
2:30	Mike J. Reed	A Study of the Relationships Between Bank Treatments and Near Shore Developments and Anadromous and Resident Fish in the Lower Willamette River
2:40	David L. Ward	Status of Fish Populations in Portland Area Streams
2:50	<i>Break (hosted)</i>	
		Management and Conservation – Jennifer Thompson (moderator)
3:00	Deborah J. Lev	Portland Parks and Recreation Ecosystem Management 1, 2
3:10	Mart Hughes	Portland Parks and Recreation Ecosystem Management 3, 4
3:20	Michelle A. Wilson	The Port of Portland's Approach to Site-Specific, Port-Wide, and Regional Natural Resource Planning
3:30	Denise S. Rennis	Port of Portland's Mitigation and Property Enhancement Program
3:40	Chad T. Smith	Habitat Surveys in the City of Portland's Urban Streams
	Chris R. Prescott	Characterizing the Health of Urban Watersheds
	Jim H. Middaugh	Integrating Responses to Environmental Mandates: The City of Portland's Approach to Restoring Watershed-Scale Functions
4:00	Nancy Olmsted	Urban Watersheds: Is Our Understanding Clouded by Rural Thinking?
4:10		Wrap Up – Mike Houck
4:20-6:00	<i>Social</i>	Poster Session – Jennifer Budhabhatti and Kelli Larson (moderators)

List of Poster Presentations*

<i>PRESENTERS</i>	<i>TITLE</i>
Wendy H. Archibald	Integrating Habitat Restoration and Environmental Science into the Middle School Curriculum
David C. Bailey and Michael T. Murphy	Avian Communities of Remnant Northwest Forest Fragments within the Portland, Oregon Urban Landscape
Gary C. Bock and Kristen Wallway	Urban Restoration along Burnt Bridge Creek in Clark County, WA
Jennifer Budhabhatti	The Greenspaces Vision for the Portland Metropolitan Area
Tonia A. Burns and Joseph A. Maser	Retrospective Analysis of Riparian Habitat Restoration Projects Sponsored by Tualatin Valley Water Quality Endowment Fund
Linda A. George	Urban Heat Island Development in the Portland Metropolitan Region
Scott Hoffman Black, Matthew Shepherd, Jeff Adams, and Mace Vaughan	The Xerces Society: Current Programs and Projects
Chad Honl, Karen Williams, Meg Merrick, and Wendy Archibald	From Notes in Folders to GIS Maps "Documenting Friends of Trees" Urban Forest
Kelli L. Larson	An Investigation of Individual and Group Attitudes towards Water Resource Protection in Portland, Oregon
Nathanael I. Lichti and Michael T. Murphy	Determinants of Mammal Biodiversity in Urban Forests
Amber E. Marra, Becky Blanchard, Jennifer Devlin, Mary Kimble, and Matt Burlin	Community Watershed Stewardship Program: Funding Opportunities for Local Watershed Enhancement
Karen L. Nelson	Wetland Regulation at the Federal Level
Paul D. Ries	Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planning
Laura A. Roberts and Michael T. Murphy	Determinants of Amphibian Distribution in Urban-Forested Fragments
Lauri J. Shainsky and Terry H. Kem	Cybertracking in Oregon
Issa Simpson and Wendy Rankin	Safe Routes to School - an Alternative to Driving and Dropping Students
Julie M. Smith	Engaging Students in Habitat Restoration Monitoring through Research Based Learning
Heather C. Stevens	Cascadia Wild! Mentoring Connection to Community and Nature: The Nature Awareness Project
Alan Yeakley, Connie Ozawa, Aaron Hook, Shannon Axtell, and Jennifer Shively	Regulatory Tools and Citizen Actions for the Protection of Riparian Ecosystems in Urbanizing Areas

*Please see poster addendum sheet for poster presentations accepted after this booklet went to press.

Keynote Speaker

Kathleen Dean Moore

"The Dance of World Renewal"

With stories, readings, and reflection, Kathleen Dean Moore will celebrate urban wild places and the work of people who reclaim and sustain them. Thriving green spaces close to home are not only a source of 'ecosystem services,' but are also the grounds for community renewal and a source of hope in troubled times.



Kathleen Dean Moore is the author of two award-winning books of essays about what connects people and their places: "Riverwalking: Reflections on Moving Water" and "Holdfast: At Home in the Natural World."

She is Professor of Philosophy at Oregon State University, where she directs the Spring Creek Project for Ideas, Nature, and the Written Word.

Abstracts Submitted

01

Charles A. Adams and Scott Jones

Alternatives to Growth Oregon

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The Implications of, and the Alternatives to, Continual Growth in Oregon

Alternatives to Growth Oregon (AGO) was founded in 1998 by concerned Oregonians, in recognition that increasing population and consumption are root causes of environmental degradation, economic instability, and social injustice in our State. AGO's mission is to leave succeeding generations of Oregonians a more environmentally healthy, economically prosperous, and socially just State by encouraging progress toward a sustainable society and by discouraging growth focused on increased population and consumption. AGO is working to elevate the growth debate from how and where to grow to whether we should grow. Through speaking engagements, media, conferences, position papers and reports, we are exposing the myths of "sustainable" growth and encouraging dialogue and action on achieving a sustainable future not based upon population and consumption growth. Our research efforts include exposing the costs of growth and evaluating sustainable, economically viable alternatives.

Keywords: **Environmental Economics, Urban Environmental Planning, Environmental Policy**

02

Wendy H. Archibald

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Integrating Habitat Restoration and Environmental Science into the Middle School Curriculum

Winterhaven Middle School teachers, with support from the Waters Foundation, have created an innovative interdisciplinary project centered on the theme of tree biology in urban residential, urban natural, and managed timberland settings. The key curriculum objectives of all three projects include the development of data gathering and analysis skills, documenting environmental change over time, communicating data and results to the community at large, and moving beyond the use of technology as an "electronic encyclopedia" to the creation of knowledge and communication of data that can be useful to others in the education and science community. Along with the mathematics, science, and humanities teachers at Winterhaven, four organizations in the community are involved in these projects. The Portland Parks and Recreation Bureau is working with the middle school science students on the Oaks Bottom Wildlife Refuge Stewardship Project where students are in the process of monitoring their habitat restoration progress having already gathered their baseline data. The Campbell Group LLC is a timberland management company that has worked with the staff to develop a three-year cycle of activities related to Oregon's forest economy. Friends of Trees is working with science students to monitor and document past tree plantings using Geographic Information Systems (GIS) with grant funded software and training provided by Portland State University's Urban Geography Institute.

Keywords: **Plant Ecology, Habitat Restoration, Urban Environmental Planning**

03

David C. Bailey and Michael T. Murphy

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Avian Communities of Remnant Northwest Forest Fragments within the Portland, Oregon Urban Landscape

Urbanization causes fragmentation of native habitats resulting in a complex of ecological patterns, which may affect bird communities. We present initial findings from a study of avian distribution around Portland, Oregon. Objectives were to determine the distribution of forest birds, and to explain this distribution with associated landscape and habitat variables collected at different scales. Birds were surveyed by morning point-counts conducted twice at 93 stations within 22 forest sites (2 June-6 July 2002) falling within the tri-county urban growth boundary. Site criteria included remnant second-growth, mixed deciduous/coniferous woodlands, continuous canopy cover, and a developed shrub understory. Site-scale vegetation and other habitat variables were collected from July to September. We detected 57 bird species. Richness was not related to area, nor was total bird abundance. Neotropical migrant abundance was positively correlated with area ($R^2 = 0.380$; $P = 0.002$). In contrast, resident abundance was independent of area. Dominance of resident species declined with increasing area of urban forest fragments.

Keywords: **Animal Ecology**, Urban Ecology, Forest Fragments, Neotropical Migrant Birds

04

Ann Baker and Kelley S. Webb

Urban Water Works
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Urban Water Works: The Confluence of Art, Science and Community

Urban Water Works brings art and science together to restore living water in urban landscapes. Our goal in Portland is to see a city-wide network of water projects and educational programs that make our water systems and watershed visible and culturally integrated. Ann Baker and Kelley Webb of Urban Water Works will present slides of the UWW vision for creating green living systems that provide both functional and aesthetic benefits to our urban communities. Living systems provide models that are real solutions in urban environments. Instead of piping storm water runoff to a distant site to be treated with chemicals, a city can direct rainfall and runoff to ecoroofs, bioswales and constructed wetlands. These areas green the city and provide a living pathway for water to follow. Plants absorb and stabilize toxins through a visible process that reveals the essence of water, and creates a language about life and water that a community can integrate into their daily lives. Through their involvement in living water projects, community members are forever aware of the preciousness of water, its role in supporting our ecosystems and our society and their own ability to improve water quality.

Keywords: **Environmental Social Sciences, Water Quality, Urban Environmental Planning**

05

Scott Hoffman Black, Matthew Shepherd, Jeff Adams, and Mace Vaughan

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The Xerces Society: Current Programs and Projects

Invertebrates eclipse all other forms of life on Earth, not only in sheer numbers, diversity, and biomass, but also in their importance to functioning ecosystems. Invertebrates perform vital services such as pollination, seed dispersal, and nutrient recycling, and they serve as food for countless other animals. Although invertebrates are vitally

important, they are often overlooked in decisions of the management of both aquatic and terrestrial ecosystems. The Xerces Society is an international non-profit organization that protects the diversity of life through the conservation of invertebrates. The Society advocates for invertebrates and their habitats by working with scientists, land managers, educators, and citizens on conservation and education projects. Its core programs focus on endangered species, native pollinators, and watershed health. Although we work internationally, several of our current projects will have a positive impact on the environment of the Pacific Northwest. For example, we are working to protect several threatened butterflies under the Endangered Species Act. Through our aquatic program we are producing a CD-Rom guide to monitoring water quality in the Pacific Northwest using stream macroinvertebrates. In February we will publish the Pollination Conservation Handbook, a book detailing how to provide habitat for native pollinators, both in backyards and managed natural areas. In the spring and summer of 2003 we will work with Metro to train volunteers to monitor butterfly populations in our region's greenspaces. And, as always, we continue to produce Wings, our biannual magazine full of essays and photographs relating to invertebrate conservation.

Keywords: Habitat Restoration, Water Quality, Environmental Policy, Endangered Species, Pollination Biology, Invertebrate Conservation

Publication: Hoffman Black, S., M.D. Shepherd, and M.M. Allen. 2001. Endangered invertebrates: the case for greater attention to invertebrate conservation. *Endangered Species Update*. 18(2):41-49.

Publication: Hoffman Black, S. and D.M. Vaughan. (in press). Endangered insects. In: Resh, V.H. and R. Carde (eds.) *The Encyclopedia of Insects*. Academic Press. Sand Diego, CA.

06

Gary C. Bock and Kristen Wallway

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Urban Restoration along Burnt Bridge Creek in Clark County, WA

The Watershed Stewards of Clark County comprise a volunteer program sponsored by Clark County Public Works Watershed Resources section in partnership with WSU Cooperative Extension. Volunteers are trained in watershed ecology and other subjects during a 10 week course, then return at least 45 hours of volunteer service to the community. Kristen Wallway, a volunteer Watershed Steward, has formed a partnership with the Michael Servetus Unitarian Universalist Fellowship. The fellowship owns approximately 1300 feet of land along Burnt Bridge Creek, the most heavily urbanized creek in southwest Washington. This partnership has led to a restoration project that involves people from all over the community. What started as a small planting project for Earth Day 2002 has turned into a major project with monthly work days and a 30 to 40 foot riparian buffer along the entire section of creek owned by the fellowship. Juvenile offenders from Clark County Corrections regularly come to the work days and receive community service credit. Interested people from the church, the local neighborhood, and areas all over the county regularly spend time enhancing the riparian area and maintaining the plants. The Watershed Stewards formed a partnership with Trout Unlimited and received a grant of nearly \$10,000 from Washington Department of Fish and Wildlife. The grant is being used to purchase plants, maintenance equipment, and build a trail for public access.

Keywords: Plant Ecology, Fisheries, Environmental Social Sciences, Habitat Restoration, Water Quality

07

Scott A. Bradway

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EnviroCorps: How AmeriCorps Members are Involved in Urban Restoration Efforts

Over the past year the NWSA EnviroCorps program, in an effort to evaluate past project effectiveness, assigned a member to develop a project evaluation method. This method will be presented in the time allotted, including how and why the method was developed, as well as how it has been used. The Northwest Service Academy

EnviroCorps program is a team based AmeriCorps program Serving and Strengthening Northwest Communities by addressing critical environmental and educational needs. Information will be provided on how to utilize EnviroCorps teams in urban restoration projects.

Keywords: **Habitat Restoration**

08

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The Response of a Forested Community (Forest Park in Portland, OR) to Urbanization

Human activities cause changes in most natural systems. As human populations increasingly expand into forested areas, forests will become more reflective of human influence. I examined changes along an urban-rural forest gradient using 24 randomly selected sites in a naturally regenerating forest (Forest Park in Portland, Oregon). An additional site outside of the park was placed in a forest remnant that did not have any history of logging to serve as a control. The date and type of the last major disturbance (e.g., logging, fire) at each site was estimated using dendrochronology, site observations, and historical archives. Data on tree species composition, dbh, and diversity (H') were collected at all 25 sites. Data were analyzed using ANOVA and multiple regression to determine trends of change related to the urban-rural gradient. Many tree variables, especially those related to increasing shade tolerance, were positively correlated with distance from downtown. Portland and with the number of houses in the surrounding area. Significantly fewer saplings and small trees of shade tolerant species were located in the park nearest to the city suggesting possible interference with regeneration. The section of the forest nearest the city shows characteristics typical of an earlier successional stage than would be expected from its disturbance history. Possibly some factor of urbanization is interfering with normal successional processes in those sections of the park closest to downtown Portland. Such changes pose important ramifications for the management of natural forested site in urban areas.

Keywords: **Plant Ecology, Environmental Management, Environmental Policy**

09

Jennifer Budhabhatti

Metro Regional Parks and Greenspaces

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The Greenspaces Vision for the Portland Metropolitan Area

In 1989, Citizens in the Portland metropolitan area, non-profit, federal, state and local agencies recommended that natural areas be protected on a multi-jurisdictional level, including 24 cities and 3 counties. This led to the formation of the Metropolitan Greenspaces Program, which in turn resulted in adoption of the Metropolitan Greenspaces Plan and the accompanying greenspaces map. The Metropolitan Greenspaces Plan (1992) is a decade old, but its vision of an interconnected regional system of parks, greenspaces, open spaces, trails and greenways will be implemented for years to come. A greenspaces map was developed in 1990, based on inventorying aerial photos, conducting field surveys, using ecological and community criteria and seeking public input; it depicted 57 natural areas and 34 trails. A bond measure was passed in 1995, resulting in the acquisition of 14 sites and 7 trails covering 7,000 acres of greenspaces in the Portland Metropolitan area. The Greenspaces System concept map was developed in 2002, to update the 1990 greenspaces map and to depict the interconnected regional system of parks, greenspaces, open spaces, trails and greenways. A planning boundary of 1,011 sq. miles of area was identified based on sub-watershed boundary. Land cover was analyzed using 1998 satellite images and natural areas were identified. The natural areas were ranked based on ecological and community criteria, as cited in the Greenspaces Master Plan and approved by the Greenspaces Technical Advisory Committee (GTAC) and public outreach. Criteria were (1) Ecological criteria: Size, Proximity to natural areas, Proximity to riparian corridors, Species richness; (2) Community criteria: 2015 Metro forecast densities, Adjacency to trails, Adjacency to schools. Using

this ranking and their local knowledge the GTAC connected the top 200 natural areas through corridors.. This map is visionary and conceptual and will be used as a starting point to discuss non-regulatory tools such as acquisition, conservation easements, and incentives to protect both publicly and privately owned greenspaces in the next decade.

Keywords: **Urban Environmental Planning, Environmental Policy**

10

Tonia A. Burns and Joseph A. Maser

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Retrospective Analysis of Riparian Habitat Restoration Projects Sponsored by Tualatin Valley Water Quality Endowment Fund

The increased cost and ecological importance of restoring urban riparian zones has forced managers to evaluate past projects objectives and accomplishments to apply improved knowledge to future efforts. Portland State University was awarded a grant by the Tualatin Valley Water Quality Endowment Fund (TVWQEF) of the Oregon Community Foundation to classify and conduct a retrospective analysis of the restoration projects sponsored by the TVWQEF. In general, the aim of these projects was to improve the health or ecological integrity of the Tualatin River Basin. To determine success we assessed each project focusing on four objectives: 1) Removal of non-native plant species, 2) Addition of native plant species cover, 3) Addition of native plant species diversity and 4) Streambank corridor condition. A total count of all vegetation species planted was recorded at sites, along with the classification of alive or dead. Presence of bank erosion, estimated canopy cover and placement of woody debris were also recorded. Percent cover estimates of non-native invasive species were visually determined and recorded. A rating of none, slightly, moderately and greatly were used to determine a score of each projects success at obtaining the objectives. It is recommended that each restoration project include a maintenance plan with two years of invasive species removal. Another recommendation is that each project is required to include a schismatic map with species names and quantities. This project produced valuable information to managers and planners of ways to enhance the chances of success for future urban riparian restoration projects.

Keywords: **Plant Ecology, Habitat Restoration, Environmental Management**

11

Virginia L. Butler

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Where Have All the Native Fish Gone? Archaeological Fish Records Highlight Historic Changes to Portland Basin Fish Populations

Freshwater aquatic systems in western North America have undergone profound changes over the last 200 years owing to a range of Euro-American activities. Animal and plant populations are undergoing unprecedented declines. Archaeozoological remains that pre-date European contact can provide extremely useful histories of these ancient animals and as such, need to be considered in contemporary land-use policy. Recent study of fish assemblages from archaeological sites located along back water sloughs in metro-Portland and Vancouver that date to the last 1000 years illustrates how ancient fish bone records can be applied to contemporary concerns. Archaeological fish bone records are compared to recent fish capture records from comparable habitats. The most striking difference is the huge abundance of exotic fishes that now occupy aquatic systems and the relative scarcity of native taxa. Such a comparison of the "before" (European contact) with the "after" (European contact) graphically illustrates how much the fish biota has changed in a short time and the potential role of exotic fishes in causing such changes. Significantly, contemporary habitat restoration efforts mainly focus on the physical habitat rather than reducing exotic fish populations. Zooarchaeological records suggest native fish populations would be enhanced if more efforts were made to reduce exotic fishes.

Keywords: **Animal Ecology, Fisheries, Habitat Restoration**

12

Jim Closson

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West Willamette Wildlife Corridor

If invasive species and urban development are the catalysts by which we measure the threats to urban greenspaces, then what should be done to address these threats? One way Three Rivers Land Conservancy is approaching these issues is developing a working partnership with other land managers in the West Willamette Wildlife Corridor, an area stretching from Tryon Creek State Park to Forest Park. The foundation of the partnership is sharing information about programs and efforts to address invasive species control methods and eradication in this Three River's focus area. Three Rivers Land Conservancy owns a 40 acre forested parcel along Terwilliger Boulevard. Partnership Goals include: identify and establish partnership opportunities for invasive species removal, public education and outreach, and collaborative research opportunities; inventory invasive species infestations in approximately 700 acres; develop a rapid inventory and mapping methodology which effectively determines infestation levels and addresses control method options as part of the inventory technique, and one that could be field tested and developed over time and utilized by other land managers; coordinate efforts to estimate control and removal costs and develop funding proposals for work crews to remove invasive species; build on existing information regarding invasive species control methods; and utilize the group as a support and information network. It is apparent that invasive plant species will destroy the native ecology of urban forest and greenspaces if it does not become a priority issue, and one in which a collaborative effort among land managers is realized.

Keywords: **Habitat Restoration, Urban Environmental Planning, Environmental Management**

13

Julie A. DiLeone

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Conservation on the Urban Fringe

The East Multnomah Soil and Water Conservation District provides services to private landowners both inside and outside the urban growth boundary. We have programs to address water quality and wildlife habitat in both urban and rural settings. Since we are not a regulatory agency, landowners feel comfortable working with us to fix the resource concerns on their property. We also try to foster understanding between urban and rural landowners. We have 3 programs for landowners: 1. The Conservation Planning and Implementation Program works to develop conservation plans on small acreage agricultural and rural properties. We provide technical assistance on developing and implementing conservation plans as well as assistance finding sources of cost share. 2. The Agricultural Water Quality Management Program works with the Oregon Department of Agriculture and a local advisory committee to develop water quality rules for agricultural land in the Lower Willamette Subbasin. Small acreage 'hobby' farmers and commercial agricultural operations will be regulated by these rules. 3. The Naturescaping for Clean Rivers Program works in collaboration with the City of Portland to present free workshops that educate landowners about non-point source pollution from residential lands. (Please see the Naturescaping abstract - #61 in this proceedings)

Keywords: **Habitat Restoration, Water Quality**

14

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SOLV

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Vegetation Monitoring on Restoration Sites with Volunteers

Team Up for Watershed Health (TU), a program of SOLV, engages volunteers in watershed restoration and enhancement efforts in the greater Portland metropolitan area. Over the past two years, more than 3,000 volunteers have worked at 30 sites. Sites are nominated by community organizations, watershed councils and by program sponsors and partners. TU accepts sites that fulfill two criteria: 1) sites appear in a watershed assessment or management plan or are a priority based on analysis by a government agency, and 2) sites are appropriate for volunteers where they can make a contribution to watershed health. TU works on restoration sites for 3 years, and then continues maintenance and monitoring for an additional 5 years. SOLV recently implemented a comprehensive monitoring program that involves photo-point and vegetation plot monitoring. Photo-points as well as vegetation plots are set up by staff and all data is collected by community volunteers and students that have attended our monitoring training. The vegetation plots are fixed and cover at least 10% of the site area. Data collected within these plots include species survival, species growth rates, caliper width, plant health, types of damage, ground cover composition, soil type and invasive species coverage. These data are collected once a year in the spring and photo-points are taken twice a year. The purpose of this data collection is to determine the success of our restoration activities in terms of plant survival and growth as well as identify maintenance activities that need to occur.

Keywords: Plant Ecology, Environmental Social Sciences, Habitat Restoration

15

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Zoonotic Disease Load in Urban Parks Small Mammal Fauna is Inversely Proportional to Biodiversity

One key impediment to effective conservation efforts is the fact that arguments in support of conservation almost invariably tend to be subjective and rely on emotion rather than on reason. Nevertheless, an increasing body of literature points to a number of important pragmatic correlates to conservation: long distance impacts of deforestation in lowland tropical forests causing forest loss in highland regions, or the higher species diversity of benthic invertebrates enhancing ecosystem functioning. These studies, however, have tended to be considered irrelevant to mainstream urban human populations. We have been investigating in Portland (Oregon) a potential inverse correlation between biodiversity and incidence of zoonotic disease (specifically, Sin Nombre Virus, the etiological agent for Hantavirus Pulmonary Syndrome in humans, with a 40% mortality rate). The first nine months of the planned three-year study have taken place in Forest Park, Powell Butte, and Tryon Creek (additional parks are scheduled). These parks vary in area and vegetation, hence provide a continuum in small mammal biodiversity. To date we have sampled over 135 specimens for presence of antibodies to SNV. Within the limits of our sampling protocol, the incidence of SNV+ deer mice (*Peromyscus maniculatus*) in parks ranges from 5.4% (Tryon Creek) to 16% (Forest Park) and is significantly correlated with proportion of deer mice constituting the small mammal communities ($R^2 = 0.9055$; $P = 0.04$). The implications of the work are unambiguous. Greenspaces must be managed to maximize biodiversity in order to minimize the presence of zoonotic diseases and their associated risks to humans.

Keywords: Environmental Management, Environmental Policy

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FISH FIRST!

Waiting for nature to rehabilitate degraded streams will not result in recovery, or recovery within hundreds of decades, because society is unwilling to dramatically reduce growth and expansion, remove the influence of people and structures, or restrict human occupation for at least a half mile from a stream. Thus, it has been the focus of FISH FIRST to undertake projects that directly benefit fish.

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What's in Our River? - The Lower Columbia River Aquatic Nonindigenous Species Survey

Introductions of aquatic nonindigenous species (ANS) (also known as "invasive" or "exotic" species) are increasing, along with their social, economic and ecological impacts. Following substantial amplification in the speed and volume of global shipping, the discharge of ballast water into aquatic systems world-wide has become a significant pathway for ANS introductions. With five major deep-water ports, the lower Columbia River receives a large volume of ballast water from nearby highly invaded estuaries as well as foreign ports. Recent ANS introductions of concern to researchers include the New Zealand mudsnail, the Siberian prawn, and *Pseudodiaptomus*, a planktonic crustacean. In addition, the flora and fauna of many urban freshwater systems have been significantly altered by non-native species introductions carried out by government agencies as well as individuals intending to bolster native species diversity. Examples of such introductions in our region include bullfrogs, large and small mouth bass, and carp. Despite previous invasions and the potential for new ANS introductions via ballast water, and regardless of the long history of intentional introductions of aquatic species in the waters of the Pacific Northwest, no systematic survey of ANS exists for the lower Columbia River. Implemented in the fall of 2001, the objective of the Lower Columbia River Aquatic Nonindigenous Species Survey is to remedy this by characterizing ANS in the lower Columbia River Basin. This two-year investigation will serve as a baseline for evaluating the rate of species introductions to the river and contribute important new information to ongoing regional ANS studies.

Keywords: Invasive Species, Columbia River

18

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Portland Parks and Recreation Ecosystem Management 2

The first phase of the Portland Parks and Recreation ecosystem management framework is an inventory of the existing conditions of natural area parkland. Since the vegetation community reflects the soils and hydrology of an ecological unit and contributes heavily to its structure, a comprehensive vegetation inventory is an essential management tool and the current main area of focus. To this end, the Natural Resources Program, with the help of an AmeriCorps volunteer, is developing a vegetation classification and mapping protocol. The classification scheme is adapted from the National Vegetation Classification System (NVCS), which was developed by the Nature Conservancy and has been adopted by many federal agencies including the BLM, USGS, and the National Park Service. A comprehensive classification will be done of all natural area parkland using high-resolution aerial photos, while more detailed, on the ground surveys are used in individual sites. In addition to cataloging the

vegetation communities on parkland, the ecological condition of distinct areas will be rated and management concerns will be noted. ArcView GIS will be used to facilitate the geographic representation of the vegetation data. Wildlife surveys - including birds, amphibians, insects, fish, and mammals - can be an important component of a natural resources inventory. Portland Parks currently lacks the resources to conduct wildlife studies. Interested students and professors are encouraged to contact Parks staff to discuss research possibilities. (Also see related abstracts #26, 32, 75).

Keywords: **Animal Ecology, Plant Ecology, Habitat Restoration**

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Urban Heat Island Development in the Portland Metropolitan Region

Urban heat islands develop as a result of the change in the radiative and thermal properties of the earth's surface with urbanization. In general, urban heat islands are considered to generate negative impacts on the environment. Analysis of meteorological data gathered from more than 30 roof-top sites for the last three years reveal a significant urban heat island effect in the Portland, Oregon region. These data are complemented with several hundred ground-level temperature data points gathered along transects. Our analysis compares the current situation with a regional temperature study conducted in 1985 and correlates climate changes with changes in land-use and urbanization.

Keywords: **Air Quality**

20

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Out of Site Out of Mind

In Portland there are more than 1000 subsurface water quality facilities. They include Oil/Water Separators, Water Quality Manholes, Stormwater Treatment devices, and Drywells. This infrastructure has been installed to halt the flow of pollutants to surface waters. So much for the question of why? The remaining questions are the topic I'd like to raise at this symposium. What are they? Where are they? How do they function? Who is responsible for their installation, performance and maintenance? When are they installed? Replaced? Maintained? Monitored? Which public agencies have jurisdiction over them? The existence and general understanding of this infrastructure is and has been well known by developers, planners and engineers engaged in site specific project planning, development and management. The aggregate results produced by this infrastructure are not. Assuming this infrastructure is working effectively and halting the flow of pollutants: Who is removing the pollutants and where are they taking them? How is this maintenance evaluated? What is the process utilized to ensure that the captured pollutants are handled, transported, and disposed of responsibly? Finally, who cares? The answer to the last question is one that should be seriously considered by the academics, bureaucrats, and employees of non-profit environmental organizations.

Keywords: **Environmental Economics, Water Quality, Hydrology, NPDES**

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Prioritizing Scenarios of Conservation for the Portland Metro Area's Terrestrial Vertebrates

In response to planning needs addressing declining urban habitats for terrestrial wildlife, managers are utilizing broad-scale, region-based strategies for identifying, conserving and restoring habitats. The results of such a regional analysis of habitat and synthesis of sensitive species distribution are presented here as part of a multi-agency approach to target areas of substantial occurrence of sensitive species. Individual distributions for 365 species were developed using landscape models, which utilize a coarse filter (hexagon), and habitat association to identify potential significant habitats (White et al. 1992). Utilizing parameters developed by Adamus et al. (2000), models are affected by adjacent habitat including riparian occurrence, Wooded wetlands, Shorelines, Marsh, Edge effect, and Stream gradient. Species-habitat relationships were modified from a binary assignment, as used in Gap Analysis, to a habitat selection gradient with values of 0-10 (no selection to high selection). The map of habitat distribution was based upon the original habitat description maps supplied by Metro and includes modifications to include additional information from ORNHP on wetland distributions in the southern metro region, and predicted riparian types supplied from buffered streams. A subset of vertebrate models was analyzed using the program Marxan to develop an optimized model of conservation priorities. The advantage of such a modeling scenario is the inclusion of prioritized species distributions with the land value in a conservation design that meets the goals set for each species at the lowest cost.

Keywords: **Animal Ecology, Environmental Economics, Urban Environmental Planning**

22

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WUW-Net Update

WUW-Net has undertaken a number of projects related to its goals of learning and coordination: WUW-Net sponsors informative speakers at its monthly meetings; WUW-Net is developing a regional workshop on outreach for urban watersheds; WUW-Net developed and presented a major regional workshop on science-based management of urban riparian zones; WUW-Net worked with the Oregon Plan staff to improve communication between Oregon Plan staff and local governments. Further, to clarify the role of local governments in the Oregon Plan, WUW-Net surveyed local governments about their salmon and ESA activities to help provide better information to decision makers about funding needs for these activities in urban areas, WUW-Net wrote and distributed a series of informative "white papers" on ESA related issues and impacts within urban areas (e.g., Pringle Creek, Salem, Oregon). WUW-Net also works closely with the National Marine Fisheries Service and coordinates with other state and federal agencies involved with salmon protection and recovery. WUW-Net also provides information exchange, networking, coordination and strategy development opportunities.

Keywords: **Environmental Social Sciences, Habitat Restoration, Urban Environmental Planning**

23

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Birds, Bugs and Plants: Research to Support Regional Urban Planning and Policy Decisions

Ecological studies provide invaluable decision support for policymakers, particularly in urban areas where human impacts are strong and widespread. Our research focuses on the urban gradient paradigm, in which study sites are placed across a range of urbanization to study adverse land-use effects and how those effects may be mediated. In 1999 we surveyed birds and plants at 54 study sites throughout the Portland metropolitan region. We found that long-distance migratory songbirds are especially at risk in urban areas. Nonnative plants and birds are substantially reduced near streams with >200-ft forested buffers (1-sided). These data fed directly into Metro's Goal 5 wildlife habitat inventory Geographic Information Systems model. In 2001 we revisited the 1999 study sites plus 102 additional sites and conducted wildlife habitat assessments to field-test Metro's wildlife habitat model, resulting in model adjustments. We collected instream macroinvertebrates and other data at the 1999 study sites to identify factors important to stream health. Working with Judy Li's lab at OSU, we found that streams are positively influenced by the amount of vegetation within 300' of streams and proportion of the drainage retaining forest canopy cover, and negatively influenced by increasing acreage of industrial and commercial lands. Future work includes gathering baseline ecological data and developing a long-term monitoring strategy in the Damascus area, which has just been added to the Urban Growth Boundary. These results will help guide regional environmental planning efforts and policy decisions. Funding sources: Mace Watchable Wildlife Endowment, USFWS/Metro Regional Parks and Greenspaces Program Partnership.

Keywords: Animal Ecology, Urban Environmental Planning, Environmental Policy

Publication: Hennings, L.A. 2001. *Riparian bird communities in Portland, Oregon: Habitat, urbanization, and spatial patterns*. MS Thesis, Oregon State University, Corvallis, Oregon.

Publication: Hennings, L. A. and W. D. Edge. *In press*. Riparian bird community structure in Portland, Oregon, USA: Habitat, urbanization and spatial scale patterns. *The Condor*.

24

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From Notes in Folders to GIS Maps "Documenting Friends of Trees" Urban Forest

Friends of Trees is the only nonprofit in the Portland-Vancouver area focusing exclusively on planting and caring for city trees and inspiring stewardship of the urban forest through environmental education of the general public. We focus on urban and suburban neighborhoods and school properties, as well as urban natural areas. Since its founding in 1989, Friends of Trees has trained and organized over 23,000 volunteers to plant over 200,000 trees and seedlings in the Portland Metropolitan area. The organization began replacing street trees that had died, as it emphasized community-building efforts. Today, Friends of Trees has solid partnerships with both Portland's Urban Forestry Division and Bureau of Environmental Services. A volunteer Tree Committee was established several years ago to offer a diverse selection of tree species that are suitable for the various planting-strip widths in the area, helping insure diversity in the urban forest. We promote community-based science, emphasizing education and stewardship of the urban forest. Friends of Trees has accumulated address and species data for trees it has planted during its 12-year history. From paper sheets of data in folders, we have expanded to the use of files in Excel and Access. Using ArcView software from ESRI, we are mapping Friends of Trees-planted trees, and are able to determine tree diversity, tree survival and health, while continuing to advocate for the urban forest at various levels of public policy determination.

Keywords: Environmental Social Sciences, Urban Environmental Planning, Environmental Policy

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4-H Wildlife Stewards - Bringing Science and Nature Together One School at a Time

Can elementary and middle school students develop science skills, make informed decisions and formulate hypotheses on environmental issues such as water quality? If so, how might we integrate appropriate learning environments and instructional materials in partnership with schools, parents, and community members? Will such activities delivered informally engage entire communities in environmental stewardship and improve science education as currently measured? Are community-trained volunteers the critical missing link to make all this happen? These are the questions the 4-H Wildlife Stewards Program is addressing in their 3-year \$748,000 project funded by National Science Foundation. This project addresses the learning approaches likely to promote understanding of science information and the critical need to provide trained volunteers to help deliver environmental programs in schools. OSU Extension 4-H Program in collaboration with school districts, parent groups, and organizations mobilizes parent and community support for improving student science through the 4-H Wildlife Stewards Program. 4-H Wildlife Stewards are trained volunteers who deliver sustainable natural science education programs through the creation of wildlife habitats on school grounds and promote science competency among youth by inspiring, educating, and connecting communities, schools, and natural science agencies. Benefits of this effort in 2002 include 55 urban and rural schools with more hands-on science programs for 12,887 youth delivered by 156 trained 4-H Wildlife Stewards. This workshop will introduce participants to this program model as it goes nationwide and will highlight some of the lessons we learned in educating and involving schools and communities in addressing issues around environmental stewardship through the 4-H Wildlife Stewards Program.

Keywords: **Environmental Social Sciences, Habitat Restoration, Urban Environmental Planning**

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Portland Parks and Recreation Ecosystem Management 3

The management of 7,000 acres of open-space parklands requires a spatial approach that is flexible and able to record management activities. Inherent in the GIS approach is the ability to manage quantitative data that translates into cost-effective decision-making. The Natural Resource Program is currently using ArcView 3.2, the Metro RLIS and the City of Portland's Corporate GIS data-libraries as core spatial tools. ArcView has proven to be a highly useful application for environmental analysis. Currently the Natural Resource Program is developing data layers and database tools to implement ecosystem management system. New data is being added from both field survey and photo interpretation of recent aerial ortho-photographs. Analysis of factors such as topography, soil, hydrology, and historic vegetation combine with inventory data to determine desired future condition and appropriate interventions. We are also developing tools for recording the extent of weed infections and designing layers to track and monitor chemical and mechanical treatments, planting, seeding, maintenance, and volunteer activities. (Also see related abstracts #18, 32, 75).

Keywords: **Plant Ecology, Environmental Social Sciences, Urban Environmental Planning**

27

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Flocculation and Suspended Sediment Transport

Numerous studies have identified the importance of aqueous suspended matter to contaminant transport, nutrient dynamics, and ecology. Suspended particles adhere together, forming flocs whose physical behavior varies substantially from that of individual particles. To support ongoing studies of salmonid habitat in the Columbia River estuary, Oregon Graduate Institute (OGI) has been developing novel methods to investigate suspended matter and flocs. As part of this study, we recently acquired the first production LISST-FLOC. It uses diffraction of laser light to determine size-volume spectra of suspended particles with diameters between 7 and 1500 microns. Comparison of masses obtained from filtering, drying, and ashing of samples with LISST data allows estimation of floc porosity. To understand floc composition and structure, we have used OGI's scanning electron microscope (SEM). In addition to producing highly magnified images of flocs, SEMs collect and analyze backscattered electrons and X-rays to determine floc composition. X-rays allow identification of elemental composition of materials, such as particles high in iron, phosphorous and other nutrients. Understanding flocs and their formation also requires knowledge of the hydrodynamic environment they form in. Acoustic Doppler profilers can be used to measure both water velocity and to determine suspended matter (SPM) concentrations based on acoustic backscatter. We have also developed SPM profile models that combine acoustic backscatter with optical data to achieve concentration and size spectrum estimates throughout the water column. As development of these techniques progresses they hold promise for application beyond the Columbia River into urban streams and stormwater BMPs.

Keywords: Geology/Soils, Water Quality, Hydrology

Publication: Jay, D. A. and J. D. Musiak, 1994, Particle trapping in estuarine turbidity maxima, *Journal of Geophysical Research*. 99: 20,446-61

Publication: Orton, P.M., Jay, D.A., and Wilson, D.J., A model-dependent heterogeneous suspended particulate matter calibration for bottom boundary layers. *Marine Geology* submitted.

Publication: Mayer, T. D. and W. M. Jarrell. 1995. Assessing Colloidal Forms of Phosphorous and Iron in the Tualatin River Basin. *Journal of Environmental Quality* 24: 1117-1124.

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Healthy Portland Streams Project Update

The Healthy Portland Streams (HPS) project is critical to addressing Portland's River Renaissance Vision and the Endangered Species Act, Clean Water Act and Metro Title 3/Goal 5. HPS will update Portland's decade-old environmental zoning program to adequately protect streams, wetlands, riparian areas, and upland wildlife habitat. The Portland Planning Bureau began by reviewing recent scientific literature and updating the City's significant resource inventory. Independent scientists reviewed this work. Staff consulted with other agencies and a citizen committee in preparing amendments to the City's comprehensive plan, zoning maps, and zoning codes that regulate development in environmental zones. The City released an initial draft proposal in November 2001. Although regulatory agencies and some citizens expressed support, most of those commenting expressed concerns about the mapping approach, regulatory overkill, cost, complexity, fairness, and specific issues such as landscaping and tree removal requirements. Since March 2002, the City has been reviewing public comments, conducting site visits, refining the inventory protocol, sponsoring economic analysis, and framing policy issues for discussion. During 2003, the City will develop clear policy direction for watershed health, update the resource

inventory (for riparian areas and upland wildlife), and simplify existing environmental zoning regulations. Stakeholder involvement will be key. Revised drafts will be ready for public review and hearings before the Planning Commission and City Council in fall/winter of 2003. Once this groundwork is in place, the Planning Bureau will revise the draft ESEE analysis, environmental zoning maps, code improvements, and a non-regulatory strategy proposal for public review and decision-making.

Keywords: Urban Environmental Planning, Environmental Management, Environmental Policy, Land Use Planning

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Green Urban Design

We shall not achieve sustainable urban environments by a single discipline, by uncoordinated acts of design, or understood through the application of prescriptive criteria. Rather it will be solved as we consider how communities and government agencies work together, to affect how groups of buildings and their sites are designed. As cities redevelop, transportation, land use, and environmental considerations define them. We can begin to value these elements equally and seek their goals simultaneously. As an outcome of this discussion, each public infrastructure project and private project should demonstrate how they contribute to the watershed, how they improve habitat, and achieve economic, and community goals at very little cost to each project. Urban design, as a discipline-in concert with many other professionals and community leaders, has a significant contribution to make. It serves the middle scale, meeting the goals of individual buildings and regional planning. Where a project is planned to add value to an urban area, urban design can find and develop human aspirations that include cleaner water, air, and accommodation for other species, meeting economic and societal goals. A new urban landscape can be considered where groups of buildings and the space between them are be designed for people, helping them to clean the environment, rather than contaminate it. We are investigating a holistic design approach, considering how sites can be selected and designed to address rainwater, habitat, and public space needs as well as address siting, land use, and transportation issues. We will describe a range of projects from our portfolio of work that illustrates this green urban design approach. They include a light rail project; a new town center, a 25,000 person assembly hall, a 700,000 gsf convention center, hospitals, and museums, as well as other projects making a contribution to the organization of the city and its watershed.

Keywords: Water Quality, Urban Environmental Planning, Air Quality, Transportation & Environment

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Western Bluebirds: Ecology, Genetics, and Conservation

The Prescott Bluebird Recovery Project (PBRP) is a volunteer-based, non-profit organization dedicated to the conservation of the Western Bluebird (*Sialia mexicana*) in Oregon's Willamette Valley. In the early 1900's bluebirds were common in the Willamette Valley. However, the population declined dramatically by 1940, probably due to changing land use patterns, and is still listed by Oregon state government as a sensitive species. PBRP maintains and monitors over 1700 nest boxes. We have banded nearly 10,000 individual bluebirds and have collected nesting data on over 1400 nesting attempts. We maintain all data in a relational database that allows us to extract information in a variety of formats in order to address our research questions. On the conservation side, we study demography and population growth, the influence of supplemental feeding on survival and fecundity, causes of natural mortality in adults, habitat usage, and inbreeding. Our more basic research questions include studying patterns of natal and breeding dispersal, endoparasitism and sexual selection, heritability of fitness, and the

differential persistence of genetic lineages. We share data with the North American Bluebird Society and participate in the Cornell Lab of Ornithology Nest Box Cam Program. We are active in educational outreach through the annual Champoege Bluebird Festival and other public events. Information about our program can be accessed at <www.prescottbluebird.com>.

Keywords: **Animal Ecology**

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An Investigation of Individual and Group Attitudes towards Water Resource Protection in Portland, Oregon

Evidence suggests that although Portland residents support stream and wetland protection in general, significant opposition to specific water resource protection measures exists. The research presented in this poster is aimed at exploring this ideological divergence and seeking explanations for urban residents' varying environmental attitudes, with particular attention to support for and opposition to different policy tools comprising the Healthy Portland Streams Initiative. Environmental attitudes at both the individual (resident) and group (watershed council and neighborhood association) level are being investigated, because the frequent involvement of such groups in environmental decision-making raises questions about the extent to which their views and activities represent the interests of the general public. The primary data collection method employed in this project is a written questionnaire (to be implemented in Winter 2003). The questionnaire is primarily an attitudinal survey, but socio-demographic and other independent variables will also be collected to examine factors that explain environmental attitudes. Attitudinal scales will quantify such variables as environmental ideology, political attitudes (e.g., regarding property rights), civic involvement, and place attachment. Behavior will also be investigated with measures such as voting behavior and landowner practices. Interviews with Portland-area agency personnel and neighborhood residents are underway to aid the research design, including the development of hypotheses and the survey instrument. This poster presents some preliminary findings from this work, as well as survey questions and hypotheses to be tested with the mail questionnaire. Currently, the study area for this research is the Johnson Creek Watershed.

Keywords: **Environmental Social Sciences, Hydrology, Environmental Policy, Water Resources**

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Portland Parks and Recreation Ecosystem Management 1

The Natural Resources Program of Portland Parks and Recreation has adopted an ecosystem management approach aimed at protection and enhancement of more than 7,000 acres of natural area parkland. We invite partnerships with academic and other interested groups to better inform our management of these sites. Our natural area parks serve as urban ecology laboratories, native wildlife habitats, and biodiversity preserves. They provide nature-based recreation, water quality improvement, education and stewardship opportunities, and open space. Urban park sites provide long-term research opportunities on protected sites with stable management. As density increases throughout the Metro region, urban parks may serve as a model for future functioning of suburban and rural landscapes. Little is known about ecological processes in urban environments. Do wildlife adapt to smaller patch sizes? Is nutrient cycling in urban forests disrupted by pollution, trampling or soil invertebrates? We need to better understand how our urban natural areas function to insure their future. Our Ecosystem Management Approach consists of six steps: Inventory, Desired Future Condition Statement, Assessment, Prescription, Intervention, and Monitoring. Adaptive management will allow research findings to be incorporated into our ongoing operations. We are currently engaged in system-wide inventory, as well as more detailed inventory at individual park sites. At

a few model sites, we are in the implementation phases of our program. We look forward to collaborating with researchers and other land managers in the region. (Also see related abstracts #18, 26, 75).

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Metro Green Streets Project: Environmental Designs for Transportation

As cities continue to grow, it has become increasingly important to acknowledge the effect of roads and highway right-of-way on the health of our environment, particularly streams and wildlife corridors, while providing certainty in our ability to build urban transportation systems. These conflicts are especially acute in newly emerging urban areas at the urban fringe. These areas often contain many largely undisturbed streams and wildlife corridors, and few roads. In the Portland metropolitan region, the conflict between stream protection and urban growth pressures has increasingly limited the region's ability to urbanize these emerging areas. There are a number of projects that Metro has initiated that would help quantify transportation impacts and propose ways to mitigate their impacts on storm water, fish and wildlife. The Metro's Green Streets Project, completed in June 2002, addresses the growing conflicts between good transportation design, and need to protect streams and wildlife corridors. The key components are the Green Streets Handbook, with best management practices for building environmentally sound streets that rely on interception and infiltration of storm water, in lieu of traditional conveyed systems; spacing guidelines for new stream crossings based on a technical analysis of the relative environmental and transportation benefits; an inventory of existing culverts that block passage of endangered salmon and steelhead species, and a plan for retrofitting culverts based on scientific benefits. A pilot study has been initiated to quantify deer/elk mortality related to vehicular accidents in the Portland metropolitan area and to determine their hot spots. Results from this study will inform transportation planners about the need to provide wildlife passage opportunities in the Portland metropolitan area.

Keywords: Animal Ecology, Urban Environmental Planning, Transportation & Environment, Wildlife Mortality

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Determinants of Mammal Biodiversity in Urban Forests

Wildlife communities inhabiting remnant habitat fragments in cities are subject to island biogeographic processes, but the numerous landscape-level ecological changes that occur along urban-rural gradients complicate these patterns (e.g. Bolger et al. 1997, Pickett et al. 2001). To better understand the interaction of factors determining community assembly at scales from individual parks to entire urban landscapes, we trapped small mammals in 15 urban forest fragments in greater Portland, Oregon. Species richness ranged from 2 to 10 in different parks, but *Peromyscus maniculatus* dominated captures at all sites. Initial analyses demonstrate a positive species-area relationship for native mammals. Non-native species occurred mainly in smaller fragments, but this pattern is statistically insignificant given the current data. We hope to refine our understanding of the urban landscape's effects on mammalian biodiversity in Portland by 1) expanding the current analysis to include measures of evenness and community structure, fragment isolation, and fragment shape; 2) performing a GIS landscape analysis to investigate the effects of land-use around fragments, and 3) obtaining field data on the distribution of mammalian predators, which may influence small mammal diversity at several scales. Small mammal trapping will also continue through the summer of 2003.

Keywords: Animal Ecology, Mammals, Fragmentation

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Student Watershed Research Project

In 1991, Saturday Academy convened a group of scientists to identify the information decision-makers need to assess anthropogenic effects on surface waters and watersheds in the Portland/Vancouver area. The group chose a set of parameters and protocols that could be applied in the field by 8-12th grade students resulting in enhanced student education and high-quality reproducible data. The result was the NSF funded Student Watershed Research Project (SWRP). Ten years later the Student Watershed Research Project has trained 163 8-12th grade teachers and involved over 9000 students in our long-term riparian and aquatic monitoring program. Our mission is to develop awareness, knowledge, skills, and commitment leading to responsible behavior and constructive actions with regard to water quality and watershed resources. It is our belief that individuals who understand the complexity involved in environmental science will be better equipped to evaluate and act upon environmental problems in their communities. The SWRP program works to: Engage high school students in the scientific analysis of local streams; Challenge students to interpret stream impacts as a means to understand the larger watershed; Ensure that student findings are accurate with high level of reliability; Manage student-collected data in a regional database; Share student findings with agencies, watershed councils and other interested parties; Foster stewardship of natural resources; Maintain a reproducible model and provide training for volunteer monitoring. SWRP conducts baseline watershed monitoring of physical, chemical, and biological parameters at least twice a year at multiple stream sites.

Keywords: Water Quality

Publication: Lev, D.J., Renfro, S.L., Lindbo, D.T., Jarrell, W, Blair, J., Andrews, S., Howell, L. 1998. The Student Watershed Research Project (SWRP) collecting watershed data for use by resource management agencies. *Urban Ecosystems*, Vol.2, No.2/3, pp 113-127.

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Spatial Distribution of Stormwater Facilities within the City of Portland

The City of Portland has required on-site mitigation of stormwater since 1999 for all new and redeveloped property that creates over 500 square feet of impervious surface. The City of Portland Environmental Services Stormwater Management Manual directs the mitigation approach and design through select stormwater facilities. These stormwater facilities can be generally categorized as surface (mimicking natural hydrologic processes), subsurface (underground manufactured or engineered solutions, largely non-visible on the landscape), or both. This research looks into the spatial distribution of residential stormwater facilities and how the choice of facility is translated into visual change of the urban landscape.

Keywords: Urban Environmental Planning, Environmental Management

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Community Watershed Stewardship Program: Funding Opportunities for Local Watershed Enhancement

The Community Watershed Stewardship Program (CWSP) is a part of an eight-year partnership between the City of

Portland Environmental Services and Portland State University to encourage and facilitate local watershed enhancement through leveraging resources, providing training and expanding existing opportunities. The primary component of this community assistance has been through the grants program, which offers up to \$5,000 per project from an available \$45,000 per year for watershed stewardship projects within the City of Portland. The CWSP has dispersed almost \$300,000 over eight years to community groups, schools and individuals to carry out watershed enhancement work that ranges from outreach and education to implementation and maintenance. These city funds have been matched by the community in volunteer and in-kind donations in the amount of over \$1 million. The results of this grant program include over 17,000 citizens involved, 93,000 volunteer hours generated, and 56,000 native trees and shrubs planted. We have recently completed an assessment of the grant program, including site visits to all projects that included physical improvements to the landscape. We can now identify trends in the types and locations of projects funded, as well as challenges for the future.

Keywords: Environmental Social Sciences, Habitat Restoration

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Integrative Undergraduate and Graduate Education in Urban Ecology at the University of Washington

Most of today's scientific and social problems lie at the interface of many disciplines. Urban ecology is an emerging field that addresses one of the most challenging problems facing humanity worldwide: how to manage metropolitan growth by simultaneously maximizing human wellbeing and minimizing impacts on ecosystems. The vision of our Urban Ecology program is to change the culture of graduate education from a traditional enterprise focused on an individual's discipline to one clearly emphasizing interdisciplinary teams. Team members' dissertations will include a common, co-authored section based on a real-world research problem addressed by the team, plus an individually-written disciplinary section. Students from widely varied backgrounds are immersed immediately into interdisciplinary research questions, using real-world problems presented to them by outside clients. The core curriculum assures that all students receive essential skills and informational training. This requires team-taught courses where several Urban Ecology faculty members are in the classroom with the students for all sessions, and where everyone participates. By integrating research and education the Urban Ecology program is building a theoretical framework and a series of empirical studies that increase understanding of the complex mechanisms that mediate the interactions between natural and human processes in urban ecosystems. This will produce students experienced in solving real-world problems, improve working relationships between academia and business, regulatory, and urban communities, and strengthen the foundation of Urban Ecology as a field. In addition, faculty and students involved in the IGERT Urban Ecology program are collaborating with the Urban Ecology program at the University of Arizona and a similar program in Berlin, Germany.

Keywords: Animal Ecology, Environmental Social Sciences, Urban Environmental Planning

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Rapid Assessment of Invasive Plants at Smith and Bybee Lakes Wildlife Area, Portland, Oregon

Smith and Bybee Lakes Wildlife Area is comprised of several terrestrial plant communities which are inhabited by a range of native and non-native plants. Many of the non-native plants are invasive and could threaten restoration efforts at the wildlife area. An inventory of problem plants was needed in order to develop a management plan for them. Quantitative plant sampling techniques are well-developed; however, it was more important to assess the overall range of nuisance plants and their degree of infestation fairly quickly, in order to move on to developing priorities and methods for control and/or eradication. We developed a rapid assessment technique that entailed

walking terrestrial portions of the wildlife area and observing the non-native plants encountered. The area was divided into 35 subsections based on structural similarities of the plant community in a continuous area. Each subsection was evaluated for its overall health, distribution of each invasive species and level of infestation of each invasive species. The entire wildlife area was walked several times to ensure species were not missed or underestimated due to seasonal effects. Invasives were mapped and clustered into groups that could be managed collectively. The management plan prioritizes the groups and recommends control methods for each group, including timing, technique and appropriate work force (e.g., volunteers or contract labor).

Keywords: Habitat Restoration, Plant Ecology

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Integrating Responses to Environmental Mandates: The City of Portland's Approach to Restoring Watershed-Scale Functions

Natural resource protection and restoration efforts in the Pacific Northwest largely have ignored the potential contribution that urban areas can make to landscape-scale watershed processes. Traditional urban responses to the needs of fish, wildlife and other natural resources often have been piecemeal in approach, focusing on concerns at the edge of water bodies or within small sections of upland areas instead of on more important landscape- and watershed-scale processes that create problems in the first place. For example, Portland historically viewed its responses to the Clean Water Act, the Endangered Species Act, Superfund and State of Oregon land use goals as separate programs. Although each program achieved some success, the city still faces significant challenges because it has not addressed the changes to ecosystem processes caused by development. In response, Portland developed an integrated watershed-planning framework based on the assumption that there are ways to restore watershed functions in developed areas that will benefit fish, wildlife and people. The framework outlines scientific principles, indicators of watershed function related to hydrology, physical habitat, water quality and biological communities; optimal values for those indicators; and, an adaptive management approach for prioritizing watershed protection and restoration actions. Portland's intent is to use the framework to develop an integrated, scientifically sound response to a variety of federal, regional, state and local mandates and objectives and to assist more effectively with broader efforts to identify larger-scale opportunities and priorities for restoring ecosystem processes in the Columbia and Willamette river basins. (Also see related abstracts #46, 63).

Keywords: Habitat Restoration, Urban Environmental Planning, Environmental Management

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Assessing Riparian Corridor Conditions in Alluvial Environments of the Portland Basin

The vitality of urban stream corridors reflects the interplay of dynamic physical and biological processes. To select appropriate rehabilitation actions, urban watershed managers must evaluate the findings of diverse, discipline-specific assessments (many of which are little more than laundry lists of data), and somehow integrate them. Elegant, accurate, integrated, riparian assessment methods are needed so that watershed partners can focus restorative actions on conditions that limit the functions of these areas. Further, these partners need a common language for describing and accessible tools for measuring these conditions. With the assistance of two consecutive grants from the National Science Foundation, Mt. Hood Community College has developed an Integrated Natural Resources Technology Program and re-organized natural science studies into watershed context. Part of this work has been to develop, test and revise new field assessment methods. The integrated riparian corridor assessment methods highlighted in this presentation have been adapted for use by community college students from what we

think is the best available current science. We encourage this audience to try them out and let us know how they worked for you. The methods assess the following attributes of riparian corridors recruitment potential for LWD, stream shading by vegetation and topography, in-channel LWD as a hydrologic modifier, channel-floodplain relations, WQ protection by vegetation, channel substrate. We have found that the findings of these assessments, when combined with our region's standard wildlife habitat assessment and NRCS/FS/BLM method for determining Properly Functioning Condition for streams (optional), can provide a useful basis for prescribing rehabilitation actions that are likely to be successful. We will briefly describe the field methods and simple tools in our presentation.

Keywords: **Geology/Soils, Habitat Restoration, Environmental Management, Hydrology, Fluvial Geomorphology**

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The Nature of the City: Vertebrate Diversity within Portland Parks and Greenspaces

Urban environments have an increasingly large influence on natural environments because of the rapid growth of cities throughout the world. Ecologists have traditionally viewed urban sites as "unnatural" and therefore we know relatively little of the structure and function of their biotic communities. I describe efforts by a team of biologists from Portland State University to measure and explain variation in terrestrial vertebrate biodiversity in Portland parks and greenspaces (Ps & GSs). We sampled small mammal, amphibian, and avian diversity in 15, 17 and 22 Ps & GSs, respectively, in 2002. We also sampled vegetation and habitat structure within all 22 Ps & GSs, and are beginning to quantify features in the landscape surrounding all of the latter sites. Preliminary findings suggest that vertebrate diversity increases with size of the park or greenspace. The diversity seen in the larger Ps & GSs may even approach levels observed in relatively undisturbed sites outside the METRO growth boundary. It is unclear at this point, however, whether high diversity is a product of P & GS size, composition and structure of the vegetation within sites, or other factors. Species composition, independently of diversity, appears to also vary with P & GS area. Our preliminary results are intriguing, but much future work is needed to (a) document diversity in additional protected and unprotected sites, (b) assess the importance of surrounding landscapes on diversity, (c) directly compare sites located inside and outside of the urban growth boundary, and (d) begin analyses of the population processes of individual species.

Keywords: **Animal Ecology, Plant Ecology, Environmental Policy**

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Wetland Regulation at the Federal Level

The U.S. Army Corps of Engineers has regulatory roles designed to protect the biological, chemical, and physical integrity of waters of the U.S. Activities requiring authorizations in the form of a "permit" include placement of fill, riprap, construction of docks, piers, etc. Regional permits, developed by coordinating with federal, state, and local agencies, cover numerous relatively minor activities. Regional permits are tailored to the geographic nuances of the region. Permitting requires the balancing of environmental protection with economic development. Mitigation is permitted for losses of water resources when all practical efforts to avoid wet areas have been applied. Failure to seek or comply with a permit may result in civil penalties.

Keywords: **Urban Environmental Planning, Hydrology, Environmental Policy**

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Imagining Creative Interactions on Ross Island: A Call to Artists and Environmentalists

Portland area artists, writers, and environmentalists are joining to imagine creative new ways of interweaving the human and natural on a site that offers a unique opportunity. Ross Island (in the Willamette, right in the middle of Portland) is being prepared for handover from Ross Island Sand and Gravel, to the City of Portland. Ecological remediation is being planned by the relevant committee. They're figuring out what kind of preserve or park Ross Island should turn into. Humans and the natural environment are not "opposites" but can AND OUGHT TO creatively interact. So a "No Trespassing" nature preserve is not a good result. We are working to activate the Portland creative arts community to imagine good human/natural interactions. How could people use this place, while it still functions in its primary role as habitat for heron, eagle, salmon, etc? What role could the arts play in this imagined ideal future? Some of what's happening so far: (1) ORLO (the Portland arts/ecology activism group) will sponsor a "call to artists" for creative designs, for a gallery exhibition in August 2003, with possible symposium and publication in "The Bear Deluxe" magazine; (2) some artists groups have begun discussing possibilities; and (3) some writers groups have been contacted. Individuals and groups should contact David Oates with ideas, proposals, questions at (503) 232-1164 or email <david_d_oates@yahoo.info>. We imagine a series of events that stimulate discussion city-wide and regionally. We think Portland is uniquely situated to do ground-breaking work in connecting the natural world into the urban/human environment.

Keywords: Habitat Restoration, Urban Environmental Planning

Publication: David Oates, Paradise Wild: Reimagining American Nature (Oregon State Univ. Press, Feb. 2003)

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Urban Watersheds: Is Our Understanding Clouded by Rural Thinking?

Natural Resource Planning Services, Inc., is a science and planning consulting firm that integrates biological and physical sciences with planning and policy development to help public clients understand the risks and liabilities their decisions may have on the environment. We work primarily with local and regional urbanized jurisdictions and find that daily they face a bewildering number of challenges to their ability to deliver urban-level services (e.g., zoning/land use controls, utilities, transportation, recreation). Successful service delivery has often come at a cost to environmental quality and health, not only within but often far beyond the jurisdiction's boundary. Attempts to encourage a more environmentally sensitive approach either through "voluntary" efforts or regulatory mandates (e.g., CWA, NPDES, TMDL, ESA, etc.) require an understanding of the environmental controls and processes that are active within the jurisdiction and the effects or impacts on these controls and processes when they are interrupted by urban activities. This is made all the more complicated when watersheds are not within the jurisdiction. Understanding urban watersheds is an ever evolving process. Though it is a relatively new field the paradigmatic underpinnings and science have been imported from rural and non-urban investigations and studies (e.g., forests, rural and often less degraded watersheds). Therefore the precepts, assumptions and tools are rural or forest oriented. We have found in our work that this "rural thinking" does not adequately explain how watersheds work in the urban environment. Nor does it lead to solutions and policies that decision makers must address. There is a need for urban-based and focused research and fresh thinking about the interaction between urban activities and watershed systems. We are grappling with these issues and trying to make sense of it in the urban context. We are making some headway and contributing to the urban-based thinking and understanding. We are applying and testing some of these new assumptions in jurisdictions as diverse as the Cities of Corvallis, Gresham, and Clark County. We will present a basis for a paradigmatic shift from a principally rural to an urban context. We will draw on projects that address watersheds impacted by urban activities in the above locations and propose some new

assumptions that more accurately describe urban watersheds. We will also describe some of the “new” tools that are being developed to address the urban watershed (e.g., watershed templates, pathways analysis).

Keywords: Environmental Economics, Habitat Restoration, Urban Environmental Planning, Endangered Species

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Characterizing the Health of Urban Watersheds

The success of watershed management efforts rests on having accurate and comprehensive information about watershed conditions and ecosystem processes, and how these compare to conditions that would be expected in a healthy watershed. Characterizing the health of watersheds is one of the most critical early steps in watershed planning. Watershed characterizations identify high-quality habitats that should be protected, characterize the scope severity, and dynamics of watershed problems which watershed plans must address; and define the baseline against which future progress can be measured. The City of Portland has developed a set of indicators for characterizing the health of urban watersheds. The indicators were based on guidance from a number of efforts including the Northwest Forest Plan and NMFS' Matrix of Pathways and Indicators, and were designed to address the complexity and pervasiveness of impacts in urbanized watersheds. Conditions in Portland watersheds are addressed by evaluating three major elements. Landscape factors are broad-scale influences such as climate, geology, topography and soils that play a major role in determining the structure, dynamics and function of a watershed. When characterizing existing conditions and setting objectives for future desired conditions, it is important to understand landscape factors because they provide the template and raw materials out of which a watershed is shaped. The health of the riverine-riparian ecosystem is characterized by evaluating indicators of flow and hydrology, habitat, water quality, and biological communities. These indicators provide a holistic assessment of stream and river health, and identify environmental problems and their dynamics. Indicators of human activities and influences characterize the human activities across the watershed that influence stream and river health and are critical for identifying the sources of environmental problems. The City of Portland has established draft objectives for each of the indicators to guide restoration efforts and define success, developed some important caveats about how these objectives should be used, and developed a process for refining these over time as understanding of local watersheds improves. (Also see related abstracts #40, 63).

Keywords: Fisheries, Habitat Restoration, Environmental Management

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Tree and Shrub Research Plots: An Assemblage of Two Research Objectives

The City of Portland's Watershed Revegetation Program (WRP) has planted over 1.6 million plants on more than 1,500 acres since 1996. Two studies were undertaken by the WRP to learn the survival rates of different native species and the impact of animal damage to native plantings. In animal damage plots, it was shown that plants that were tubed (10x30 Vexar tubes) had almost four times less damage than unprotected plants. Mouse mesh (8'x10' plastic mesh) helped to avoid some rodent damage, but was not advantageous compared to the tubes. Species that were the most susceptible to animal damage include Cascara (*Rhamnus purshiana*), Red Osier Dogwood (*Cornus sericea*), Serviceberry (*Amelanchier alnifolia*), Western Red Cedar (*Thuja plicata*), OR Crabapple (*Malus fusca*), Black Hawthorn (*Crataegus suksdorfii*), and Big Leaf Maple (*Acer macrophyllum*). Plants that showed no animal damage included Red Elderberry (*Sambucus racemosa*), Madrone (*Arbutus menziesii*), Red Flowering Currant (*Ribes sanguineum*), and Western Hemlock (*Tsuga heterophylla*). On permanent plots at the other study sites, first

year tree survival was 69% at one site and 85% at the other. Shrub survival rates were 73% and 75% respectively. Species that had the best survival include Oregon Ash (*Fraxinus latifolia*), Tall Oregon Grape (*Berberis aquifolium*), and Swamp Rose (*Rosa pisocarpa*). It is concluded that all trees and some shrubs should be protected, row planting schemes help increase survival, and planting species that occur near the planting site will help increase survival rates.

Keywords: Plant Ecology, Habitat Restoration

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Plant Community Monitoring at Metro Greenspaces

We performed botanical monitoring of four Metro greenspaces: Cooper Mountain, Multnomah Channel, Coffee Lake/Tonquin Geologic Area, and Banks. This project established baseline botanical information to assist Metro with monitoring these greenspaces. This is the first year of a longterm effort to monitor plant communities at these sites. These methods can be repeated in future years and compared with these baseline data to assess the effectiveness of management activities. A combination of nested-frequency, point-intercept, and line-intercept sampling was used to target specific plant species and communities at each site. At Cooper Mountain, data indicate that burning may increase species diversity. At Multnomah Channel, transects were dominated by *Phalaris arundinacea*. Flooding may decrease the presence of *P. arundinacea* and allow other species to establish. At Coffee Lake, the Texas Oil transects were dominated by *P. arundinacea*. The Wetland Conservancy transects were dominated by *Alopecurus pratensis*. At the Banks site, the Cedar Canyon transects were monocultures of *P. arundinacea*. In the Willow transects, it appears that as average water depth increases, species diversity may decrease. The increased species diversity at lower water depths is likely due to herbaceous species, primarily *P. arundinacea*. This trend suggests that if water depth was increased, herbaceous species coverage may decrease. It is unknown whether the absence of other species will change the coverage of *Salix geyeranii* in this macroplot. The Herbaceous transects were dominated by *P. arundinacea* and were deep.

Keywords: Plant Ecology, Habitat Restoration, Environmental Management

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A Study of the Relationships Between Bank Treatments and Near Shore Developments and Anadromous and Resident Fish in the Lower Willamette River

The lower Willamette River is used by large numbers of juvenile and adult anadromous salmonids (*Oncorhynchus spp.*). The lower River also serves as a harbor to a busy commercial shipping industry. The river has been deepened and widened by dredging, numerous structures have been built to accommodate shipping, and much of the natural shoreline has been replaced by rip-rap or vertical walls for flood control. The effects of bank and near shore development on fish populations have been coming under increased scrutiny by natural resource agencies with requirements that bank stabilization methods include "fish friendly" methods. However, the actual benefits of these activities on fish and aquatic ecosystems have not been thoroughly evaluated. As redevelopment opportunities emerge along the bank and near shore areas it will become increasingly important to understand the conditions juvenile salmonids are faced with and need as they move through the lower urbanized portion of the Willamette. The study is designed to evaluate the habitat functions that bank treatments and near shore developments provide for salmonids. Information will be collected on the types of bank treatments and near shore developments that are being preferred, how they are distributed in the lower Willamette and the specific features that distinguish them from other areas. The results of the study will give the City information that is useful where more certainty is

desired regarding planning, permitting and enforcement of activities in the near shore and bank areas of the lower Willamette River.

Keywords: Fisheries, Habitat Restoration

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Considerations of Urban Restoration at the Tualatin Hills Nature Park

Restoration becomes more problematic under the constraints of urban development. At Tualatin Hills Nature Park, a restoration of the parking lot and adjacent mitigation site was undertaken to provide a more appropriate gateway to the 219-acre natural area. Project concerns such as mitigation requirements, water retention and erosion control issues, powerline corridor considerations and the use of fire demanded effective communication between various local and regional agencies and the Park District. Neighbors are very sensitive to changes in their beloved local park, so timely and effective public education was necessary to keep visitors and patrons notified and happy. Another concern was the impact that non-native invasive plants have on natural areas. Besides the existing weeds in the proposed restoration site, there was and still exists the potential for weed seeds to blow in from adjacent untended or overgrown fields or corridors, or be tracked in by visitors. Weed control can be the most daunting portion of restoration. Determining historically appropriate and site-specific native plant species was also a challenging component of this particular urban restoration, requiring extensive research and communication with botanical experts. Even locating a source for the chosen vegetation was difficult. It is hoped that this restoration site can be a helpful source of information for other urban projects in the Tualatin Basin, both for what to do and for what not to do.

Keywords: Plant Ecology, Habitat Restoration, Urban Environmental Planning

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Port of Portland's Mitigation and Property Enhancement Program

The Port of Portland's Mitigation Management Program was initiated in late 1997 to respond to ongoing and proposed mitigation requirements and mandates from various regulatory agencies. By 1997, nine wetland mitigation sites in the Portland area were already in existence, and permit requirements had been completed for one site. By 2001, existing mitigation sites numbered eight, five sites had met planting and/or monitoring requirements and two new sites were added including one in Washington County. In addition to its mitigation activities, the Port's property enhancement program focuses on restoring or enhancing environmental functions and value to its natural area properties as well as Port properties identified as having environmental value because of connectivity or other natural resource features. The Port's Intergovernmental Agreement with the City of Portland's Bureau of Environmental Services has resulted in the revegetation of over 66 acres of Port property along the Columbia Slough. In addition, grant funding for projects such as restoration of forested habitat along Old Marine Drive, which borders the northern boundary of Smith and Bybee Lakes Natural Area, and construction of a wildlife undercrossing to improve habitat connectivity impacted by Time Oil Road are being sought. The presentation will provide a brief overview of the Port's mitigation sites and ongoing monitoring and maintenance activities to improve habitat value on these sites. In addition, projects taking place as part of the Port's property enhancement program will be briefly described.

Keywords: Habitat Restoration, Urban Environmental Planning, Environmental Management, Mitigation

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Stream and Fish Habitat Conditions in Tryon Creek: Their Likely Causes and Ramifications for Salmonids

Tryon Creek, a Willamette River tributary in southwest Portland, is one of the few streams within the Portland urban area that still supports salmonids that have been listed under the Endangered Species Act (steelhead trout (*Oncorhynchus mykiss*)) or considered for listing (coastal cutthroat trout (*O. clarki clarki*) and coho salmon (*O. kitsuch*)). Several methodologies have been used to assess stream and fish habitat conditions in Tryon Creek, including surveys of physical habitat attributes and macroinvertebrates. These surveys consistently indicate that salmonid habitats in Tryon Creek are extensively and intensively degraded in ways that reduce the survival and production of salmonids. The major cause of the degradation appears to be changes in runoff caused by the cumulative effects of urbanization. These results are consistent with available literature on the effects of urbanization on stream channels at the current levels of impervious area existing within the watershed. This paper provides an overview of assessment methods, results, identified data gaps, and recommendations for monitoring and measures needed to protect the stream from additional degradation.

Keywords: Fisheries, Habitat Restoration, Hydrology

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Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planning

The trees in our cities make up a valuable resource called the urban forest. Although often taken for granted, the urban forest provides a myriad of economic, environmental, and social benefits while contributing to the quality of life in our cities. The Oregon Department of Forestry (ODF) Urban and Community Forestry Assistance Program provides technical, financial, and educational assistance to help cities realize the benefits of managing their urban forests. Recently, ODF cooperated in a research project conducted by the USDA Forest Service Center for Urban Forest Research that reveals the cost and benefits of our urban forests in the Pacific Northwest. Scientists studied the contributions trees make to stormwater retention, carbon sequestration, energy savings, increased property values, and aesthetics. Subtracting costs of planting, maintenance, and care reveals that trees produce annual net benefits ranging from \$5.22 to \$46.82 per tree by the time they reach 20 years old. With an average benefit cost ratio 2.7, cities that do not plant trees forgo quantifiable economic and environmental benefits. Over a 40 year period, a city could be forfeiting \$1.42 million per 1000 trees missing from the landscape. A copy of the research report is available from ODF.

Keywords: Environmental Economics, Urban Environmental Planning, Environmental Policy

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An Urban and Community Forestry Research and Education Agenda

With 65 percent of all Oregonians now living in cities and towns, and with increasing land use controversies and growth management pressures, urban forestry issues are becoming paramount to our ability to maintain and enhance

the quality of life of our cities. Cognizant of the value and importance of Urban and Community Forestry research and education, over 75 individuals representing a variety of agencies, organizations, and institutions, participated in a yearlong effort to identify, characterize, and prioritize the most important urban forestry research and education issues facing the state. The resulting publication, An Urban and Community Forestry Research and Education Agenda for Oregon, is offered as a first step down this path toward a more sustainable future for Oregon communities. Working together, individuals and the groups they represent can make a significant difference in the future of our communities, through fostering research and education efforts that enhance our quality of life through the planting, management, and care of our urban and community forests. The Agenda is designed to provide practitioners, researchers, policy-makers, and potential funding organizations and agencies with a blueprint for the future to help address critical issues in Oregon communities through the management of our urban forests. Printed copies may be obtained by contacting Diana Peden by email at <dpeden@odf.state.or.us> or by phone at 503-945-7386. The electronic version of this publication can be found at <www.oregoncommunitytrees.org>.

Keywords: Urban Environmental Planning, Environmental Management, Environmental Policy

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Establishing a Middle School Environmental Program

Our newly established school, Cascadia Middle School, offers an inquiry based learning for 7th and 8th grade students. As part of our program, staff and students have developed exciting project focused on community, citizenship and our local environment. Our project is hands-on and promotes community leadership and environmental problem solving. The project intends to address the root causes behind environmental issues in our community's watershed. Specific project goals include stream habitat restoration, stream monitoring, and networking within our community (professionals, community members and peers). We hope with this holistic approach, students will be empowered by incorporation of practical, real world science into the classroom and making lasting change in their community. In addition to direct benefits to our student, our project will result in positive, lasting improvements to our local communities. Come hear about our triumphs and issues at establishing this program at a new middle school.

Keywords: Environmental Social Sciences, Habitat Restoration, Water Quality

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Determinants of Amphibian Distribution in Urban-Forested Fragments

Amphibians are highly sensitive to environmental conditions and their distribution depends presumably on the existence of a complex set of microhabitats that are poorly studied in urban environments. Here we report initial findings from an ongoing study to document amphibian distribution within the Portland metropolitan region. We detected seven species during the fall 2002 season. Captures were dominated by *Ensatina eschscholzii*, *Plethodon vehiculum* and *Taricha granulosa*. Analyses of the relationship between amphibian distribution and abundance and various microhabitats (e.g. leaf litter, coarse woody debris, tree density) and landscape features (area and isolation of forest fragments) will be presented.

Keywords: Animal Ecology, Amphibians

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Ecoroofs Everywhere and the Hawthorne Hostel Ecoroof Project

Ecoroofs Everywhere is a Portland-based non profit organization dedicated to furthering the use of green roof technologies. The organization is focused on coordinating select demonstration projects, providing technical assistance and consultation services to property owners, and serving as a clearinghouse of information on ecoroof research and materials. For the purposes of this forum, we will introduce audiences to the numerous ecological benefits of ecoroofs, outline the goals of the organization, and highlight a recently completed ecoroof project: the Hawthorne Youth Hostel ecoroof project. The Hawthorne Youth Hostel ecoroof project garnered considerable media attention because of its relatively low cost, incorporation of community volunteers, and high visibility. The project is a model for future demonstration projects to be conducted locally by Ecoroofs Everywhere.

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Lower Willamette River Ecosystem Restoration Partnership

Historically, the Willamette River in the Portland area comprised an extensive system of active channels, emergent wetlands, riparian forest, and adjacent upland forests. Urban and industrial development has created relatively steep, stable shoreline areas through construction of docks, bulkheads, and piers, reducing natural habitat. The Corps of Engineers (Corps) has authorities under Water Resources Development Act (WRDA) that could be used for ecosystem restoration. The Corps, the City of Portland and the Port of Portland propose to work together, using WRDA authorities, on ecosystem restoration work in the Lower Willamette. This multi-year process is in the early planning stages, but focused on a vision that significant improvements can be achieved for fish and wildlife habitat, human uses, and aesthetics through careful planning and implementation. The City and the Port, as local sponsors, will work with the Corps on planning conducted under a two-phase reconnaissance and cost shared feasibility study. The feasibility study will be a conceptual analysis that provides a comprehensive engineering and environmental background for restoration actions throughout the Lower Willamette River, from the confluence with the Columbia River to Willamette Falls. The planning objective will be to develop a generalized plan adaptable to specific locations throughout the project area. The array of options that could be considered in the feasibility study includes no action, streambank restoration, in-river restoration, and tributary restoration. The success of this project will require coordination with local, state, and federal programs and extensive stakeholder involvement.

Keywords: **Fisheries, Habitat Restoration, Water Quality**

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Urban Wetlands and the Need for Interdisciplinary Research

New, interdisciplinary research approaches are needed to advance both ecosystems science and our understanding of urban environments. Because cities are complex, coupled human and natural systems, ecology of cities rather than ecology done in cities (Grimm 2000) is needed to explore the dynamics of the system and provide guidance to planners. Ecologically healthy urban landscapes that include natural areas can help maintain biodiversity, water quality and water quantity, and fulfill human aesthetic and recreational needs. However, not only the character of

those natural areas, but the landscape context, and functions that people desire the area to fulfill, must be considered in urban planning. In the case of urban wetlands, much attention has been paid in the Portland region to wetlands in the size range of 2 ha in area or less, because these are the wetlands that have been most likely to be altered or lost to development. Loss or degradation of such wetlands may have more impact on some functions (plant diversity and animal habitat) than others (protection from flooding along major rivers). Potential for preservation or conservation and the potential for a particular wetland to fulfill a given function (water quantity modification, or water quality improvement) are influenced by both the biophysical environment and socio-cultural environment, and these contexts are not independent. Improving our understanding of the relationships among function, biophysical context and social, economic and cultural context, should enable us to make better decisions on conservation and restoration of wetlands in the urban environment.

Keywords: **Environmental Economics, Environmental Social Sciences, Urban Environmental Planning**

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Cybertracking in Oregon

Cybertracker is a Palm/Visor-driven program that allows people to learn about and collect spatially-explicit data on wildlife, vegetation and any other aspect of ecosystems. When coupled to a GPS unit, each observation is tagged with date, time, latitude and longitude. Data are then downloaded and plotted on a TOPO! map. Data can also be exported to an Excel spreadsheet, and shot into ArcView to create GIS layers. Cybertracker can provide valuable insight into how animals are using the landscape, as tracks, sign, trails, and other data are collected dynamically. While serving as an excellent research tool that avoids the "paper phase" of data collection, Cybertracker is also a phenomenal teaching tool. Deerdance -- in partnership with Jackson Bottom Wetland Preserve (and sponsored by USFW, EPA, Metro Greenspaces, Lamb and Norcross Foundations) -- is the primary provider of Cybertracking training. Research and community service learning projects have been undertaken in a variety of urban ecosystems by high school and college students, non-profit organizations, and professional ecologists. Known fondly by its caretakers as "the elder in our pocket," the program was developed by Louis Lieberman and Lindsay Steventon in conjunction with their work with the Kalihari bushmen. The version of Cybertracker used in North America was introduced by Jon Young from Wilderness Awareness School. Embedded in Cybertracker are generations of native wisdom, revealed by thoughtful use, and passed on by those of us who are passionate about the earth and its creatures.

Keywords: **Animal Ecology, Plant Ecology, Environmental Management**

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Naturescaping for Clean Rivers

The purpose of Naturescaping for Clean Rivers Program is to foster a stewardship ethic relative to the urban landscape by encouraging an urban lifestyle that folds pollution prevention into everyday life. It seeks to show citizens that individuals can make a difference by introducing them to the benefits of more ecological and sustainable gardening practices. The program works with them at the neighborhood level to gain the information, skills, and confidence needed to take action. The primary goals of the program are to reduce water pollution, reduce the volume and rate of stormwater runoff, and reduce water consumption by urban residents. Secondary goals are to increase and improve wildlife habitat and to reduce solid waste, air pollution and energy use. To accomplish its goals, the program organizes and conducts free workshops in neighborhood facilities. The following learning opportunities are provided through the NCR program. Basic Workshops: This naturescaping introduction is

provided through an informal four-hour workshop. The workshops are free, but pre-registration is required. Most workshops are co-sponsored by a partner community group that helps pay the expenses of the program. Site Planning Workshops: Follow-up workshops are available to individuals who have completed the Basic Workshop. These hands-on workshops provide specific information to help individuals move from information to action. There are two Site Planning Workshops. Site Planning 1 focuses on learning and practicing the process; and Site Planning 2 focuses on what participants are planning to do in their own yards.

Keywords: **Plant Ecology, Water Quality, Urban Environmental Planning**

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Safe Routes to School - an Alternative to Driving and Dropping Students

The "Walk There" program is a one year pilot project funded by a grant from the Environmental Protection Agency. The Oregon Department of Environmental Quality (DEQ) is the grant recipient and administrator, working in partnership with Multnomah County Health Department, Buckman Elementary School, and the SUN Community Schools program. Buckman School is located in inner southeast Portland. The "Walk There" Program recruits senior citizens to walk children to school using a walking school bus model. A walking school bus consists of students "picked up" by adults along a designated route to and from school. The goal of the program is increased pedestrian activity through reduced automobile use. Successful accomplishment of this goal will result in: reduced vehicle emissions, safer routes to school for students, less traffic congestion in and around the school, improved health for participating children and seniors, student education about air pollution and its effect on health. The grant funds a coordinator position with responsibility for pulling together the community, the school, the volunteers and participants. Partnership is key to this program's success. This presentation will provide information on the following: Coordination that has taken place to date in developing the program; Data on current emissions and preliminary analysis on emission reductions resulting from increased walking; Community response; Strategies to change community norms regarding environmental and health issues; Strategies for making the project a sustainable community based volunteer program.

Keywords: **Air Quality**

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Habitat Surveys in the City of Portland's Urban Streams

In 1999-2001 the City of Portland contracted the Oregon Department of Fish and Wildlife (ODFW) to conduct habitat surveys on streams in the lower Willamette River basin within the city. These included Johnson, Fanno, and Tryon Creek basins as well as many streams that originate in the northwest hills area and empty into the Willamette River. The ODFW stream habitat survey methodology was chosen because it is a rigorous and repeatable methodology that ODFW is using to survey streams across the state. The survey was the first urban stream system conducted by ODFW. While the methodology has been used more often in rural streams, the survey could be applied to the urban area with minor modifications. The habitat methodology surveys valley and stream geomorphic features such as landscape changes, major tributaries, or passage barriers, as well as additional features unique to urban streams (i.e., road crossings, bank treatments, vegetation features). Information collected from the survey used in a variety of ways including being fit into a fisheries habitat model called Ecosystem Diagnosis and Treatment (EDT). The model will be used in city-wide watershed planning to identify how current conditions differ from a reference or historic condition and how that may be affecting salmonids. In addition, the habitat survey reach breaks are guiding an ongoing fish survey that the City has contracted with ODFW in the same urban streams.

(Also see related abstracts #40, 46).

Keywords: Fisheries, Habitat Restoration, Urban Environmental Planning

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Geonomics: Recovering Natural Rents to Conserve Natural Resources

Herman Daly, among others, has long noted that to conserve resources, society could recover more natural “rent.” Resource owners and users, paying more for their claims on our natural heritage, claim or use less. In Finland, loggers pay a higher “rent” (actually, a land-value tax) and do a better job of stewarding the forests. Less extraction of trees or ores or any resource in turn leads to less thru-put, which in turn leads to fewer byproducts including pollutants. Recovering more site “rent” also motivates owners to use less surface area, and to use it more wisely. In South Africa, Johannesburg levied a land-value tax and enjoyed the fastest site-recycling rate in the world; by absorbing development in the city, little was left over to sprawl outside the city. Using urban land more efficiently spares farmland, natural area, and habitat from needless development. Out from under development pressure, governments can more easily plan, zone, and enforce land-use regulations. More compact cities provide more riders for mass transit, improving air quality. Shifting people from driving to riding also cuts traffic, runoff, and improves water quality. Hong Kong funds its transit system with rent, not subsidy. Other localities recover ground rent by shifting their property tax off buildings, onto locations. A few use assessment districts to recover rent and development districts to neuter the property tax. Dozens of groups, like the National Neighborhood Coalition, recommend this reform of public revenue flow. In Oregon, more policy-makers are picking up the property tax shift banner.

Keywords: Environmental Economics, Urban Environmental Planning, Environmental Policy

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Engaging Students in Habitat Restoration Monitoring through Research Based Learning

Research based learning engages students in learning science through doing science. Students create protocols and collect data to help inform real world issues. Among the data available from students are vegetation data from three test plots in Forest Park, each variously affected by English Ivy (*Hedera helix*). Also available is preliminary vegetation data from a restoration area in the Sandy River Delta. These are both the first stages in longitudinal studies.

Keywords: Plant Ecology, Environmental Social Sciences, Habitat Restoration

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Watershed Sources of Nutrient Input to an Urbanizing Stream in Northwestern Oregon

We investigated spatial and temporal relationships among surface and subsurface watershed attributes including regional groundwater, near-stream groundwater, and riparian soil chemistry and stream nutrient concentrations,

phosphorus (P) and nitrogen (N), in the urbanizing Johnson Creek watershed in Portland, Oregon from 1998 to 2001. We hypothesized: (1) Streamwater nutrient concentrations would vary according to watershed attributes, and (2) P loading had significant surface hydrological pathways due to urbanization. On the basin scale, we found a correlation between N and non-urban landuse. P was correlated with urban landuse. Within non-urban areas, near-stream groundwater P correlated with streamwater P; however, there were no such correlations within urban landuse areas, indicating significant surface inputs of P in addition to groundwater sources. Both soil aluminum (Al) and iron (Fe) were inversely correlated with near-stream groundwater P, suggesting the formation of Al/Fe-P complexes in the non-urban area that reduced the availability of P. Based on a mass balance analysis within a small, urbanized sub-watershed, storm drains contributed 37% of soluble reactive phosphorus (SRP) and 25% of total phosphorus (TP) during storms. These findings suggest that elevated levels of P within urbanizing areas of Johnson Creek watershed are controlled by two different factors: riparian soil chemistry and urbanization. Significantly lower Al and Fe contents in soil within urban areas of Johnson Creek reduce P retention, hence increasing P availability to stream. Increase in storm runoff input via street and storm drains within urbanized areas of Johnson Creek is an anthropogenic source of P to the stream.

Keywords: Geology/Soils, Water Quality, Hydrology

Publication: Sonoda, K., Yeakley, J.A., and Walker, C.E. 2001. Near-stream landuse effects on streamwater nutrient distribution in an urbanizing watershed. *Journal of the American Water Resources Association*. 37: 1517-1532.

Publication: Sonoda, K., Yeakley, J.A. and Adams, S. 2002. Near-stream groundwater correlations with streamwater nutrient concentrations in an urbanizing watershed. In J.F. Kenny, ed. *Ground Water/Surface Water Interactions*. American Water Resources Association, Middleburg, VA, pp. 67-72.

Publication: Sonoda, K. 2002. *Watershed sources of phosphorus input to an urbanizing Oregon stream*. PhD dissertation, Portland State University, Portland, Oregon.

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Cascadia Wild! Mentoring Connection to Community and Nature: The Nature Awareness Project

Objectives: The Nature Awareness Project is a long-term project that provides Native Science mentors for teachers and youth who pursue the development of a native knowledge of place. Developing an intimate relationship with nature, participants study hazards, awareness, core naturalist routines, animal tracking, plant ID and uses, ecological relationships, urban biodiversity, wilderness survival and bird language. Weaving cultural baskets of nature-based communities that raise ecologically literate generations will support continuous understanding of the science of ecology, the language of nature, through daily practice and living, building solid understanding of complex ecological relationships. **Methods:** Inspired from mentoring methods of ancient indigenous cultures, nature is valued as the ultimate teacher and a mentoring culture, or cultural basket, is the mechanism through which nature's language is learned and taught. Data is collected through journaling and mapping. Through mentoring and the use of naturalist tools such as secret spots, animal forms, and thanksgiving, students practice naturalist core routines to develop a deep ecological knowledge of place. Mentoring is delivered through wandering, elders/field guides, games, songs, and stories using methods such as trickster/transformer, the Art of Questioning, and information dropping. **Expected results or results obtained so far:** Over years of involvement students and teachers become the living repository of biodiversity knowledge in addition to biodiversity journals/logs that are maintained at school sites. **Information for the research (Location / Spatial extent / Duration):** NAP study sites are located in Portland Parks, Metro Parks and Greenspaces and school grounds in the Portland region. Involvement lasts for consecutive school years including summer programs.

Keywords: Animal Ecology, Plant Ecology, Environmental Social Sciences

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Integrating Wildlife Objectives and Restoration Efforts at Smith and Bybee Lakes Wildlife Area, Portland, Oregon

Restoration project managers consider many things in planning their projects, such as site history, the surrounding landscape, hydrology, plant stock availability, and many other factors. It is generally presumed that the restored sites will provide habitat for wildlife, however, key questions may not be taken into account, i.e., does this project provide the optimum habitat that could be created, for the species that are most in need of habitat at that site? The 2,000-acre Smith and Bybee Lakes Wildlife Area is managed primarily for wildlife habitat. A number of restoration projects are under way in this badly degraded urban natural area. The overall approach conserves biodiversity at Smith and Bybee lakes by restoring and maintaining examples of naturally occurring plant community types. The general approach is refined by considering the needs of individual species and guilds, the landscape context and restoration limitations. Specific steps involved in this refinement include researching historic vegetation in the area, the status and needs of breeding birds that would have used the historic vegetation, and examining the surrounding landscape for intact habitats and habitat gaps. We are initially using neotropical migrant birds because information on their status is readily available and monitoring methods are relatively well developed. This work will be expanded to other wildlife guilds in future years.

Keywords: **Habitat Restoration**

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Lake and Aquatic Invasive Species Activities at the Center for Lakes and Reservoirs (PSU)

The Center for Lakes and Reservoirs (CLR) at Portland State University was established by the legislature in 2001 to address lake and aquatic invasive species (AIS) management issues in Oregon. Major efforts of the CLR have included: development and implementation of a statewide aquatic invasive species management plan; a survey of AIS in the lower Columbia River; assistance in establishment and implementation of the Oregon Ballast Water Management Program; research on methods to verify management of ballast water to reduce risk of introduction of AIS; elucidation of the role of hull-fouling in AIS introductions into the Columbia; examination of the biology of ballast water; development of a *Spartina alterniflora* management plan; monitoring for zebra mussels in the western U.S.; monitoring for mitten crabs in Oregon estuaries; modeling mitten crab population expansion on the west coast of North America; research on the biology and management of *Egeria densa*; development of nutrient criteria for lakes in EPA Region 10, and development of management plans for aquatic weed infested lakes. Much of the work by the CLR has resulted from collaboration with regulators, industry, nonprofit groups, and other academics in the Columbia River Aquatic Nuisance Species Initiative, Western Regional Panel on Aquatic Nuisance Species, Oregon Invasive Species Council, and Pacific Ballast Water Group.

Keywords: **Habitat Restoration, Water Quality, Environmental Management, Environmental Policy, Invasive Species**

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Greenspaces Program: A Unique Partnership with Grants Available for the Portland, Oregon/Vancouver, Washington Metropolitan Area

In the late 1980's, citizens and representatives from non-profit organizations and local governments collaborated on greenspaces protection in the bi-State, Portland, Oregon/Vancouver, Washington metropolitan area. Their efforts to get Federal support led to the 1991 launching of Greenspaces Program (Program), a unique partnership between the U.S. Fish and Wildlife Service (Service) and Metro, the lead local partner. The Program focuses on environmental education, habitat restoration and natural resource conservation. It serves as one of only two national demonstration programs of its kind, involving the Service in urban-focused partnerships designed to benefit fish, wildlife and the public in population centers. Each year, a portion of the funding is allocated to partners and leveraged through two grant programs. The Environmental Education Grant Program supports efforts to a) build educational programs and projects around urban natural areas, b) encourage field and hands-on learning experiences, c) teach about ecological systems and local watersheds, and d) foster community involvement in the stewardship of natural areas. Conservation and Restoration Program funding objectives are to: a) support urban-focused natural resource conservation, restoration and enhancement to benefit fish, wildlife and their habitats, b) build upon current information and knowledge about local fish and wildlife and their habitats, and c) promote collaborative partnerships and citizen involvement directed towards regional natural resource conservation and restoration priorities. The Greenspaces Program is positioned to both support and benefit from urban ecological research, surveys and monitoring, as sound science is needed for successful natural resource conservation and habitat restoration efforts.

Keywords: **Environmental Social Sciences, Habitat Restoration, Environmental Management**

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Report on the Efficacy of the Oregon Ballast Water Management Program in 2002

SB 895 established the Oregon Ballast Water Management Program during the 2001 legislative session to address the introduction of aquatic nuisance species when ballast water is discharged from ships. This report evaluates the procedures, activities and problems encountered during the first ten months of the implementation of the Oregon Ballast Water Management Program (January 1-October 31, 2002). Recommendations for improvement of the Oregon Ballast Water Program are made based on this evaluation. Ballast water is taken on and released by a vessel to maintain trim and stability when loading and unloading cargo. When ballast water is taken onboard, any organism less than about 1 cm in size in the vicinity of the intake may also be ballasted into the vessel. All or part of the ballast water, and the organisms in the ballast water tanks, may be discharged in port when a ship takes on cargo or fuel. It has been estimated that 21 billion gallons of ballast water are discharged into US ports each year. Thus, ballast water can be a major pathway of new species introduction to aquatic ecosystems. The Oregon Ballast Water Management Program requires exchange and reporting from all transoceanic vessels calling on ports in Oregon. The Oregon program is therefore more protective of Oregon water resources than the current federal program. To protect Oregon waters from ANS introductions, the Oregon program requires ballast water exchange when it is taken onboard in a North American coastal port located north 50 degrees N latitude or south of 40 degrees N latitude.

Keywords: **Transportation & Environment, Environmental Management, Environmental Policy**

Publication: Oregon State Congress, January 2001. Oregon Ballast Water Management Program. ORS Chapter 722.

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Clackamas River Basin Fish Passage Assessment

Because current anadromous salmonid populations in the Clackamas River Basin, renowned for its salmonid production, are lower than historical levels, the Clackamas River Basin Council (CRBC) has/is planning and managing a series of sub-basin watershed assessments and related projects to explore restoration of salmonid populations and their habitat. The Clackamas Basin Fish Passage Assessment completed its pilot phase in summer 2002 in the Clear and Foster Creek drainages and is preparing to cover the remaining Clackamas River Basin over the next two years. The Fish Passage Assessment is notable for the following significant accomplishments: Field surveys of identified stream crossings on all ownership types; Thorough structure prioritization based on objective, quantifiable data; Outstanding stakeholder cooperation at private, county, state, and federal levels; Successful education and outreach efforts that have led to increased participation in watershed council activities. We identified crossings on fish-bearing streams using stream, road, and tax lot GIS overlays. All landowners were contacted in a four stage process of newsletters, postcards, phone calls, and personal visits that involved the CRBC, the consultants and, where available, cooperative neighbors. Crossings and stream profiles were sampled using a 2-person crew and auto-leveler. Clear and Foster Creek data is currently being prioritized and reviewed by the CRBC Technical Advisory Committee. Modification of the pilot project's methodology is completed and coordination with stakeholders in Goose, Eagle, and Deep Creek drainages has begun in preparation for assessing fish passage on the lower Clackamas River Basin in 2003.

Keywords: Fisheries, Habitat Restoration, Cooperation and Outreach

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Status of Fish Populations in Portland Area Streams

The Oregon Department of Fish and Wildlife began regular monitoring of fish communities in Portland area streams in 1993. We worked with Clean Water Services of Washington County to survey tributaries of the Tualatin River from 1993 through 1995 and again from 1999 through 2001. We worked with Clackamas County to survey urban streams in north Clackamas County from 1996 through 1998 and in 2002 and 2003, and to survey tributaries of the Tualatin River within Clackamas County in 2002 and 2003. We worked with the City of Portland to survey tributaries of the Willamette River within Portland from 2001 through 2003. To date we have surveyed 43 streams in the Portland urban area. We have collected 32 fish species from 16 families. Sixteen of these species are exotic. Number of species found in individual streams ranged from 0 to 15. Approximately 60% of our catch consisted of sculpins *Cottus spp.*, and most of these were reticulate sculpin *C. perplexus*. Although salmonids are abundant in relatively few streams (about 8% of the overall catch), we found at least one salmonid species in 31 streams. Cutthroat trout *Oncorhynchus clarki* are generally the most abundant salmonid. About 10% of our catch consisted of exotic species. Species assemblages and relative abundance varied among seasons in most streams. Index of Biotic Integrity (IBI) scores indicate that over 80% of stream reaches surveyed are severely impaired. The remaining reaches are moderately impaired. No streams surveyed have IBI scores considered acceptable.

Keywords: Animal Ecology, Fisheries

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Trees for Green Streets: The Role of Street Trees in Mitigating Stormwater Runoff from Streets

In September 2000, Metro, Portland's regional governing body, initiated the Green Streets Project to illustrate the roles street networks play in degrading water quality, and to find possible solutions to reducing their water quality impacts. Green Streets create opportunities for capturing and infiltrating stormwater runoff from streets, using street designs that incorporate street-side bioswales and larger street trees with wide-spreading canopies. Impervious surface area is reduced and replaced with vegetation that can absorb and treat polluted stormwater runoff. The result of more than nine months of research and interviews, *Trees for Green Streets* contributed to the Green Streets Project through the exploration of the role of trees in the street right-of-way, the potential for improving water quality using street trees, and the degree to which different species of trees remove, absorb or stabilize pollutants commonly found in stormwater runoff from streets. This research was published by Metro in *Trees for Green Streets: An Illustrated Guide* in June 2002. The information provided in the guide is a first step toward understanding the stormwater functions that trees provide within urban areas. The concepts, characteristics and criteria for selecting trees for green streets will be presented by Kelley Webb, primary author of the *Trees for Green Streets* guide.

Keywords: Plant Ecology, Water Quality, Transportation & Environment

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Portland Parks and Recreation Ecosystem Management 4

Due to the great amount of community interest in the rehabilitation of Oaks Bottom Wildlife Refuge, several steps of the natural area ecosystem management planning process have been put in place to provide guidance for current work and management of the refuge. In 2001 the framework for a neighborhood based volunteer stewardship program was designed and a list of all revegetation and management projects was included in order to match volunteers with site work priorities. Both the stewardship framework and the project list were designed to update the Oaks Bottom Coordinated Natural Resource Management Plan (1987), establish protocols for researching historical use and documenting existing conditions, and complement the ecosystem management planning process. In the spring and summer of 2001, Portland State University students conducted several surveys of existing conditions at the refuge; currently, Reed College students are conducting the second year of an amphibian survey in the northern portion of the refuge. In 2002, Parks Natural Resource staff prepared a desired future condition statement and associated maps that provided specific recommendations for native plant revegetation. Plans are now being made for a public approval process of this proposed desired future condition statement. Also in 2002, a private consultant completed an initial assessment of the site's wildlife habitat. Consultants to the Army Corps of Engineers are now conducting a habitat restoration feasibility study. Although much is known about the refuge, more detailed information about the existing vegetation, fish and wildlife, and usage issues remains to be researched and documented. (Also see related abstracts #18, 26, 32).

Keywords: Plant Ecology, Environmental Social Sciences, Habitat Restoration

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The Port of Portland's Approach to Site-Specific, Port-Wide, and Regional Natural Resource Planning

Like other government agencies, the Port of Portland answers to the public's demand for balanced development that is sensitive to the environment. The Port's Natural Resource Policy therefore states that the Port will look for opportunities to enhance and sustain natural resources as part of its planning, development, and operational activities. As part of this effort, the Port has developed the Natural Resource Assessment and Management Plan (NRAMP). The NRAMP includes inventories, maps, models, and databases that characterize the Port's property in terms of existing resource type, quality, function, and relationship to the greater Metro-area landscape. Using a system consistent with Johnson and O'Neil's *Wildlife-Habitat Relationships in Oregon and Washington* (OSU Press, 2001), and working in conjunction with The Northwest Habitat Institute, the Port has developed strategies for identifying priority species, functions, and habitats of management interest to the Port. Based on these priority elements, the Port is currently developing long-term desired ecological conditions, and the requisite biological objectives needed to obtain them. The Port will look for opportunities to work with other entities in the region to achieve these resource goals, while simultaneously allowing the Port to fulfill its operational mission. In addition to accommodating the Port's long-term natural resource planning needs, the NRAMP provides a sophisticated tool for use in Alternatives Analyses, allowing Port staff to assess potential project effects. Ultimately, once the Port establishes its biological objectives, individual projects will be analyzed to determine their effect on the Port's ability to reach its natural resource goals.

Keywords: Urban Environmental Planning, Environmental Management, Environmental Policy

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Regulatory Tools and Citizen Actions for the Protection of Riparian Ecosystems in Urbanizing Areas

The Portland metropolitan region presents a unique opportunity to explore variations in riparian management strategies. Previous research by the authors has examined conditions in the smaller municipalities of Hillsboro and Oregon City, Oregon for a single time period. Data on management strategies were collected through personal interviews and a review of municipal-level planning and policy documents for these two cities. Digitized aerial photographs were used to analyze vegetation patterns in relation to stream corridors. Although direct regulation to protect vegetation in stream corridors was found to be historically weak, by 1997 noticeable differences in the management strategies of the two municipalities were detected. Vegetation in stream buffers in the two cities also differed in terms both of percentage cover of riparian buffers and of patterns with increasing buffer width. Current research is incorporating the city of Portland over a longer time scale (1990-2002). Our goals are to determine (1) changes in the condition of riparian buffers in rapidly growing urban areas, (2) the effectiveness of different management strategies, and (3) the role that citizen groups have played in influencing the protection of riparian ecosystems. Our analyses of on-the-ground change will yield insights about the effectiveness of municipal management strategies and of citizen-based organizations for protection of riparian areas: a key component of the urban environment. The methodology developed through this project will provide a template for comparisons among major metropolitan areas. Our results will be useful to urban environmental managers, planners, policy makers, and environmental activists.

Keywords: Plant Ecology, Urban Environmental Planning, Environmental Policy

Publication: Ozawa, C.P., J.A. Yeakley, R. Friday, and M. Sharp. 2000. An Exploratory Investigation of Regulatory Strategies to Protect Stream Buffers in Oregon. In P.J. Wigington and R.L. Beschta, eds. *Riparian Ecology and Management in Multi-Land Use Watersheds*. Amercian Water Resources Association, pp 357-362.

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Controls on Native Plant Diversity in Urban Riparian Areas in Northwestern Oregon

For the past 5 years, we have conducted research on native plant and soil distribution in urban riparian areas in the metropolitan Portland area. In one study we examined whether differences in biogeographic factors in riparian areas were associated with changes in plant species diversity, contrasting rural and urban riparian zones in northwest Oregon. Thirty-five sites were established: 17 in rural watersheds and 18 in urban watersheds. Four transects were measured at each site. A total of 138 plant species were identified, including 102 native and 36 non-native species. In both urban and rural sites, riparian width was the biogeographic variable most related to native species richness. Perimeter:Area ratio (P:A), a measure of edge, was most correlated to Shannon diversity of native plant species for both rural and urban sites. Isolation, or lack of connectivity along the stream corridor, was found to be important in explaining native plant cover in urban areas. In a second set of studies using similar methodology, we established 30 permanent plots in riparian areas within the urban growth boundary, and examined both soil and biogeographic factors that explained native plant distribution. Biogeographic factors that explained native plant distribution included patch area and P:A. Native plant distribution was also positively related to canopy cover and inversely related to sandy soil and shallow upper soil horizons. These results suggest that canopy cover, soil texture, soil depth, patch size, patch edge, and patch connectivity are all important factors in managing native plant distribution in urban riparian areas.

Keywords: Plant Ecology, Geology/Soils, Environmental Management

Publication: O'Neill, M.P. and Yeakley, J.A. 2000. Biogeographic variation and riparian plant species diversity in an urbanizing Oregon basin. In P.J. Wigington and R.L. Beschta, eds., *Riparian Ecology and Management in Multi-land Use Watersheds*. American Water Resources Association, pp. 311-316.

Publication: Sharp, M. M. 2002. *Effects of physical soil properties on the coverage of native and non-native plants in urban riparian areas*. MS Thesis, Portland State University, Portland, Oregon.

Publication: Youngman, J. L. 2002. *Biogeographic and Land Cover Effects on Urban Riparian Plant Assemblages*. MS Thesis, Portland State University, Portland, Oregon.

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