1st Annual Johnson Creek SCIENCE SYMPOSIUM



May 21, 2015

Reed College, Performing Arts Building, Room 320

Organized by the Johnson Creek Watershed Council

Sponsors

USGS science for a changing world
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Metro
ENVIRONMENTAL SERVICES CITY OF PORTLAND

AGENDA:

1:00 to 1:50 – State of the Watershed:

1:00	Bruce Newton, JCWC Board	Science Collaboration and the IJC
1:10	Adam Stonewall, USGS Oregon Science Center	Johnson Creek Hydrology
1:20	Julie DiLeone, East Multnomah SWCD	Water Quality Synthesis
1:30	Torrey Lindbo, Gresham Watershed Division	Stream Temperature and Macroinvertebrates
1:40	Roy Iwai, Multnomah County Road Services	Fish in Johnson Creek

1:50 to 2:50 – Academic Research:

1:50	Alan Yeakley, Portland State University (PSU)	Urban flood and water management in a Blue-Green City: the Clean Water for All research initiative
2:00	Jennifer Morse, PSU	The influence of metals from stormwater outfalls on sediment denitrification in Johnson Creek
2:10	Samantha Hamlin and Marissa Matsler, PSU	Delivering Blue-Green Infrastructure (BGI): An exploration of barriers and uncertainties surrounding the city-wide implementation of BGI facilities
2:20	Ashlie Denton, PSU	Restoration choice: Attitudes, perceptions, and values in the Johnson Creek watershed
2:30	Maya Jarrad, Noelwah Netusil and Zachariah Perry, Reed College	Reed College Research: Crystal Springs and Johnson Creek
2:40	*Questions*	

30 MINUTE BREAK – Refreshments served on the Eco-Roof Mezzanine

3:20 to 4:20 – Watershed Science:

3:20	Celeste Mazzacano, Xerces Society	A quest for dragons: Odonate diversity in Johnson Creek watershed
3:30	Jennifer Antak, Portland BES	City of Portland's Watershed Health Index - Johnson Creek
3:40	Kate Holleran, Metro	Gauging Restoration Success: How site conservation planning and key ecological attributes inform restoration along Johnson Creek
3:50	Keri Handaly, Gresham Watershed Division	Modeling the Hydromodification Benefits of Gresham's Downspout Disconnection Program
4:00	Terrence Conlon, USGS Oregon Water Science Center	Groundwater: An unseen resource in Johnson Creek watershed
4:10	*Questions*	

4:20 to 4:40 – Robin Jenkinson, JCWC Watershed Science Director, ***2015 to 2025 Action Plan***

4:40 to 6:00 – Poster Presentations: (located in Kaul Auditorium, No-Host Bar)

Adam Nayak, Cleveland High School	Weather or Not, Sometimes it's Hot; Secondary Data Analysis of Northwest Streams
Michele Blackburn, Xerces Society	Freshwater mussels in Johnson Creek: Engaging partners & Volunteers in conservation stewardship
Henry Sullivan and **Aden Qamar**, Faculty Supervisor: Molly Sultany, NW Academy	URBAN ALGAE: The Effects of Pollution on Epilithic Diatoms in the Johnson Creek Watershed Viewed with a Scanning Electron Microscope
Jared Kerman and **Katerina MonBelle**, Faculty Supervisor: Molly Sultany, NW Academy	Welcome to the Nanoscale: Using Diatoms as Bioindicators of Water Quality in Johnson Creek
Randall Smith, Department of Physics, Portland State University	The Air-Water Interface At Johnson Creek, Oregon: A Structural Analysis of Surface Films by Comparative Microscopy
Lisa Huntington, Eric Rosewall and **Ray Lipin**, Depave	Saint Mary's Ethiopian Orthodox Church Depave
Lindsey Reschke, Portland Community College	A GIS Analysis of Impervious Surface in Commercial and Industrial Land Use in the Clackamas WES Service District #1
Karl Lee, USGS, Retired	Crystal Springs Partnership
Jennifer Morace, USGS	USGS National Water-Quality Assessment (NAWQA) Program: The Pacific Northwest Stream Quality Assessment
Ronda Fast and **Chad Smith**, Portland BES	City of Portland Culvert Replacement/Abandonment on Crystal Springs Creek for Unimpeded Fish Passage
Caz Zyvatkauskas, JCWC Board	Wildlife on Johnson Creek
Noah Jenkins, Robin Jenkinson and **Danielle Miles**, Johnson Creek Watershed Council	JCWC Riparian Reforestation Strategy
Susan Hawes, Portland Parks & Recreation, City Nature East	Citizen Science; Birds and Butterflies on Powell Butte
Mart Hughes, Portland Parks & Recreation, City Nature East	Portland Parks Stewardship of Natural Areas in the Johnson Creek Watershed

Academic Speakers:

Urban flood and water management in a Blue-Green City: the Clean Water for All research initiative

Alan Yeakley (presenting), Colin Thorne, Emily Lawson + numerous UK & US colleagues

The City of Portland, Oregon, demonstrates many best practice examples of sustainable stormwater and flood risk management that embrace the *Blue-Green* ideal of reconfiguring the urban water cycle to more closely resemble the natural water cycle. A UK-US interdisciplinary collaboration under the Clean Water for All (CWfA) initiative conducted extensive research in Portland in 2014 to investigate the environmental, social and economic impacts of Portland's flood risk management, water quality improvement and river restoration strategies.

Six topic areas ran in parallel throughout this study. Hydro-morphodynamic modelling of the East Lents floodplain restoration site explored the influence of the floodplain on Johnson Creek sediment dynamics, and demonstrates that 20-25% of the total input sediment is deposited in the floodplain, which impacts on flood risk and water quality. The catchment composition and land use were found to influence the level of urban heavy metal pollution in Johnson Creek and setback stormwater outfalls play a key role in treating water and improving water quality prior to entry into mainstem Johnson Creek. Research into the societal perceptions of the costs and benefits of green streets highlighted that public awareness and understanding of the functions of blue-green infrastructure are often limited. Consultation and co-construction of solutions during the development phase should be explored as a means to improve local awareness and satisfaction, and thus, encourage a change in public perceptions and behaviour. Lack of confidence in political acceptability and public perceptions were also highlighted as significant barriers to the widespread adoption of blue-green infrastructure and socio-political uncertainties were shown to currently hamper decision making to a greater extent than scientific uncertainty in the hydrological performance of blue-green assets. The CWfA research culminated in the development of a novel GIS tool for evaluating the multiple benefits and benefit dependencies of blue-green infrastructure. This provides an enhanced evidence base to justify the adoption of blue-green infrastructure and an understanding of asset design modification to co-optimise the multiple benefits for local residents and communities, and for the wider City of Portland.

The influence of metals from stormwater outfalls on sediment denitrification in Johnson Creek

Jennifer Morse, Assistant Professor, Environmental Science & Mgmt, Portland State University

Stormwater pipes are frequently point sources of contaminants in urban catchments. Recent advances in stormwater management that fall under the umbrella of "green infrastructure" attempt to promote infiltration and pollutant removal by routing stormwater through vegetated structures or through restored riparian zones. In Johnson Creek and its tributaries, a river network that encompasses rural and urban subcatchments, river restoration and green infrastructure have been widely implemented to reduce flooding and improve water quality. In this river network, we sought to 1) identify hot spots of metal contaminants from stormwater inputs; 2) characterize relationships between metal concentrations and sediment microbial activity; 3) and characterize spatial patterns in sediment biogeochemistry as a function of catchment land use, management approach, and spatial configuration. We identified 40 stormwater pipes that discharged into in 18 stream reaches of Johnson Creek and its tributaries. We collected surface sediment samples next to, upstream, and downstream of each pipe. Sediments were sieved through a 2 mm sieve, subsampled for analysis of denitrification potential and substrate-induced respiration, and air-dried for particle size distribution, phosphorus and metals (Pb, Cd,

Cr, Cu, Zn) by ICP-MS. Results are analyzed using regression analysis. We present our results for sediment microbial activity and denitrification potential as a function of metal concentrations. This allows us to identify hotspots of contamination in the river network and to show the effect of metals on sediment biogeochemistry in this urban river.

Delivering Blue-Green Infrastructure (BGI): An exploration of barriers and uncertainties surrounding the city-wide implementation of BGI facilities

Marissa Matsler, IGERT Fellow, Ecosystems Service for Urbanizing Regions & Samantha Hamlin, IGERT Fellow, Ecosystems Services for Urbanizing Regions, Portland State University

Blue-Green Infrastructure (BGI) and Sustainable Drainage Systems (SuDS) are increasingly recognized as vital components in urban flood risk management. However, uncertainty regarding their hydrologic performance and lack of confidence concerning their acceptability create concerns and challenges that limit their widespread adoption. Two of the five projects that make up the Clean Water for All (CWFA) research initiative examine these socio-political barriers and challenges of implementation of BGI in Portland, Oregon through semi-structured interviews with two influential stakeholder groups: 1) mid-level managers/practitioners and 2) Portland residents. Semi-structured interviews with both groups found overlapping uncertainties and concerns.

Uncertainties expressed by managers and practitioners were examined using the Relevant Dominant Uncertainty (RDU) approach. Two types of RDU were identified: scientific RDUs related to physical processes that affect infrastructure performance and service provision, and socio-political RDUs that reflect the lack of confidence in the socio-political structures and public preferences for BGI. We found that socio-political RDUs have the greatest impact on decision making in Portland. Residents perceptions and attitudes were examined regarding a particular facility type, namely bioswales, highly visible interventions requiring significant support from residents and policy-makers to be implemented and maintained appropriately. Residents living near bioswales installed in different years were interviewed regarding awareness, understanding, and opinion about the devices to understand how perceptions and attitudes of BGI facilities might develop over time. The study found no consistent patterns across the time periods observed, but did find common issues that affected residents appreciation and acceptance, principally: environmental attitudes, awareness and understanding of purpose and function, plant choice and maintenance, and mess and littering.

Both studies support the conclusion that that the identification and management of both biophysical and socio-political uncertainties are essential to the implementation of BGI and sustainable urban flood risk management solutions that are scientifically sound and supported by local stakeholders; and that, in particular, increased engagement and dialogue with residents, developing local BGI maintenance, and possibly even tailoring facilities where feasible, could improve overall satisfaction.

Restoration choice: Attitudes, perceptions, and values in the Johnson Creek watershed

Ashlie Denton (presenting) & Mary Ann Rozance, IGERT Fellow, Ecosystems Services for Urbanizing Regions, Portland State University

Urbanization modifies ecosystem services (ES) not only within the city but also in the areas adjacent to the urban, which undergo land use change as urban areas expand outward. More populated regions rely on these transitioning lands for water filtration, agricultural production, and many other ES. Although much of the literature argues that urbanization is inevitably negatively impactful on the environment, a change in land use, while adding pressure, does not necessarily have to degrade ecosystem function. Recent research has demonstrated the ability of landscape features in human-dominated areas to provide a wide variety of ES including a reduction in cooling energy, carbon sequestration, and cultural benefits. One way that these ES can be supported is through private landowner stewardship practices.

A focus on stewardship efforts has long been a tradition within ecosystem recovery efforts. For the most part, research in understanding participation within these efforts has focused on rural and natural resource lands external to urban areas. There have been numerous calls in the literature to better characterize and understand individual stewardship practices within urban settings, including transitioning lands. A better understanding of residential landowner behavior becomes particularly important as rural lands become more urbanized and the collective practices of residential landowners continue to have the potential to either degrade ecosystem functions or support their viability.

The Johnson Creek Watershed in and around Portland, Oregon, is one area that has experienced rapid urbanization over the past twenty years. While this area's original ES have experienced increasing pressure, stewardship programs on riparian zones— or the land areas protecting the rivers and their tributaries— are rapidly gaining ground, slowly recovering canopy cover. One way this is happening is through incentivized restoration programs supported by a variety of organizations. The purpose of this study is to gain a better understanding of who participates in restoration programs within transitioning landscapes. We sent a survey to five hundred riparian landowners throughout the Johnson Creek Watershed. The survey measured landowner perceptions, values, response to incentives, and aesthetic preferences. These variables have been analyzed in the literature, but very few studies have analyzed them either in conjunction with one another or in urban and urbanizing regions. This study will contribute to an understanding of the opportunities and barriers to riparian restoration within transitioning lands.

Reed College Research: Crystal Springs and Johnson Creek

Maya Jarrad, Research Assistant, Department of Economics
Noelwah R. Netusil, Stanley H. Cohen Professor of Economics
Zachariah Perry, Grounds Specialist, Reed Canyon Manager

This presentation provides an overview of research conducted at Reed College including how research has been influenced by the canyon restoration project that started in 1999. We also discuss a recent grant from the USDA's National Institute for Food and Agriculture to use data from multiple jurisdictions, the watershed council, Soil and Water Conservation Districts, and other participants in riparian restoration projects to build a comprehensive dataset and GIS layer of the locations, basic restoration actions, and date range of projects started between 1988 and 2014. The data and GIS layer will be used to estimate the value to homeowners of urban and rural riparian restoration projects in the Johnson Creek Watershed.

Partner Speakers

A quest for dragons: Odonate diversity in Johnson Creek watershed

Celeste A. Searles Mazzacano, Ph.D., Staff Scientist & Aquatic Conservation Director,
The Xerces Society for Invertebrate Conservation, Portland OR

Anecdotal observations suggest that diversity of Odonata (dragonflies and damselflies) in Johnson Creek is lower than expected when compared to similar habitat in Multnomah and Washington counties. However, informal observation found increased odonate diversity at Crystal Springs in Westmoreland Park in the first year following stream restoration and floodplain re-connection. This talk describes the early data collected for a formal study that was launched in Spring 2015 to 1. quantify odonate diversity and seasonality at Westmoreland Park; and 2. to examine the local life history of the migratory dragonfly species Common Green Darner (*Anax junius*) and Variegated Meadowhawk (*Sympetrum corruptum*).

City of Portland's Watershed Health Index – Johnson Creek

Jennifer Antak, City of Portland Environmental Services

The City of Portland Environmental Services developed a Watershed Health Index to determine the relative health of our City's watersheds. The city monitors conditions in Portland's portion of the Willamette River and subwatersheds including the Willamette Tributaries, Fanno Creek, Columbia Slough, and Johnson Creek. The monitoring data feeds into the index, which was then used to develop watershed report cards. The report cards give a quick view of conditions in each of these watersheds. The grades summarize information gathered about the hydrology, water quality, habitat, and biological communities. The report cards will track changes in watershed health over time, show the types of projects that have the most positive impacts and help the city comply with state and federal regulations. This presentation will focus on what is measured in Portland's portion of the Johnson Creek watershed and the resulting index grades for each of the indicators.

Gauging Restoration Success: How site conservation planning and key ecological attributes inform restoration along Johnson Creek

Kate Holleran, Senior Natural Resources Scientist, Metro

Metro uses a site conservation planning process that identifies conservation targets and key ecological attributes to guide strategic restoration actions at Metro natural areas. Strategic actions are designed to improve or maintain the condition of the key ecological attributes. Climate change implications are factored into restoration work. Significant restoration work has been initiated in the aquatic, riparian and upland habitats in the Johnson Creek watershed. Examples of how the conservation targets and key ecological attributes for Metro's Johnson Creek natural areas informed recent restoration work, as well as the metrics for determining change in the key ecological attributes, will be presented

Modeling the Hydromodification Benefits of Gresham's Downspout Disconnection Program

Keri Handaly, City of Gresham's Watershed Division

City of Gresham's Downspout Program: Modeled Benefits of Hydromodification Impact Reduction
In 2009, The City of Gresham began a pilot project of a downspout disconnection program as a low cost retrofit in older neighborhoods within Johnson Creek where few to no stormwater treatment or controls existed. This project was in response to the Oregon Department of Environmental Quality's interest in the contribution of flow from stormwater runoff to negatively impact local streams. The City also dovetailed this program with its other public education programs focusing on home maintenance chemical reduction and achieved over 500 hundred high quality interactions using one-on-one home visits, workshops, stormwater facility tours, and block parties.

Now entering its fifth year, the downspout program's flow reduction impacts were modeled in a subbasin of the Hollybrook neighborhood. To date, 151 homes have disconnected all or a portion of their roof within the Hollybrook area, managing a total of 4.3 acres. This includes a portion of the Hollybrook Elementary School roof and parking lot which were disconnected and managed as public demonstration gardens. The model of flow reveals that although roofs make up almost 50% of the total impervious area within a residential zone (the rest comprised of streets, sidewalks, and driveways), only a portion (15%) are typically able to be managed via disconnection because of various safety factors such as the slope towards the home's foundation and distance/slope towards neighboring properties. In conclusion, the downspout program alone will not be able to mitigate the impacts of stormwater flow on local streams and other retrofit approaches such as green streets will be necessary.

Groundwater: An unseen resource in the Johnson Creek watershed

Terrence Conlon, Hydrologist, USGS Oregon Water Science Center

Groundwater flows to springs and seeps along Johnson Creek and its tributaries. This groundwater discharge augments winter streamflow and is the primary source of summer flow in Johnson Creek. Groundwater provides a source of cool water to maintain aquatic habitat during the warm, dry summer. Monitoring of groundwater levels is critical to understanding trends in groundwater discharge to Johnson Creek. Groundwater levels systematically measured since 2000 in the Johnson Creek watershed have increased, suggesting that groundwater discharge to streams increased. Depending on the volume of increase in groundwater discharge, groundwater may improve temperature and streamflow, and consequently aquatic habitat in Johnson Creek.