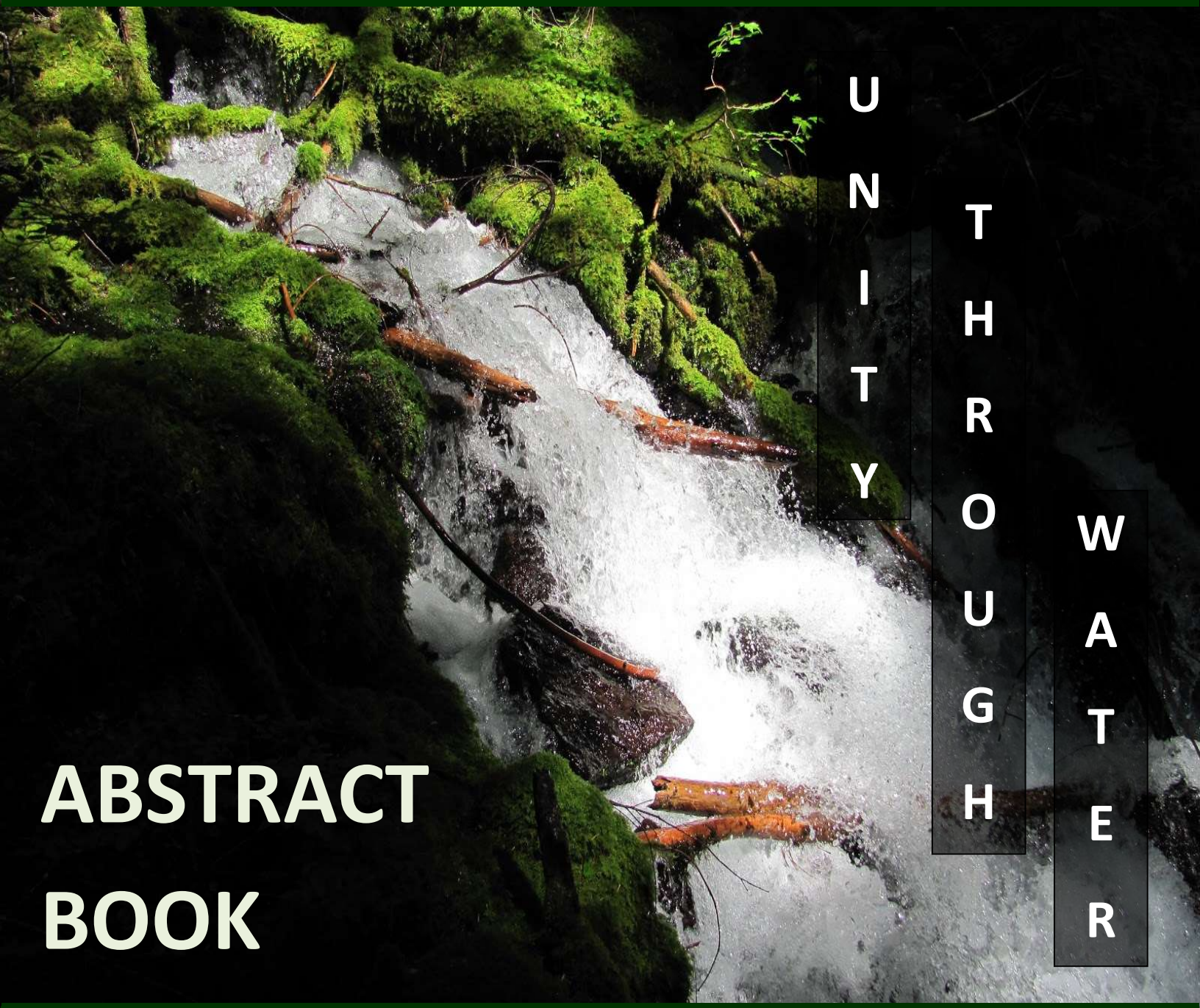
7TH ANNUAL PACIFIC NORTHWEST WATER RESEARCH SYMPOISUM

Hosted by Oregon State University Hydrophiles



ABSTRACT BOOK

CH2M HILL Alumni Center, Oregon State University
Visit: http://hydrophilesresearchsymposium.org/

OSU Oregon State University

TABLE OF CONTENT

PLANNING TEAM

NAME	AFFILIATION
Beth Rutila	Water Resources Science, Oregon State University
Carolyn Gombert	Oregon State University
Christina Welch	Water Resources, Oregon State University
Fatima Taha	Water Resources Graduate Program, Oregon State University/University for Peace/UNESCO-IHE
Ingria Jones	Water Resources Policy and Management, Oregon State University
Jonathan Sanfilippo	Oregon State University
Lauren Bomeisl	Water Resources Graduate Program, Oregon State University
Nicole Feiten	Water Resources Graduate Program, Oregon State University
Travis Grohman	Water Resources Engineering, Oregon State University

SPONSORS

Todd Jarvis | Scientific Mediation + Serious Gaming in Water

SYMPOSIUM SCHEDULE

MONDAY, MARCH 6th

Time	Activity	Room
07:30 AM - 08:00 AM	Check-in and Breakfast	Lobby
08:00 AM - 08:30 AM	Opening Remarks - Dr. Tala Navab-Daneshmand: "Unity Through Water"	Cascade Ballroom
08:45 AM - 09:45 AM	Morning Oral Session 1: Hydrology	Cascade Ballroom
10:00 AM - 10:30 AM	Morning Break	Lobby
10:30 AM - 11:15 AM	Morning Oral Session 2: Water Governance	Cascade Ballroom
12:00 PM - 01:00 PM	Lunch (provided for registered attendees)	Lobby
01:00 PM - 02:30 PM	Interactive Blue Ribbon Workshop: Climate Change Conflict Resolution	Cascade Ballroom
02:30 PM - 03:30 PM	Blue Ribbon Meet & Greet (Light snacks and refreshments)	Lobby

TUESDAY, MARCH 7th

Time	Activity	Room
07:30 AM - 08:00 AM	Check-in and Breakfast	Lobby
08:00 AM - 09:45 AM	Morning Breakout Workshops	Cascade Ballroom 110A, 110B, & Johnson Lounge 102
09:45 AM - 10:00 AM	Morning Break	Lobby
10:00 AM - 12:00 PM	Poster Presentations	Cascade Ballroom 110A & 110B
12:00 PM - 01:00 PM	Lunch (provided for registered attendees)	Lobby
01:00 PM - 01:45 PM	Afternoon Oral Session Session 3: River and Lakes Session 4: Water Quality and Ecology	Cascade Ballroom 110A & 110B
02:30 PM - 03:00 PM	Afternoon Break	Lobby
03:00 PM - 04:30 PM	World Café Discussion: Bear Wilderness	Cascade Ballroom 110A
04:30 PM - 05:00 PM	Awards	Lobby
05:00 PM - 06:00 PM	Networking Session (refreshments and hors devours)	Lobby
06:00 PM - 07:00 PM	Keynote Speaker: OWRD Director Tom Byler	Cascade Ballroom 110A

POSTER SESSIONS

Tuesday Poster Presentations: Session A (10:00 AM-12:00 PM, Cascade Ballroom 110 A)

A1	Amberlie	Barnard	Oregon State University	Implementing Water Data Sharing for Produce Rule Compliance
A2	Fatima	Taha	Oregon State University	Globalization of Water Resources: Examining Social Learning Through the Use of Serous Gaming
A3	Amelia	Yeager	Oregon State University	Engineered Log Jam Impacts on Stream Geomorphology and Fish Habitat: Does Stream Size Matter?
A4	Sam	Swanson	Oregon State University	This Way Through: Engineering transitions in emigrating smolt behavior near guidance structures at large dams
A5	Trevor	Grandy	Oregon State University	Saving Darlingtonia: Land Use and Groundwater Impacts to a Carnivorous Pitcher Plant, Darlingtonia State Natural Site, Florence,
A6	Michelle	Hu	Oregon State University	Winter Storms and Climate Change in the Oregon Cascades
A7	Christina	Welch	Oregon State University	Transboundary Groundwater Resources in the Rio Grande/Bravo Basin
A8	Linnia	Hawkins	Oregon Climate Change Research Institute	Projections of midcentury hydroclimate seasonality in the western US from a large ensemble of regional climate model simulations
A9	Carl	Talsma	Oregon State University	Evaluation of Evapotranspiration Partitioning in Satellite Driven Models
A10	Stephanie	Bianco	Oregon State University	Characterization of Stream Channel Change in the Western Cascase Mountains
A11	Julianne	Robinson	Oregon State University	Small-Scale Aquifer Storage and Recovery
A12	Michael	Fratkin	Oregon State University	A comparison of channel head identification tools in the Oregon Coast Range
A13	Karla	Jarecke	Oregon State University	The role of topographic position in controlling soil moisture availability in steep terrain of the Western Cascades
A14	Mary	Engels	University of Idaho	Mapping soils through the trees: A mixed methods approach for small low islands
A15	Brendan	Buskirk	Oregon State University	High Resolution Temperature Analysis of IMW Stream Restoration in the Middle Fork of the John Day River.
A16	Alberta	Gittens	Oregon State University	Land use effects on stream temperature along a temperate riparian corridor in western Oregon
A17	Jesse	Hall	Oregon State University	Surface Water and Shallow Groundwater Temperature Relations in a Riparian Corridor in Western Oregon

Tuesday Poster Presentations: Session B (10:00 AM-12:00 PM, Cascade Ballroom 110 B)

B1	Francisco Pickens	Oregon State University	Using Recirculating Chambers to Quantify Effects of Aquatic Vertebrates on Stream Metabolism
B2	Nicole Feiten	Oregon State University	Characterizing seasonal estuary fish assemblages and environmental conditions at tide-gate locations in the Coos Bay Estuary
B3	Travis Grohman	Oregon State University	Design Tools for Efficient Denitrifying Permeable Reactive Barriers in Oregon
B4	Hannah Rolston	Oregon State University	Biomineralization for In Situ Groundwater Remediation of 1,4-dioxane
B5	Steven White	Oregon State University	Water purification from landfill leachate
B6	Genevieve Schutzius	Oregon State University	The Fate of Antibiotic Resistance due to Septic Tank Use in Vietnam
B7	Mykl Nelson	Oregon State University	Lifecycle analysis of urban home garden systems
B8	Michelle Talal	Oregon State University	Vegetation biodiversity patterns and ecosystem functioning in various types of green infrastructure in Portland, Oregon
B9	Juliette Ohan	Oregon State University	Microbial Induced Calcite Precipitation (MICP) in the Saturated Zone in Rifle, CO
B10	Angelo Sanfilippo	Boise State University	The Effects of Dissolved Organic Carbon Quantity and Quality on Hyporheic Zone Microbial Respiration
B11	Simon Kahsai	Oregon State University	Optimization of green Infrastructures to manage stormwater in an urban setting with consideration of societal preference
B12	George Ng	Oregon State University	Modeling the fate of radiocesium in a modern-day urban water-recycling scenario
B13	Caitlin Condon	Oregon State University	Radionuclide Movement Through Aquatic Environments
B14	Lisa Windom	Oregon State University	Response of Calcium Dissolution Rate to Diverse Fluid Dynamics of Non-Saturated Epikarst Micro-Fissures
B15	Richard Hilliard	Oregon State University	Characterization of organic carbon influence on bacterial community dynamics to control a simultaneous anammox and denitrification
B16	Matthias Fostvedt	University of Oregon	Environmental and Natural Resources (ENR) Law Center
B17	Casey Steadman	Oregon State University	Geological and hydrological influences on nitrogen and phosphorus concentrations in forested headwater catchments of the norther
B18	Aaron Rachels	Oregon State University	Identifying the primary sources of suspended sediment in Oregon Coast Range headwater streams following forest harvesting

ORAL SESSIONS

Start Time	Oral Session 1: Hydrology (Monday 8:45 am - 10:00 am, Cascade Ballroom)		
8:45	Inverse Modeling to Estimate Plant Hydraulic Strategies from Remotely-Sensed Soil Moisture	Maoya Bassiouni	Oregon State University
9:00	Estimation of Soil Evaporation from Two Potato Fields with Contrasting Irrigation Schedules Using Stable Isotope Tracers.	Firas Aloqaili	Oregon State University
9:15	Locating and Monitoring Changes in Subglacial Water Flow Using Seismology	Margot Vore	University of Idaho
9:30	Managed Aquifer Recharge: Buffer Climate-Induced Changes in Flows and Mitigate Conflict in Snowpack Dominated Watersheds	Maria Gibson	Oregon State University
9:45	A temperature base novel monitoring system for scour and deposition at bridge piers	Aston Carpenter	University of Idaho

Start Time	Oral Session 2: Water Governance (Monday 10:30 am - 11:45 pm, Cascade Ballroom)		
10:30	The Impact of Litigation on Collaborative Processes for a New Water Management Regime in the Upper Deschutes River Basin, Oregon	Hannah Satein	Oregon State University
10:45	Mapping Water Resource Vulnerability in the Columbia River Basin: A Socio-Environmental Approach for Targeted, Community-Based A	Paris Edwards	University of Idaho
11:00	Characterizing Water Governance in the Willamette Basin	Ingria Jones	Oregon State University
11:15	The Old(er) Men of the Sea: Graying of the fishing industry and its impact on community resiliency	Deanna Caracciolo	Oregon State University

Start Time	Oral Session 3: Rivers and Lakes (Tuesday 1:00 pm - 2:15 pm, Cascade Ballroom 110 A)		
1:00	Hydrodynamics and Water Quality Model of the Tigris River System in Iraq	Muhanned Al-Murib	Portland State University
1:15	A hyporheic mesocosm experiment to examine the influence of quantity and quality of low molecular weight DOC (Acetate) on carbon metabolism	Satish Serchan	Oregon State University & USFS-PNW Research Station (Corvallis)
1:30	Temporal record of metal deposition into Middle Champion Lake	Beth Rutila	Oregon State University
1:45	Quantifying the contribution of internal loading to the occurrence of epilimnetic algal blooms in Willow Creek Reservoir, Heppne	Sarah Burnet	University of Idaho

Start Time	Oral Session 4: Water Quality and Ecology (Tuesday 1:00 pm - 2:15 m, Cascade Ballroom 110 B)		
1:00	An Examination of the Use of Seascape Scale Habitats Including Oyster Aquaculture and Zostera marina by Fish and Crab in US Paci	Larissa Clarke	Oregon State University
1:15	Growth, condition, and survival of larval Alaskan cod species in a warming ocean	Brittany Koenker	Oregon State University
1:30	Evaluating Biochar in Sustainable Stormwater Treatment of Heavy Metals	Sarah Burch	Oregon State University
1:45	Effects of Chlorinated Methanes (CMs) on the Reductive Dehalogenation of Trichloroethene	Emma Ehret	Oregon State University

ABSTRACTS - ORAL SESSION 1: HYDROLOGY

Title	Inverse Modeling to Estimate Plant Hydraulic Strategies from Remotely-Sensed Soil Moisture
Author(s)	Maoya Bassiouni, Water Resources Engineering, OSU
Abstract	Characterizing plant strategies for regulating transpiration under limited soil moisture conditions is challenging at scales beyond the individuals and test plots. We hypothesize that the probability density functions (PDF) of remotely sensed soil moisture provides key information to determine soil moisture levels at which stomata are fully open or closed at large scales. Data in this project are derived from readily available products including the European Space Agencies (ESA) Climate change Initiative (CCI) soil moisture, the National Aeronautics and Space Administration (NASA) Tropical Rainfall Measuring Mission (TRMM), and the Harmonized World Soil Database (HWSD). The analysis is conducted at a quarter degree latitude corresponding to approximately a 30-kilometer cell grid. Locations for which point measurements of plant-hydraulic parameters are available in the literature were selected and PDFs of soil moisture states were determined at these locations from the satellite derived soil moisture data. Through Bayesian modeling the empirically derived soil moisture PDFs most consistent with a standard bucket model of soil column hydrology forced with stochastic precipitation inputs is found to determine the statistics of plausible soil moisture thresholds at which stomata are open or closed. The range of initial results was consistent with literature values of plant-hydraulic parameters in different climates and ecosystems. This research will utilize the global dataset and investigate global patterns of plant-hydraulic strategies. Findings may provide insight on the drought-resilience of managed and natural vegetated landscapes.

Title	Estimation of Soil Evaporation from Two Potato Fields with Contrasting Irrigation Schedules Using Stable Isotope Tracers
Author(s)	Firas aloqaili, BEE WRS, OSU
Abstract	Development of new techniques able to identify non-productive soil evaporation water losses for agriculture will assist in improving harvest yields per unit of irrigation water. In this research, water lost from the soil as evaporation was estimated in two potato fields based on the hydrogen and oxygen isotope ratios (i.e. deuterium to hydrogen isotope ratio (D: H)) of residual soil moisture. Soil samples were collected from two fields with contrasting irrigation schedules during the summer of 2016 from two positions in the planting line at three depths. We used H2O liquid - H2O vapor equilibration laser spectroscopy, a technique that is faster and has a lower cost than conventional isotope ratio mass spectroscopy for measuring the stable isotope ratio of soil waters. In this technique, the liquid phase soil pore water and headspace water vapor are allowed to reach equilibrium at a controlled temperature in the closed system. This technique can measure the O18/O16 and D/H isotope ratio of soils with water contents as low as 6%. In this project, the stable isotope ratio was used to assess evaporation during the summer season at the Hermiston Agricultural Research and Extension Center (HAREC) in

	Hermiston Oregon. We collected soil samples for six months, with sixty samples (2 locations: row and inter-row; at 5 positions: 3 depths: 5cm, 15cm, 25cm; 2 treatments: day and night) during each monthly sampling campaign. These soil samples were analyzed for stable isotope markers of the amount water that was lost to the atmosphere as evaporation during and after irrigation. Our results show that the average deuterium to hydrogen isotope ratio (D: H) of the pivot with nighttime irrigation was lower than average (D: H) ratio of the pivot with daytime irrigation. These results suggest that less soil evaporation occurred from the nighttime irrigated pivot, which also had higher soil moisture levels than the pivot watered during the daytime. Proportional crop cover in the pivot under daytime irrigation was smaller than the pivot under nighttime irrigation. This technique is a fast and effective way to assess the amount of soil evaporation and help inform decisions on how, where and when to irrigate fields. Stable isotope geochemistry presents new opportunities for the agricultural community to make progress in improving water management programs.

Title	Locating and Monitoring Changes in Subglacial Water Flow Using Seismology
Author(s)	Margot Vore and Timothy Bartholomaus, University of Idaho
Abstract	Glacier dynamics are greatly influenced by subglacial water flow but, due to the challenges of observing glacier beds, there are many unanswered questions about how subglacial environments change throughout a melt season. Subglacial environments evolve in response to water that flows through channels and conduits at the glacier's bed and changes in water input greatly affect the subglacial channel morphology as well as basal sliding speeds. Moving water in rivers and beneath glaciers produces seismic signals, however, fluvial and glaciohydraulic seismology is in its infancy. By monitoring changes in the source of glaciohydraulic tremor throughout the melt season, new details about the evolution of the subglacial landscape and the dynamism of subglacial conduits may be uncovered. To address this opportunity, we installed nine seismometers on Taku glacier, northeast of Juneau, Alaska from March 2016-October 2016. These seismic stations were placed near or on the glacier allowing for continuous data collection throughout the melt season. The temporal scale of the data collected allows us to detect any patterns or changes that occur in the seismic noise produced by water flow throughout a melt season. Any "noise" found in the seismic signal between 2-10Hz has the potential of being produced by water. By determining the direction of the wave arrivals through waveform polarization analysis and through waveform cross correlation methods, we may be able to detect changes in the seismic signals arrival directions and approximate a location of water flow under the glacier. These analyses are likely to provide new constraints on the processes behind glacier motion, sediment transport and other topics.

Title	Managed Aquifer Recharge: Buffer Climate-Induced Changes in Flows and Mitigate Conflict in Snowpack Dominated Watersheds
Author(s)	Maria Gibson, College of Earth, Ocean, and Atmospheric Science/Water Resources Science, Oregon State University
Abstract	As climate-induced snowmelt occurs, subsequent modifications to natural surface flow patterns are predicted to extend the gap between wintertime collection and peak summertime distribution. Therefore, increasing water storage, within a heavily regulated, highly connected, snow-dominated watershed will likely heighten water resource resiliency among basin-wide water users and enhance ecosystems. Although demand is traditionally met by above-ground reservoir storage, it is hypothesized aquifers provide enough underground storage capacity to aid in buffering the effects of climate and to mitigate conflict. By strategically utilizing underground reservoirs as storage mechanisms - known as Manage Aquifer Recharge (MAR) - rather than relying upon snowmelt, basin-wide water resource schemes can be developed under a variety of objectives and scenarios. This presentation will discuss methods to estimate recharge potential in the snowpack dominated Yakima River basin, describe how recoverable water can buffer expected changes in climate-altered flows, and talk about ways in which MAR can be used to mitigate conflict among competing water users.

Title	A temperature base novel monitoring system for scour and deposition at bridge piers
Author(s)	Aston Carpenter, Civil Engineering, University of Idaho
Abstract	Bridge failures, also in the United States, are mainly caused by water-flow removal of streambed sediment, scour, around bridge foundations. For instance, flow around a bridge pier can be fast and very turbulent causing large shear stresses. Large shear stresses can mobilize sediment, scouring around bridge piers hindering the stability of a bridge or depositing sediment, depending on upstream sediment transport conditions. Thus, streambed surface may change its elevation in either direction depending on upstream and local flow and sediment conditions, which are time dependant. In this project, we tested a novel methodology to monitor streambed elevation changes based on daily variations of the stream water temperature. The temperature signal changes as it propagates through the sediment where an array of temperature sensors measures the pore water thermal regime. The proposed method detects any changes in local streambed elevation by comparing the in-stream and in-sediment temperature signals. Our test at 3 Idaho bridges in three different watersheds showed that the method is robust and clearly detect the maximum scour, which was verified with a scour chain measurement, and the time series of the streambed evolution, which was verified at a selected bridge with streambed survey.

ABSTRACTS - ORAL SESSION 2: WATER GOVERNANCE

Title	The Impact of Litigation on Collaborative Processes for a New Water Management Regime in the Upper Deschutes River Basin, Oregon
Author(s)	Hannah Satein, Water Resources Graduate Program, Oregon State University
Abstract	In recent decades, climate change, shifting demographics, and a growing societal desire for waterways that work for both humans and ecosystems have increased the complexity of water management in the American West. Scholars and practitioners are attempting to find ways to adapt western water management to meet the demands of this new context. Some scholars posit collaborative governance may generate more innovative and adaptable solutions better suited to resolving modern environmental problems, such as water management, than traditional regulatory approaches. However, some of these scholars debate how collaboration and regulatory enforcement, in the form of litigation, may interact: does litigation destroy collaborative governance efforts or does litigation serve as a mechanism to facilitate collaboration? The objective of this research is to examine this research question through a qualitative case study of the Upper Deschutes River Basin in Oregon, a community that is wrestling with the changing context of water management in the American West. Recently, stakeholders, representing the diverse water interests in the basin, began two collaborative processes to develop a new water management regime that meets the needs of new and historical water interests in the basin; however, a participant in these processes was concerned that they were not progressing and filed a lawsuit under the Endangered Species Act. The results of this research will attempt to demonstrate if the litigation destroys the collaborative governance efforts or conversely, if the litigation serves as a mechanism to move the basin closer to the goals of the collaborative efforts: to manage the basin to provide for historic agricultural needs, growing populations, and flows for species and ecosystems under the conditions of a changing climate. These results will contribute to the ongoing conversation about adapting water management structures in the American West and the intersection of regulation and collaboration in collaborative governance theory.

Title	Mapping Water Resource Vulnerability in the Columbia River Basin: A Socio-Environmental Approach for Targeted, Community-Based A
Author(s)	Paris Edwards, Water Resources Department/ IGERT, Program University of Idaho
Abstract	Mountain dominated systems like the Columbia River Basin (CRB) have received recent attention with regard to climate change vulnerability. Average winter temperatures are projected to increase, reducing snow accumulation and storage during core accumulation months (DJF). A hydrologic regime shift from snow to rain is expected to have cascading impacts on the volume and timing of runoff, with broad implications to human and environmental systems that will effect everyone, but not equally. Vulnerability is an issue that cross-cuts environmental and human dimensions of climate change, yet these spheres have traditionally been isolated in analyses. This research takes a holistic approach to addressing

	the interdependent relationships between socio-environmental systems and the impacts of climate change. The hotspot mapping effort comprises three steps. In brief, these include: 1) development and examination of surface water dependence variables to establish reliance on seasonal snowpack and represent patterns of use spatially at the subbasin scale; 2) overlaying water dependence results with subbasin scale socio-economic data; 3) a. identifying overlapping physical and social vulnerability to isolate "hotspot" subwatersheds, and b. reaching out to existing community organizations and partners within these areas to assess local adaptive capacity. It is expected that the results of this study will contribute to a more comprehensive understanding of water resource vulnerability across the basin, and highlight high-risk areas. The hotspot map can be used as a decision support tool for managers, interest groups, leaders, etc. to facilitate new, practical applications to risk communication. Additional benefits of a hotspot map may include improved information transparency and the incorporation of local and indigenous knowledge to build common understanding and facilitate data-infused, context-specific climate change adaptation planning. Highlighting hotspot communities may also provide policy and management relevant information by helping to highlight need, expedite adaptation, and target limited resources where they are needed most within the CRB.

Title	Characterizing Water Governance in the Willamette Basin
Author(s)	Ingria Jones, Water Resources Policy and Management, Oregon State University
Abstract	The purpose of this study is to characterize the adaptive governance capacity of the Willamette Basin and identify the barriers and opportunities to adaptive water governance. The Willamette River Basin, a tributary to the Columbia River, supports 70% of Oregon's population and contains the "richest native fish fauna in the state," (Hulse, Gregory, & baker, 2002). The Willamette Basin is facing changes that stress its water management regimes. Is the basin vulnerable in the face of these changes? Climate models project greater variability and intensity in winter rainstorm events and decreased snowpack in the Willamette Basin (Sproles et al. 2012). Environmental flow requirements for federally listed fish species coupled with increasing municipal and agricultural water demand have closed several watersheds to new surface water allocations, and reduced reliability of supplies. Sustainable water resources management requires networks of water managers who practice adaptive management by continually monitoring, assessing, and improving management procedures and outcomes. This requires adaptive capacity, which is "the ability of a resource governance system to first alter processes and if required transform structural elements in order to better cope with experienced or expected changes in the societal and natural environment," (Pahl-Wostl et al., 2010, 572). To characterize adaptive capacity in the Willamette Basin, questionnaires were distributed to 100 water managers at the basin-wide scale and the watershed level to examine four key elements of adaptive capacity: social capital; human, financial, and physical capital; management tools and strategies; and governance strength. Respondents include experts involved in managing water

	on a basin-wide scale and those managing on a watershed-level within the selected watersheds. Surface water availability exceedance rates identified three watersheds spanning low (McKenzie River), Medium (North Santiam River), and High (Middle Fork Willamette River) levels of water scarcity. Semi-structured interviews will be conducted with key managers to identify specific barriers to and opportunities for adaptive governance. Preliminary quantitative results indicate relatively high governance strength and use of management tools and strategies and mixed levels of social capital due to relatively low trust in hobby farmers, ranchers, and hydroelectric stakeholder groups. Results also suggest a lack of adequate financial and physical capital and a belief that water users have low capacity to adapt to changes in supply and demand.

Title	The Old(er) Men of the Sea: Graying of the fishing industry and its impact on community resiliency
Author(s)	Deanna Caracciolo, Marine Resource Management, Oregon State University
Abstract	Understanding the full spectrum of resilience is critical to the success of coastal communities in a world under constant change and coastlines under ever-increasing threat from climate change. On the Oregon coast, communities center their livelihoods around coupled human-environmental systems, historically characterized by natural resource extractive industries like timber and fishing. This study involves the commercial fishing families, community leaders and support businesses of Newport and Port Orford. It focuses on decision-making and the regulatory, economic, technological and socio-cultural factors within these "fishing-dependent" communities. Specifically, does the apparent "graying" or aging of the fleet influence the resilience of both the community of place and the community of "interest" (commercial fishing)? We are using a multi-method approach consisting of capturing oral histories, conducting semi-structured interviews and community outreach, and secondary data compilation to learn about this and assess and document change in intergenerational family business practices. My project focuses on the commercial fishermen and their families. For example, with an aging workforce approaching retirement and some indication of decreased recruitment into the industry, what impact might this have on the transfer of knowledge, capital, and infrastructure that keeps the commercial fleet successful? Can a more collaborative, community-based approach to management be used to increase efficiency, success, and equality within fishing fleets, while also breaking down barriers that may inhibit younger generations from entering these family businesses? The information gathered by this pilot study could inform management strategies and their impacts on coastal communities of place and interest in Oregon and beyond.

ABSTRACTS - ORAL SESSION 3: RIVERS AND LAKES

Title	Hydrodynamics and Water Quality Model of the Tigris River System in Iraq
Author(s)	Muhanned Al-Murib, Civil and Environmental Engineering, Portland State University
Abstract	The Tigris River one of two great rivers in Iraq. The Tigris with the Euphrates Rivers and their tributaries form a major river system in the Middle East. Turkey, Syria, Iran, and Iraq share the Tigris River basin area even though a majority of the basin area is in Iraq. The total length of the Tigris is 1850 km from which 1418 km is within Iraq. Over 40% of the water in the Tigris is allocated for agricultural purposes. A study area of 880 km extended from Mosul dam to Kut barrage is modeled using the water quality CE-QUAL-W2 model. CE-QUAL-W2 is a two-dimensional (longitudinal and vertical) water quality model developed by the U.S. Army Corps of Engineers and Portland State University.W2 model simulates river circulation, stage, vertical and horizontal velocities, water temperature, and a host of water quality constituents. Total dissolved solids (TDS) is one of the most critical and important concerns of Tigris River because of the heavy agricultural use of the water. Therefore, this study discusses the implementation of CE-QUAL-W2 model on Tigris River to simulate flow, temperature, and TDS.

Title	A hyporheic mesocosm experiment to examine the influence of quantity and quality of low molecular weight DOC (Acetate) on carbon metabolism
Author(s)	Satish Serchan, CEOAS/Water Resources Science, USFS-PNW Research Station (Corvallis) and Oregon State University
Abstract	The hyporheic zone can influence biogeochemical functioning and integrity of stream water. In well oxygenated hyporheic zones, we would expect microbial respiration to convert stream-source DOC into DIC. Previous work from a well network located in WS01 at the HJ Andrews Experimental Forest showed that the increase in DIC along hyporheic flow paths was 10-times greater than would be expected from the loss of DOC. These results suggest that an alternative source of DOC is likely present. However, hyporheic zone biogeochemical processes are difficult to isolate in well networks because of confounding factors (e.g., riparian soil processes, alternative sources of DIC, etc.). Therefore, we designed and built six replicate 2-m long hyporheic mesocosms to study the effects of labile DOC in DIC production and O2 consumption along well-defined hyporheic flow paths. Sodium acetate (NaAc) was continuously injected into the mesocosms from Nov 23 to Nov 27, 2016. We compared DOC, DIC, O2, and SUVA254 from water collected at specific locations along hyporheic flow paths between control and treatment mesocosms. Stream water DOC concentrations (0.11-0.19 mM) and DOC loss (0.01-0.05 mM) were low in control mesocosms. DOC loss in treatment mesocosms were an order of magnitude higher (0.14-0.31 mM) than control mesocosms. Assuming a 1:1 molar ratio for the respiratory quotient, production of DIC was less than expected relative to the consumption of O2 early in the tracer injection which may have been a legacy effect of anoxia experienced by our system before the initiation of experiment. Nonetheless, we did observe less DIC produced than DOC consumed at latter stages of the experiment indicating alternate uptake of organic

	C related to luxury consumption or growth. Our results clearly show that addition of low molecular weight labile DOC led to priming effect in the hyporheic mesocosms, i.e., metabolism of recalcitrant DOC after addition of labile DOC.

Title	Temporal record of metal deposition into Middle Champion Lake
Author(s)	Beth Rutila, Water Resources Science, Oregon State University
Abstract	Non-ferrous smelters are the primary anthropogenic source of atmospheric cadmium (Cd) (72%) and zinc (Zn) (72%), and are a significant source of atmospheric lead (Pb) (12%) and of other heavy metals. Elevated heavy metal concentrations have been detected in the Upper Columbia River Basin (UCRB) and are hypothesized to have originated from regional anthropogenic activity, including from Teck's integrated zinc (Zn) and Pb smelting and refining complex in Trail, BC. Despite estimates of atmospheric emissions from the Teck facility (38,465 tons of Zn, 22,688 tons of Pb, and 1,103 tons of Cd) between 1921 and 2005, the fluxes of these emissions into the regional terrestrial and aquatic systems over time are poorly understood. Lake sediment cores act as temporal records of atmospheric metal deposition into lakes, and can provide insight into the sources of metals that may have influenced regional water quality. To evaluate the contribution of metals into the UCRB, sediment cores were collected from five lakes in both Washington and British Columbia. Here we will present the first temporal reconstruction of Pb isotope ratios and metal concentrations from Middle Champion Lake, located 11.6 km NE of the Teck Trail facility. Age control for the sediment core is provided by 210Pb dating and 137Cs measurements. Trace metal concentrations and Pb isotopes were measured within the cores in order to fingerprint the relative contribution of multiple emission sources over time. Sediments within the core interval 23-25 cm below the sediment-water interface exhibited the highest concentrations of Cd, Pb, Zn, As, In, and Bi, and likely correspond to the height of production at the Teck facility in the 1940s. Pb isotope measurements of that same depth interval display ratios most similar to Sullivan Mine ore, the predominant ore processed during that time. The results from this study provide evidence that the Teck facility is likely the overwhelming predominant source of Pb into Champions Lake over the past 100 years. Future studies that measure Cd and Zn isotopes are necessary to further fingerprint the sources of heavy metals in Champions Lake sediments.

Title	Quantifying the contribution of internal loading to the occurrence of epilimnetic algal blooms in Willow Creek Reservoir, Heppne
Author(s)	Sarah Burnet, Department of Fish and Wildlife Sciences, University of Idaho
Abstract	For many lakes, internal loading of phosphorus from sediments has been calculated to be a large fraction of the annul P budget and has been identified to significantly delay improvements of water quality after reducing inputs of P. While mathematically valid based on an annual mass balance, we ask: what is the contribution of internal loading to epilimnetic algal biomass during the summer growing period in directly stratified lakes? Although significant internal loading of P

	may occur in an anoxic hypolimnion, the only relevance to primary producers is the P that becomes available across the thermocline via storm events, translocation by biota, or destratification. To advance the science of lake management and focus restoration actions, it is necessary to accurately estimate the contribution of internally loaded P to primary production. We will use a field-based approach to measure the mass of P that is translocated across the thermocline in Willow Creek Reservoir in Heppner, OR, a 50 hectare, 26 m max. depth reservoir with known severe internal loading that reaches >600 µg P/L. To determine the mass of P entrained by storm events indicated by thermocline deepening from metalimnetic entrainment, we will set out a series of thermistor strings to monitor water temperature at different sites and collect water samples for P analysis before and after storms. By combining this measured entrainment per storm with the progression of seasonal internal loading, we will be able to create a model to partition an annual budget to the fraction that significantly stimulates primary production.

ABSTRACTS - ORAL SESSION 4: WATER QUALITY AND ECOLOGY

Title	An Examination of the Use of Seascape Scale Habitats Including Oyster Aquaculture and Zostera marina by Fish and Crab in US Paci
Author(s)	Larissa Clarke, Marine Resource Management, OSU
Abstract	Understanding the ecological role of shellfish aquaculture (Crassostrea gigas) and eelgrass (Zostera marina) as important habitat in US Pacific Northwest estuaries is important for management decisions. The aquaculture industry is currently restricted by regulations concerning impacts of their activities on Z. marina as this seagrass is designated as Essential Fish Habitat (EFH) for federally managed fish species. In this study, abundance, species diversity, and behavior activities of fish and crab in Pacific Northwest estuaries were quantified using underwater GoPro® video surveys. The particular interest were landscape scale features that might influence behavior of these more mobile species and here, longline oyster aquaculture, eelgrass beds and the edge between these two habitats was evaluated. Predation tethering units (PTUs) were also deployed in each of these habitats to evaluate predation risk and refuge value and temperature, relative light, and salinity measurements were taken to characterize the physical environment. Habitat complexity represented as seagrass density and epiphyte cover were also measured within each habitat. Preliminary results suggest there are important differences in use of these habitats by some fish and invertebrates that could be associated with predation and refuge value.

Title	Growth, condition, and survival of larval Alaskan cod species in a warming ocean
Author(s)	Brittany Koenker, Water Resources Department/ IGERT Program, University of Idaho
Abstract	Arctic cod (Boreogadus saida) is an ecologically significant species in polar food webs, forming a critical link between plankton and upper trophic levels. From a management perspective, the fate of Arctic cod is of particular concern as they are a keystone species and are federally managed in the Chukchi and Beaufort Seas. Arctic cod is uniquely adapted to occupy ice-edges, but shrinkage of sea-ice habitat could facilitate invasions by North Pacific gadids (e.g, walleye pollock, Gadus chalcogrammus). Both Arctic cod and walleye pollock co-occur in the North Bering and Chukchi Seas, but basic understanding of larval physiology is limited by widespread sea-ice cover making it difficult to determine how each species will respond to climate change conditions. By assessing the sensitivity of each species to environmental conditions affecting growth, it is possible to better understand larval survival, and thus the factors dictating success of the population in the face of climate change. In the laboratory, we examined larval growth, survival and condition in response to predicted variation in temperature and food availability. Preliminary results indicate significantly different growth and survival responses between species, with Arctic cod having higher growth potential at low temperature but surviving across a narrower thermal range than walleye pollock. This research will provide critical vital rates to improve our understanding of the mechanisms affecting survival of these larval cod species in the face of climate change. The fate of these fish has direct impacts on higher trophic levels and the humans that depend on them.

Title	Evaluating Biochar in Sustainable Stormwater Treatment of Heavy Metals
Author(s)	Sarah Burch, Water Resources Graduate Program, Oregon State University
Abstract	Heavy metals, such as copper, zinc, and cadmium, are ubiquitous in stormwater and potentially toxic to aquatic organisms at low concentrations. Removal of heavy metals contamination by conventional treatment is expensive and does not always reduce metals concentrations low enough to ensure safety of all aquatic species. This research seeks to evaluate the effectiveness of biochar as a low-cost, sustainable solution for the remediation of heavy metals in stormwater. Biochar has potential to advance sustainability in metals remediation based on the added benefits it offers of bioenergy and heat production, soil enrichment, and carbon dioxide sequestration. These added benefits, in combination with the results of this research focused on improving water quality, seek to improve the three pillars of sustainability: society, economy, and environment. Different biomass feedstocks of naturally available materials (Douglas fir chips and hazelnut shells) were pyrolyzed at varying temperatures to determine the effects of feedstock and production conditions on biochar characterization and metals removal. Adsorption experiments were conducted in batch reactors and constant flow fixed-bed column filtration experiments. This presentation will introduce motivations and methods of batch and fixed-bed column experiments examining copper removal in synthetic

	stormwater. Preliminary results of effects of feedstock and pyrolytic temperature on copper removal in batch isotherm experiments were used to select an optimal thermally-altered media. Batch and continuous flow column filtration results will be presented, which indicate that hazelnut shells pyrolyzed at 700 C exhibit superior performance in copper removal compared to other types of biochar examined and granular activated carbon (GAC), the current prevailing adsorbent. Adsorption results will be used in conjunction with biochar characterization and modeling techniques to elucidate the mechanisms for metals removal by biochar, which will be used to inform engineering design and optimize biochar production conditions to advance sustainability. Modeling of batch of continuous flow experiments will move beyond common empirical isotherm models and employ thermodynamically-based surface complexation modeling to predict metals adsorption under varying solution conditions and incorporate electrostatic effects. These electrostatic models are better equipped to evaluate metals removal in solutions of varying pH, ionic strength, and metals loading, making them more suitable for application in complex stormwater systems.

Title	Effects of Chlorinated Methanes (CMs) on the Reductive Dehalogenation of Trichloroethene
Author(s)	Emma Ehret, Chemical, Biological, Environmental Engineering, Oregon State University
Abstract	Chlorinated solvents, such as trichloroethene (TCE), are among the most prevalent subsurface contaminants in the United States. Reductive dehalogenation is an anaerobic biotransformation pathway that can transform TCE to less chlorinated products and ethene. Complex sites may harbor chlorinated methanes (CMs) alongside chlorinated ethenes (CEs) like TCE, potentially slowing CE transformations. It is prudent to explore the dynamics of these kinetics so that bioremediation schemes may be optimized for complicated cases. Results will be presented from 3-stage batch experiments with Evanite (EV) and Victoria/Stanford (VS) TCE-dehalogenating mixed cultures. The objectives were to: establish rate effects of CM exposure on CE transformation, test the reversibility of toxic effects, and determine the effects of both time of exposure and CM concentration on toxicity results. Each test began at stage 1 with the addition of carbon tetrachloride (CT) or chloroform (CF), 50μM TCE, and 2mM formate as a hydrogen source. Two more TCE and formate additions were delivered at 5-day or 14-day intervals, where the final addition was performed after sparging the reactor to remove CMs. CM and CE headspace concentrations were measured via gas chromatography during the tests. CE rates for each stage were estimated by determining the rates of product formation and through a Multi-Fit Monod model. Stage 1 TCE transformation to vinyl chloride (VC) was rapid and occurred before CT was completely transformed. The transformation step most hindered by the first addition of CT was that from VC to ethene, likely from the build-up of chloroform from CT transformation. Rates for CE transformation decreased most drastically between the first and second stages, suggesting an effect of the exposure to CT transformation products (likely CF). The subsequent elimination of CMs at stage 3 did not appreciably change these rates further. This suggests irreversible damage to the cells, however, transformation of VC to ethene still occurred though at a much reduced rate. An increase in initial CT

	concentration resulted in a further lowering of the rates of CE transformation. The results indicate both a concentration and a time dependent effect on the CM toxicity. Work to demonstrate chloroform toxicity is ongoing.

ABSTRACTS – POSTER PRESENTATION

Title	Implementing Water Data Sharing for Produce Rule Compliance
Author(s)	Amberlie Barnard, Food Science and Technology, Oregon State University
Abstract	The Food and Drug Administration finalized the Standards for Growing, Harvesting, Packing, and Holding of Produce for Human Consumption, known as the Produce Safety Rule, in November 2015. The final rule establishes stringent requirements for microbiological water quality for agricultural water that is applied to produce typically consumed raw. The testing requirements present a challenge for achieving compliance. Subsequently, there is grower interest in utilizing data sharing to reduce the economical burden of water testing. In order to adequately evaluate the relationship between surface water source and applied agricultural water, covered farms using shared water sources of poor microbiological quality need to be identified. Surface water testing data from public databases including Oregon Department of Environmental Quality and the Environmental Protection Agency were accessed. Land cover data for the state of Oregon were sourced from the U.S. Geological Survey to ascertain information about agricultural output. These data were geospatially modeled with ArcGIS (ESRI) to identify surface water sources with high incidence of generic E. coli and total coliforms. Geospatial modeling identified surface water sources in Oregon that pose potential compliance issues for produce growers. Of the total 19 water basins in Oregon, nine basins have Total Maximum Daily Loads (TMDLs) approved by the EPA regarding bacterial quality. For assessing land use data, nine basins have nearby agricultural land. Five basins fall under both of these categories, including the Willamette and Umatilla basins. Water basins with both microbiologically variable water and nearby agricultural land can be identified for future field trials and collaboration in establishing a data-sharing model.

Title	The Globalization of Water Resources: Examining Social Learning Through the Use of Serious Game
Author(s)	Fatima Taha, Water Resources, Oregon State University/University for Peace/UNESCO-IHE
Abstract	Various types of serious games are increasingly played through various sectors due to the usefulness of this technique as an educational learning tool as well as informing the dialogue. The Globalization of Water Management Game is designed based on Arjen Y. Hoekstra & Chapagain (2008) Water Footprint and Virtual Water Trade Assessment Framework to ensure the sustainable use of water resources. However, this framework has been criticized as being "problematic" (Mcmanus & Haughton, 2006) and "an ambitious tool" (Launiainen et al., 2014) for promoting sustainability. This study will identify the state-of-art with respect to the globalization of water footprint through serious gaming and explore the social learning impact and the important components of the strategic-choice using Q-test. Randomly selected subsequent interviews were conducted to enrich the discussion. The analysis is drawn from the work of Miles (1994) analysis.

Title	Engineered Log Jam Impacts on Stream Geomorphology and Fish Habitat: Does Stream Size Matter?
Author(s)	Amelia Yeager, Water Resources Engineering Program, College of Forestry
Abstract	Engineered large wood (LW) jams have long been implemented as a stream restoration strategy to create fish habitat. However, the relative effectiveness of LW jams placed in streams of different sizes is unknown. The goal of this study is to assess the effectiveness of LW introduction over a range of stream sizes in a single basin in the Oregon Coast Range consisting of second and third order streams. As part of a salmon habitat restoration project, 35 LW jams have been placed throughout the Mill Creek watershed, which is home to a long-term salmon life cycle study managed by the Oregon Department of Fish and Wildlife (ODFW). The Mill Creek basin will serve as a natural laboratory to quantify scale-dependent effects on stream geomorphic change and grain size distribution after the addition of LW and correlate stream geomorphic change with biological salmon habitat indicators. Seven LW jams were selected based on consistent number and size of pieces and varying bankfull width and drainage area. Geomorphic change induced by the LW will be quantified using a variety of measurements which will be performed before and after the first winter high flow season after jam installation. Indicators to be examined include grain size distribution, stream topography and width, frequency of pools, and LW movement. Relative change between sites of different sizes will also be calculated to determine which size site experiences the most geomorphic change. This will be primarily influenced by the upstream drainage area of the site and the ratio of log size to channel size within the site. We hypothesize that sites of intermediate log to channel ratio will experience the most geomorphic change because the equilibrium between LW contact with the channel and discharge (driven by drainage area) is maximized. By identifying which site size category experiences the most change after the introduction of LW, and clarifying the relationship between this change and salmon habitat data, we will be able to

	optimize LW stream restoration efforts by focusing resources on stream reaches that will experience the most geomorphic change and create the most habitat.

Title	This Way Through: Engineering transitions in emigrating smolt behavior near guidance structures at large dams
Author(s)	Sam Swanson, Water Resources Graduate Program, Oregon State University
Abstract	While effective methods for upstream passage of migrating adult salmon to spawning grounds are largely established, the downstream migration of juveniles, or smolts, to the ocean remains a critical gap in fisheries science and management of dammed rivers (ISAB/ISRP 2016). Juvenile salmon in the Columbia River Basin experience high mortality rates (5-15%) when passing through power-generating hydroelectric turbines (Goodwin 2006). Millions of dollars are spent on mitigation practices and lost in foregone power revenues each year. In 2015, such costs reached $782 million at Bonneville Dam alone (NPCC 2016). In spite of these efforts, studies indicate that fish collected for transport around a dam return to their spawning grounds in poorer health and in fewer numbers than fish who pass through or over dams on their own (Crampton 2012; DeHart et al 2007). The design of downstream bypass systems, which are meant to funnel fish in-stream around a dam, are a promising option. Unfortunately, limited knowledge on how to attract fish to the bypass hinders their success (ISAB/ISRP 2016). For this purpose, floating booms are long, partially-submerged panels that are intended to guide migrating fish to safe passage around a dam. However, the engineered design of booms has been extremely limited. Until now, the evaluation of a boom's effectiveness has occurred after its introduction into a reservoir system and without a clear understanding of how different designs will impact fish behavior. Furthermore, laboratory experiments fail to accurately represent the environmental conditions experienced by emigrating smolts. My research will be the first to conduct field experiments to investigate: What hydraulic conditions created by a floating boom cause smolts to transition from passively floating with the reservoir thalweg to actively swimming towards safe passage? The overarching goal of this work is to develop new knowledge and design tools to increase fish survival while decreasing costs to dam operators. Well-designed floating booms will provide low-impact, low-cost solutions to safe fish passage around dams in the U.S. and worldwide.

Title	Saving Darlingtonia: Land Use and Groundwater Impacts to a Carnivorous Pitcher Plant, Darlingtonia State Natural Site, Florence
Author(s)	Trevor Grandy, Water Resources Policy and Management, Oregon State University
Abstract	As sea-levels rise and human land use and management expand, aquifers along the coast of Oregon are subject to various forms of pollution and degradation.

	Land use changes surrounding Darlingtonia State Park in the Coastal Range of Oregon have led to an increased number of exempt domestic wells and septic systems in the area. Exempt wells in the state of Oregon are excused from many of the tests and pumping regulations applied to wells requiring a Water Rights Permit. An increased number of exempt wells have the potential to draw down a historically shallow aquifer that may also be used by a rare carnivorous plant species, Darlingtonia californica. Septic systems paired with these exempt wells have the potential to increase nitrate levels in the shallow aquifer used by the threatened plants, which are sensitive to high nitrate levels. This study is developing a conceptual geologic model for the Darlingtonia State Park area through historic well logs and previous surface geology reports. Groundwater levels within the area are currently being monitored and evaluated while sampling the shallow aquifer via anion chromatography. The project will include an examination of land use changes through public records, aerial photography, and stakeholder interviews. An institutional analysis of groundwater policy in coastal watersheds of Lane County will provide insight on the resources available for a collaborative management approach of groundwater resources in the greater Florence area.

Title	Winter Storms and Climate Change in the Oregon Cascades
Author(s)	Michelle Hu, CEOAS/Water Resources Science, Oregon State University
Abstract	Research Question: How have winter storm temperatures varied in the Oregon Cascades over the last 30 years? This project investigates the hydrologic significance of storm temperatures on precipitation regimes in several watersheds throughout the Oregon Cascades. Currently, only monthly averages of daily air temperature records (minimum, mean and maximum) are in use. These temperatures are not differentiated from recorded days with precipitation events and potentially create a bias and diluting the temperatures relevant to snowpack monitoring. It is the author's supposition that with climate projections indicating increasing winter temperatures and precipitation, there will be significant impacts on the hydrology and water resources of the Oregon Cascades as well as forest health, recreation, and tourism in the region. This study examines potential climate impacts on winter storms by addressing the following questions: 1. What is the mean air temperature for precipitation events during winter months? 2. What is the mean air temperature for snowfall events and the temperature of the rain-snow threshold? Do these temperatures vary by elevation or latitude? 3. Is there a significant relationship between storm temperature and climate patterns (e.g. El Nino/La Nina, Pacific Decadal Oscillation, Arctic Oscillation)? 4. Which areas in each of the selected watersheds would be impacted by an anticipated warming of 2oC? What might be the hydrologic implications of this influence?

Title	Transboundary Groundwater Resources in the Rio Grande/Bravo Basin
Author(s)	Christina Welch, Water Resources, Oregon State University
Abstract	In dry regions around the world, distinct changes in timing of snowpack melt and variability of precipitation patterns are challenging the availability of water resources. As surface water quality and quantity diminishes, the reliance on groundwater to meet basic human needs will increase exponentially. Despite the known hydrologic connection between surface and groundwater, existing institutions and laws governing surface water and are not equipped to manage groundwater. While there are more than 600 international treaties managing surface water, there are only two treaties worldwide which explicitly address groundwater allocation. In the Rio Grande/Bravo basin, the international treaties between the United States and Mexico and the interstate Rio Grande Compact between Colorado, New Mexico and Texas allocate the amount and timing of surface water deliveries, yet fail to mention regulation of groundwater abstraction. Since the 1950's in the United States there has been documented pumping of groundwater into the Rio Grande River Basin. Drought conditions, ongoing adjudication of water rights, and the current Supreme Court case Texas v. New Mexico and Colorado contribute to the complex institutional dynamics in the basin. This research investigates how transboundary groundwater resources are managed on different scales. The purpose of this study is to investigate how cooperation and conflict over groundwater resources changes from the interstate to international scale. Ultimately, the findings from this research seek to contribute to the discourse highlighting the need for the inclusion of groundwater in bilateral agreements.

Title	Projections of midcentury hydroclimate seasonality in the western US from a large ensemble of regional climate model simulations
Author(s)	Linnia Hawkins1, David E. Rupp[1], Sihan Li[1], Phil Mote[1], Sarah Sparrow[2] [1]Oregon Climate Change Research Institute, Oregon State University, Corvallis, Oregon [2]Environmental Change Institute, School of Geography and the Environment, University of Oxford
Abstract	Western North America relies on winter precipitation to supply water throughout the warm, dry months of summer. Under climate change, winter precipitation is expected to increase throughout most of the region albeit falling as rain instead of snow at lower elevations. When combined with warming temperatures and increased spring evaporation, this may cause changes in summer soil moisture and runoff potentially altering the surface water budget. We investigate how these changes translate into seasonal water availability using a large ensemble of regional model simulations. A 100-member ensemble of simulations was generated for a historical period (1985-2015) and mid-21st century period (2030-2060) under Representative Concentration Pathway 8.5. The effects of regional changes in precipitation, evaporation, soil moisture, and runoff on the seasonality of water availability were evaluated. This work aims to inform adaptation efforts through improving our understanding of the western US hydroclimate under climate change.

Title	Evaluation of Evapotranspiration Partitioning in Satellite Driven Models
Author(s)	Carl Talsma, Water Resources Engineering, Oregon State University
Abstract	Satellite driven Evapotranspiration algorithms have become the preferred method in estimating global and regional Evaporative fluxes. Here, we consider three such algorithms: The Penman-Montieth model from the Moderate Resolution Imaging Spectroradiometer (PM-MODIS), the Priestley-Taylor Jet Propulsion Laboratory model (PT-JPL), and the Global Land Evaporation Amsterdam Model (GLEAM). These three models have been validated for total ET flux against observed tower measurement with no best-performing algorithm across different environments and biomes. However, the three models demonstrate strongly divergent estimates when partitioning total ET fluxes into bare soil evaporation, transpiration, and interception components. We attempt to validate these models' soil evaporation and transpiration components against 40 field based observations compiled from different studies. The various field observations use stable isotopes tracers, sap-flow measurements, and radial flowmeters, among other techniques, to separately measure Transpiration and Evaporation at globally dispersed sites. The results derived from this comparison for soil evaporation (R2= 0.008 to 0.20) and transpiration (R2= 0.36 to 0.76) suggest that the vast proportion of partitioning error comes from the poor estimation of bare soil evaporation. Through this analysis we expect to improve the partitioning of the models and better represent the observed data. In improving the partitioning, we can better measure global transpiration fluxes and better understand relationships between atmospheric carbon and the water cycle as well as how changes in an ecosystem can affect water cycle fluxes.

Title	Characterization of Stream Channel Change in the Western Cascase Mountains
Author(s)	Stephanie Bianco, Water Resources Engineering, Oregon State University
Abstract	Mountainous watersheds make up the headwaters of important river networks across the world. They are vital for human water supply, and provide habitat for diverse communities of aquatic and terrestrial species. The morphology of these high-gradient streams is influenced by a complex array of environmental and climatic conditions. As opposed to their lowland counterparts, mountainous streams are principally shaped by hillslope processes, which occur outside of the channel, rather than fluvial processes. These hillslope processes provide pulses of sediment and wood to the system and serve to alter the configuration of the stream channels. Mountain streams then deliver this sediment and wood to higher-order, downstream reaches, sometimes over the course of decades or even centuries. In doing so their impact on water quality and habitat suitability is far-reaching. The influences of human disturbances such as timber harvesting as well as climate variability on mountain stream dynamics have long been debated in the literature, yet few long-term records of channel change exist to test these theories. This study will draw

	from over 60 years of historical streamflow data and nearly 40 years of physical cross section data on five 2nd to 5th order stream reaches in the H.J. Andrews Experimental Forest, located in the Western Cascade Mountain Range in Oregon. A logistic regression analysis will be performed to produce channel "response curves", which relate magnitude of channel alteration to storm recurrence intervals. Stream reach characteristics such as basin size, presence of large wood and sediment grain size may correlate to response type and magnitude of channel change. Some reaches, especially those lacking in woody debris, may exhibit a threshold type of response curve, with bed sediments being mobilized only by storms above a certain recurrence interval. Since many of the larger sediments that make up the bed of mountain streams are mobilized only by severe, infrequent events, more long-term studies are needed to better characterize stream channel response and elucidate how a broad range of natural conditions and a diverse set of human impacts express themselves in the landscape.

Title	Small-Scale Aquifer Storage and Recovery
Author(s)	Julianne Robinson, Ecological Engineering, College of Engineering
Abstract	In the face of increasing demand for water and a changing climate that can decrease water supply, methods to augment water supply and storage capacity are becoming increasingly important. In some areas, this has taken the form of aquifer storage and recovery (ASR), which involves injecting water into a well during a time of water surplus (i.e. winter) and storing it for later recovery when water is more scarce (i.e. summer), essentially using the aquifer as an underground reservoir. Although groundwater and surface water-sourced ASR has been implemented on a large scale for industrial, municipal, and agricultural uses (Embleton 2012), its potential as a tool for domestic well owners, particularly in utilizing spring water, is largely unexplored. This study will develop and apply criteria for investigating the feasibility of ASR on a small scale, using water from a natural spring, at a site outside of Toledo, Oregon. We expect to determine the feasibility of ASR at the proposed site, and in doing so, establish a procedure for use by domestic well owners for assessing the viability of land for implementing ASR systems on a small scale/for domestic use.

Title	A comparison of channel head identification tools in the Oregon Coast Range
Author(s)	Michael Fratkin, Water Resources Graduate Program,/Forest Engineering and Resources Management, Oregon State University
Abstract	This poster presents a comparison among three methods for identifying the channel heads of two lithologically distinct watersheds in the Oregon Coast Range. Stock and Dietrich [2003] found evidence that slope-area porfiles of channels in the Oregon Coast Range can indicate segments of fluvial, diffusive, and debris-flow processes. Channel heads reflect a transition in domain processes between fluvial and debris-flow dominated channels, implying differences in the quantity and character of sediment being supplied to the mainstem by tributaries. Identifying the dominant processes within each tributary will better contextualize future work investigating variations in longitudinal channel geometry grain-size, and transport

	capacity in the mainstem of each basin. To identify channel heads, topographic analysis is conducted using high-resolution (1 m) LiDAR of elevation collected and processed by the Oregon LiDAR consortium. We consider three methods for channel head extraction: GeoNet2, Pelletier, and DReICH. These methods have provided robust tools for identifying the initiation of channels from hi-resolution topographic data and their derivatives (ie. slope, curvature etc.) in different landscapes Field observations are used to assess the accuracy of each method at identifying channel head locations. Initial topographic analysis indicates systematic differences in local-relief and gradient between the two watersheds. We suspect that the accuracy of each method will depend on the degree to which fluvial or mass-movement processes shape the basin as indicated by differences in local relief and slope.

Title	The role of topographic position in controlling soil moisture availability in steep terrain of the Western Cascades
Author(s)	Karla Jarecke, Forest Ecosystems & Society, Oregon State University
Abstract	Hillslope ecohydrological processes, including subsurface water flow and plant water uptake, are strongly influenced by soil moisture. However, the factors controlling the spatial and temporal variability of soil moisture in steep, mountainous terrain are poorly understood. We asked: How does topographic position control soil moisture availability in steep terrain of the Western Cascades? We will present an analysis of nine soil moisture (volumetric soil water content) surveys taken from July to November 2016 at 0-30 and 30-60 cm depth across 54 spatially extensive convergent and divergent topographic positions in Watershed 1 of the H.J. Andrews Experimental Forest in Central Oregon. Soil moisture monitoring locations were selected following a 5 m LIDAR analysis of topographic position, aspect, and slope. Topographic Position Index (TPI) was calculated as the difference between the elevation of each cell in a digital elevation model and the mean elevation within a 30 m radius of that cell. We used TPI to identify 5 convergent and 6 divergent hillslopes on north-facing aspects and 25-55 degree slopes. We hypothesized that soil moisture availability would differ on convergent versus divergent hillslopes due to topographically-induced differences in soil properties and upslope water subsidies. In addition, we expected that topographic position would play a lesser role in driving soil moisture dynamics during seasonally dry summer periods. By comparing the spatiotemporal variability of hillslope soil moisture across topographic positions, our research provides a foundation for additional understanding of subsurface flow processes and plant-available soil-water in forests with steep, highly dissected terrain.

Title	Mapping soils through the trees: A mixed methods approach for small low islands
Author(s)	Mary Engels, Water Resources, University of Idaho
Abstract	Soils on tropical small low islands tend to be thin and poorly developed except under certain types of native vegetation such as Pisonia grandis, Tournefortia argentea, and Scaevola sericea. Because these species-specific soils appear to act as essential nutrient reserves for the islands and nearby marine ecosystems,

	understanding their distribution is imperative for developing appropriate water, soil, and land management strategies. Since physical access to these islands is often difficult and prohibitively expensive, a promising way to delineate soil resources distributions is to map vegetation with known soil associations. This work uses a combination of remote sensing techniques to demonstrate the feasibility of a mixed methods approach to soil resource mapping. The first objective is to demonstrate that these ecosystems can be well classified using Worldview-2 data and an Object Based Image Analysis. This classification allows for the identification of homogeneous regions of distinct forests types, which in turn are used to define endmember reference spectra for Multiple Endmember Spectral Mixing Analysis (MESMA). The second objective is to demonstrate that MESMA of Landsat 8 data can successfully identify and map the extent of small low island forests with known soil associations at the sub-pixel scale.

Title	High Resolution Temperature Analysis of IMW Stream Restoration in the Middle Fork of the John Day River
Author(s)	Brendan Buskirk, Water Resource Engineering, Oregon State University
Abstract	Since 2007 Oregon State University has conducted stream monitoring efforts on the Middle Fork of the John Day River at the Oxbow and Forrest Conservation Areas. These sites were chosen through collaborative efforts with the Confederated Tribes of the Warm Springs Reservation of Oregon, who with assistance from state and private agencies, are in process of restoring remnant mine canals back to natural, shaded, sinuous river habitat. The hydrology of arid streams is an important metric for understanding the critical environment in which salmon spawn and salmonids develop. The John Day River provides a unique opportunity to study one of the few undammed reaches in which salmon runs occur. The regulation of temperature within these critical habitats is considered one of the primary factors for fish survival rates. Efforts have focused on fiber optic distributed temperature sensing (DTS), supplemented by groundwater contribution, stream discharge, bed permeability, and stream bathymetry data across the conservation sites. During the peak of summer, stream temperature exhibits a strong diurnal cycle ranging from 9°C to 25°C dependent upon daily solar flux within the reach. Salmon have been found to sensitive to stream temperatures above 15°C and are unable to survive sustained temperatures of 24°C (Bell et al, 1991). The use of DTS analysis allows for both spatial (1 meter) and temporal (1-minute average on 7.5-minute interval) with high resolution temperature (0.1°C) monitoring of the restored stream. Such high resolution DTS has allowed for critical habitat monitoring during peak summer days potentially providing critical information needed for heat flux models used to inform future restoration planning. Results over the monitoring period are currently under analysis.

Title	Land use effects on stream temperature along a temperate riparian corridor in western Oregon
Author(s)	Alberta Gittens, Animal and Rangeland Sciences, Oregon State University
Abstract	Land use effects on water quality parameters such as stream temperature are

	critical for properly managing riparian ecosystems. Intensive monitoring is being conducted of multiple ecological and water quality metrics along Oak Creek in the Willamette river basin. Oak Creek originates in the Coastal mountain foothills and is a tributary to two water quality impaired waterways of Oregon, Mary's River and the Willamette River. In order to assess water quality and riparian vegetation interaction, we are in the process of installing monitoring equipment in various locations along the creek and at some selected locations within its contributing watershed. Stand-alone temperature sensors have been deployed to collect data on water temperature as well as ambient temperature. In addition, soil moisture and groundwater monitoring stations were installed to look at stream-aquifer interactions as affected by agricultural land use. Multiple weather parameters to determine crop and riparian vegetation water uptake are also being deployed. This study uses a systems-based approach to better understand multiple soil-water-vegetation relationships occurring in this at-risk riparian system. Expected project results will help producers, landowners, and other stakeholders make better-informed decisions related to land management practices and their potential effects on water quality.

Title	Surface Water and Shallow Groundwater Temperature Relations in a Riparian Corridor in Western Oregon
Author(s)	Jesse.L. Hall, Carlos Ochoa, Ali Gittens, Todd Jarvis, and Derek Godwin
Abstract	Stream temperature in gaining streams can be affected by groundwater flow and streamflow volumes, as well as surface runoff and crop seepage contributions from adjacent agricultural fields. This study being conducted in the Oak Creek watershed near Corvallis, OR aims to characterize surface water and shallow groundwater temperature relations as affected by land use. Multiple point-specific temperature sensors have been installed at selected locations for monitoring ambient, stream, soil, and shallow groundwater temperature fluctuations along a 0.5-km reach and an adjacent pasture field in Oak Creek. Preliminary results indicate there is a strong correlation between surface water and shallow groundwater temperature during the winter season. Ongoing monitoring through the spring and summer will provide additional information related to the hydrologic connectivity of surface and subsurface flow process effects on stream temperature.

Title	Using Recirculating Chambers to Quantify Effects of Aquatic Vertebrates on Stream Metabolism
Author(s)	Francisco Pickens, Fisheries and Wildlife, Oregon State University
Abstract	Stream metabolism is being used as an indicator of stream health because it integrates responses of the aquatic community across time. Respiration and primary production both respond to changes in light and nutrients, but less is known about how they are affected by the structure and composition of the aquatic community. In the summer of 2016, we sought to answer the question of what influence Coastal Cutthroat Trout (Oncorhynchus clarkii) and Coastal Giant Salamander (Dicamptodon tenebrosus) have on the stream ecosystem respiration and primary production rates at the H.J. Andrews Experimental Forest. We utilized

	recirculating chambers to track dissolved oxygen concentrations over time in a series of treatments where we manipulated the natural biotic composition of the aquatic community. In our preliminary results, we found that dissolved oxygen in the chambers responded to the consumer biomass and that increases in temperature in the recirculating chamber needs to be addressed to obtain reliable results. Increasing temperature negatively influences dissolved gas concentrations within water in which this physical effect needs to be isolated from our data to gain clear insight of solely biotic response. Furthermore, both salamander and trout comprise a large proportion of headwater stream consumer biomass and integrating these data could provide a better depiction of habitat scale metabolic rates.

Title	Characterizing seasonal estuary fish assemblages and environmental conditions at tide-gate locations in the Coos Bay Estuary
Author(s)	Nicole Feiten, Water Resources Graduate Program, Oregon State University
Abstract	Seasonal fish assemblage composition in estuaries reflects individual life history needs that are linked to predictable patterns of environmental conditions. As these conditions change into the future, effects on native fish abundance and composition are uncertain. This research explores seasonal patterns of fish assemblage structure over time with environmental conditions that are predicted to change (i.e. salinity, tidal height, and temperature). To explore these relationships, fish were sampled with beach seines at three locations in the Coos Bay Estuary on a seasonal rotation from 2014 – 2017 at both low and high tide. Sample locations were selected to complement ongoing research exploring freshwater/estuary linkages for salmonids in tide-gate systems. Two of the sites occur in the upper Coos system in an inlet draining lowland watersheds, with the remaining site located off Coos Bay proper. Sites differ in terms of upslope river characteristics, and estuary habitat composition. Fish data collection included counts of fish (identified to species) and individual length and weight measurements. Environmental data documenting salinity, and temperature were recorded over time. Tidal height at the time of fish sampling was recorded. Fish assemblage composition was characterized using species diversity and relative abundance per sampling effort (two seine hauls define a sample). We found differences in abundance and species diversity among seasons across sites. Winter seining was characterized by the lowest species diversity and abundance, consistent with life history diversity and nursery habitat needs of marine-dependent species. Juvenile salmonids were found in every season at low abundance. More fish and greater fish diversity were generally associated with the low tide seine. In many studies, seining is conducted by boat at high tides. Our results show the importance of sampling at low and high tide. Further, these results point to the importance of recording tidal height and season as a critical element for comparing data among sites over time. Our work furthers understanding the linkages of fish assemblages and their connection to environmental conditions in the Coos Bay Estuary. This can inform conservation planning and support future research to better understand effects of changing environments.

Title	Design Tools for Efficient Denitrifying Permeable Reactive Barriers in Oregon
Author(s)	Travis Grohman, Water Resources Engineering, Oregon State University
Abstract	Nitrate leaching from dairy operations is sometimes perceived by the public and regulatory agencies to be a significant contributor to water quality issues. It has been demonstrated that Denitrification Permeable Reactive Barriers (DPBR) located at a drainage system or watershed outlet are an effective tool in preventing nitrate discharge to receiving waters at the field-scale. DPRB involve the introduction of a carbon source (most often wood chips) in a subsurface wall, trench, or layer configuration. DPRB are a promising edge-of-field technology for the treatment of nitrate due to cost efficiency, simplicity of construction, and no requirements to alter current field practices. There is, however, a significant amount of variability in the efficiency of DPRB depending upon the design parameters chosen. In order to design the most cost-efficient and land-efficient systems, design parameters (E.G. hydraulic residence time, size, shape) must be matched appropriately to field conditions. With this project, our goal is to increase the efficiency of DPRBs as applied specifically Confined Animal Feeding Operations (CAFO) across Oregon. We aim to accomplish this goal through the development of design software that aid Oregon stakeholders in choosing the most desirable DPRB design parameters based upon their specific field practices, soil type, local climate, and area available for construction. These software tools will be disseminated to Oregon stakeholders in the dairy industry for free use. Our specific objectives are as follows: 1) To use laboratory and pilot-scale experiments to study the impact of substrate (wood chip), nitrate concentration, and hydraulic residence time on denitrification under controlled environments mimicking environmental conditions across Oregon 2) To use full-scale DPRBs at an experimental field site in order to calibrate reaction rates and physical flow parameters 3)To incorporate the findings of objectives 1 and 2 into the development of design tools that aid potential Oregon CAFO operators design cost-efficient and land-efficient DPRB

Title	Biomineralization for In Situ Groundwater Remediation of 1,4-dioxane
Author(s)	Hannah Rolston, Environmental Engineering, Oregon State University
Abstract	1,4-dioxane (1,4-D), a probable human carcinogen at low (< 1ppb) concentrations, is a widely occurring groundwater contaminant due to its historical use as a stabilizer for chlorinated solvents. Aerobic cometabolism, the use of a primary substrate to induce the production of microbial enzymes capable of transforming contaminants into innocuous products, is a promising in-situ treatment strategy for 1,4-D remediation because it has the potential to mineralize trace 1,4-D concentrations to carbon dioxide (CO2). The bacterium Rhodococcus rhodochrous (strain ATCC 21198) transforms 1,4-D when grown on isobutane as a primary substrate. 13C uniformly labeled 1,4-D was used to determine the extent to which strain ATCC 21198 biomineralizes 1,4-D to CO2. In pure culture resting cell

	experiments, 100% of the 1,4-D transformed was recovered as CO2. However, the rate of transformation of 1,4-D was over 100 times faster than the rate of CO2 accumulation, indicating the presence of intermediates that were slowly mineralized to CO2 . Biomineralization was also evaluated in microcosm batch tests to better represent subsurface conditions. Microcosms were constructed with aquifer solids and groundwater obtained from a test well at the Oregon State University motor pool. Microcosm studies have shown that isobutane can be used to stimulate 1,4-D transformation by microbes native to the motor pool subsurface, and that 21198 is able to survive and transform 1,4-D in a quasi-aquifer environment. The use of 13C labeled 1,4-D is complicated in the microcosm environment due to the complex mineral composition of the solids and groundwater, however it is still possible to see biomineralization occurring, potentially even at faster rates than in pure culture studies.

Title	Water purification from landfill leachate
Author(s)	Steven White, Biological and Ecological Engineering, Oregon State University
Abstract	We propose a novel on-site resource recovery and contaminant removal system integrating previously studied and new technologies. The study will utilize lab-scale unit operations for resource recovery, contaminant removal, and treated leachate recirculation onto a simulated landfill. The vast majority of research has treated the landfill leachate as a waste to be disposed of and thus is perceived as a significant cost item with no value. This proposed work shifts the paradigm from leachate treatment to resource recovery. By taking a systems approach, landfill leachate treatment can be optimized to maximize the resource recovery (e.g. metals, ammonia, methane, waste to energy, and water) which has potential to turn the treatment process from an operational cost to an operational revenue stream.

Title	The Fate of Antibiotic Resistance due to Septic Tank Use in Vietnam
Author(s)	Genevieve Schutzius, CBEE, Oregon State University
Abstract	Using funds from the Evans Family Fellowship, I propose to investigate the presence of antibiotic-resistant bacteria and genes in household septic tank effluents in Vietnam. If possible, I would also like to consider septic sludge treatment options that could serve to reduce this resistance before discharge into the environment. The heavy use of antibiotics has led to an increase in infectious diseases caused by pathogens resistant to treatment worldwide. These “superbugs” can be transmitted through human waste effluent. In 2010, Vietnam had the highest penicillin resistance of 11 Asian countries surveyed, and resistance rates in children from urban households were 22 times higher than those in rural areas. Since a vast majority (up to 80%) of urban Vietnamese households are connected to septic tanks, there is a potential link between septic effluent and the transmission of antibiotic-resistant genes into the environment (through soil and water habitats) and to human populations. My advisor, Dr. Tala Navab-Daneshmand, and I are interested in studying the prevalence and persistence of antibiotic-resistant bacteria and determinant genes in septic tanks in Vietnam,

	where tank effluent is often discharged directly into the environment (often into fishing ponds) without treatment. We plan to collaborate with Dr. Mi Nguyen at Saigon University to conduct this qualitative and quantitative research on 50 households. Sludge samples will be collected from septic tanks in households. In the laboratory, we will identify the presence of antibiotic-resistant E. coli in these samples using culture- and molecular-based techniques. Another long-term option that we are considering for this project is the potential for anaerobic digestion of septic effluent to reduce resistant gene concentrations prior to discharge into environment. I plan to communicate our findings with members of the scientific community and those developing antibiotic resistance surveillance programs, such as the Vietnam section of the Global Antibiotic Resistance Partnership. Additionally, if anaerobic digestion (or other treatment options) are considered, I hope to propose economically feasible alternatives to address this problem by implementation of responsible treatment technologies in these communities.

Title	Lifecycle analysis of urban home garden systems
Author(s)	Mykl Nelson, Horticulture, OSU
Abstract	Many studies have examined agricultural systems and established links between soil management practices and outcomes which affect water quality. Developing an understanding of how urban gardening systems affect local water quality will allow more refined management practices for urban gardeners. I will be conducting a survey of Corvallis and Portland area home gardens to record gardeners' soil management practices and soil nutrient content. I will collect data on soil chemical properties (CEC, pH, C:N, micronutrients) and chemical content (heavy metals, nitrogenous compositions). I will tour the participating gardens to take a soil sample and follow-up on survey responses if more detail is needed. Results will be compiled into categories for level of management, nutrient sourcing, and site history. I will analyze the samples in the OSU Soil Lab. I will use ANOVA to compare categorical practices to outcomes, and ordination to find correlation between individual variables and outcomes. The results of this study will provide baseline data for urban soil health in the Willamette Valley. I will also find how site history and current management practices influence the health of urban soils. I plan for these results to be used as a reference for home gardeners.

Title	Vegetation biodiversity patterns and ecosystem functioning in various types of green infrastructure in Portland, Oregon
Author(s)	Michelle Talal, Environmental Science, Oregon State University
Abstract	Green infrastructure is likely to play an increasing role in conserving biodiversity as urbanization increases within the United States. Green infrastructure has several definitions, but can be broadly defined as an inter-connected system of natural areas and open spaces that conserves the values and functions of natural ecosystems, promotes clean water and air, and provides an array of ecosystem benefits to both people and wildlife. Previous studies indicate that green infrastructure can either promote or inhibit biodiversity, but more research is needed to fully understand and quantify the environmental benefits of green infrastructure. The purpose of this study is to investigate and quantify vegetation biodiversity patterns and ecosystem functioning relationships within green infrastructure in Portland, Oregon. Results will be used to explore potential tradeoffs between use of green infrastructure for water-related ecosystem services and biodiversity conservation. Additionally, interviews of Portland residents and land managers will inform our understanding of public perceptions of green infrastructure features. Using City of Portland geospatial data on street trees, preliminary results indicate that there is a total of 166 unique street tree species in Portland. Street tree species diversity was also evaluated by watershed within the city, and revealed that the largest street tree species richness is in Willamette River watershed (158 species), while the Skyline/Tualatin River watershed has the lowest street tree species richness (26 species). As this research continues, the results will help inform managers about best practices for increasing biodiversity and ecosystem functioning within various types of green infrastructure. This project is a new research effort that will be conducted in addition to and in conjunction with the Urban Water Innovation Network (UWIN) NSF Grant Award #1444758, a nationwide consortium of universities and partners that seeks to address various challenges to urban water systems and urban water sustainability.

Title	Microbial Induced Calcite Precipitation (MICP) in the Saturated Zone in Rifle, CO
Author(s)	Juliette Ohan, Microbiology, OSU
Abstract	Microbial Induced Calcite Precipitation, or MICP, is the biological phenomenon whereby bacteria precipitate calcium carbonate (CaCO3). Notably, this process can occur in the soil mass, and even be artificially induced in lab and field scenarios. With the introduction of a carbon and nitrogen source, native bacterial cohorts in the saturated zone can be stimulated to precipitate calcite via urea hydrolysis. In this study, a previously drilled well field located at an UMTRCA Title 1 site in Rifle, Colorado, was injected with dilute solutions of molasses and urea over the course of 18 days. A bromide tracer was also used to determine groundwater flow and injectate penetration. Groundwater chemistry was monitored using Ion Chromatography (I.C.) and CHEMetrics vacu-vials, and showed peaks in soluble (ferrous) Fe, NH3, and NO2- over the course of the study. This indicated an increase in microbial activity, urea hydrolysis and subsequent conversion into ammonia, and nitrate byproducts, respectively. Groundwater conductivity also

	increased over the course of the injections, and pH fluctuated, but decreased overall. Microbes from groundwater samples were captured on 0.2μm filters and their DNA extracted. A general 16S rRNA survey of the microbes stimulated by this process is underway and will reveal the specific bacterial cohorts responsible for calcite precipitation in the field. Combined with data from geophysical collaborators, this will provide a more complete picture of the reformation of the soil mass in the Rifle well field, and identify the inhabitants responsible – allowing future optimization of this technology.

Title	The Effects of Dissolved Organic Carbon Quantity and Quality on Hyporheic Zone Microbial Respiration
Author(s)	Angelo Sanfilippo, Department of Biological Sciences, Boise State University
Abstract	Global carbon respiration totals approximately 100 Pg per year, of which approximately 1% is contributed by streams. The majority of that contribution occurs in the hyporheic zone (HZ) of the stream. Heterotrophic HZ microbial communities contribute 40-90% of total stream respiration via metabolism of dissolved organic carbon compounds (DOC). However, the processes controlling HZ metabolism are poorly constrained and effects of the type (labile vs recalcitrant) and quantity of DOC on microbial respiration have not been extensively studied. Our study site, Watershed 1, a 2nd order headwater stream in the HJ Andrews Experimental Forest, provides historic stream data detailing seasonal variability in DOC concentrations. We are performing two experiments to assess effects of DOC on HZ respiration. An ongoing observational experiment utilizing a network of 41 hyporheic wells measures seasonal variations in in vitro rates of HZ respiration and DOC via short term incubations of sediment and pore water. Pore water is analyzed for in situ DOC factors, temperature, and pH, and sediments are analyzed for microbial abundance via realtime PCR (qPCR). These in situ data are correlated to the in vitro consumption of oxygen over time and show a marked increase in respiration in response to a seasonal influx of DOC. Separately, an ongoing manipulative experiment consisting of six replicate 2 meter hyporheic mesocosms is being utilized to measure in situ rates of HZ microbial respiration via the rate of consumption of dissolved oxygen. We are utilizing these mesocosms to examine the effects of labile (acetate) and recalcitrant (fulvic acid and similar) DOC amendments on microbial respiration. Initial observations suggest a connection between higher rates of microbial respiration, larger quantities of DOC, and more labile types of DOC, with average DO consumption rates experiencing a nearly ninefold increase during periods of high DOC (0.18 – 1.44 μg O2 g sediment-1 hour-1). Ongoing analyses are exploring relationships between DOC quantity and quality, HZ respiration, and microbial community dynamics. The results of these experiments will elucidate the connections between DOC quality and quantity and HZ respiration, and improve future modeling of carbon flux from headwater streams as a result of microbial respiration.

Title	Optimization of green Infrastructures to manage stormwater in an urban setting with consideration of societal preference
Author(s)	Simon Kahsai, Water Resources Engineering, Oregon State University
Abstract	Impervious surfaces, such as roadways and buildings, are characteristic of urbanized landscapes causing an increase in storm-water runoff volume, and often shortens outflow travel time and increases peak discharge from the basin and combined sewer overflow events. Land developments also affect city watersheds by impairing water quality and degrading stream habitats. African cities are urbanizing rapidly. New developments to accommodate increasing population means covering more open natural areas. Many studies have approached such problems exclusively the engineering way without regard to community preference. My research will assess the effect of social attitude on the optimization of green infrastructures in an urban watershed. The optimization will be accomplished with multi-objective optimization tool along with an urban storm water model - SWMM - to identify the most cost-effective green infrastructure combinations (retention/detention and drainage trenches) in an urban watershed. The objective of my study will be to assess near-optimal trade-off between total green infrastructure cost and the attenuation of peak flow discharge and volume of runoff and how it is affected by societal preference.

Title	Modeling the fate of radiocesium in a modern-day urban water-recycling scenario
Author(s)	George Ng, School of Nuclear Science and Engineering, Oregon State University
Abstract	Water recycling or re-use is increasingly being considered as a sustainable option for water-scarce urban areas. The concept is to divert treated waste water discharge to other uses, such as irrigation, industry and sometimes even indirect potable use. This scheme alleviates freshwater demands and provides other environmental benefits. With technological advancement and pressing population need, water recycling has gained traction in many parts of the world. On a different note, the world is also witnessing a renaissance in nuclear power generation as a feasible low-carbon and reliable energy source. More nuclear power plants are slated to come online in the coming decades, predominantly in Asia. Unfortunately, this also brings a remote risk of nuclear plant accidents. Both the Chernobyl (1986) and the Fukushima (2011) nuclear power plant accidents are stark reminders of the large-scale trans-boundary radioactive contamination. In both accidents, one of the radio-nuclides of concern is radiocesium. Radiocesium is readily mobile in the environment and has a significantly long half-life, as well as recognized biological and ecological effects. Although, no urban water-recycling city has been reportedly contaminated in a nuclear plant power accident, the possibility of such a confluence of place and event cannot be ruled out definitely. There have been numerous studies on cesium's behavior in water purification and waste-water treatment processes. However, to the best of the author's knowledge, none has looked from an over-arching view of urban water recycling. Thus, this presentation considers a hypothetical scenario of how deposited radiocesium might move through urban water recycling – from deposition to run-offs, water usage and waste-water treatment in a closed water recycling loop. The intent is to integrate known radiocesium's behavior into a hypothetical modern-day urban water recycling scenario. Ultimately, this would help to answer the fate of radiocesium and the water-borne risk for the urban population.

Title	Radionuclide Movement Through Aquatic Environments
Author(s)	Caitlin Condon, Nuclear Science & Engineering, Oregon State University
Abstract	Ionizing radiation is naturally occurring in the environment from cosmic sources, as well as primordial and cosmogenic radionuclides. Primordial sources of radiation are those that were present from the formation of the earth while cosmogenic radionuclides are radionuclides that are produced on Earth by interaction with cosmic radiation, which originates from space. Radionuclide concentrations are amplified in the environment from human activities including Technologically Enhanced Naturally Occurring Radioactively Materials, fallout from nuclear weapons, medical radionuclides and nuclear power accidents. Radionuclides move through environment based on their chemical form, nutrient cycles, and might follow their environmental analogs. Some nuclear events affected aquatic environments more than terrestrial environments. The weapons test Castle Bravo took place at Bikini Atoll in the Marshall Islands spreading radionuclides around the islands. The Mayak facility in the former Soviet Union was a plutonium processing facility that experienced leaks that heavily contaminated a series of lakes. The Fukushima Dai-ichi power station released radionuclides into the Pacific Ocean off eastern Japan in 2011. Previous radionuclide releases to the ocean were either of much lower magnitude, released over a much larger area or released in a continuous format. The Fukushima Dai-ichi accident caused major public concern about the spread of radionuclides through the ocean and possible contamination of the Pacific Ocean fish. Delvan Neville, an Oregon State University Radioecologist, uses the unique nature of this radionuclide release to track albacore migration through the Pacific Ocean as well as testing the concentrations of Cesium-134 and Cesium-137 in species that are harvested for human consumption. This presentation will cover the major releases of radionuclides to aquatic environments, how radionuclides move through aquatic environments, and the work by the Oregon State University Radioecology research group on radionuclides in aquatic environments.

Title	Response of Calcium Dissolution Rate to Diverse Fluid Dynamics of Non-Saturated Epikarst Micro-Fissures
Author(s)	Lisa Windom, Department of Crop and Soil Science, College of Agriculture
Abstract	Karst aquifers, composed of conduits and caverns carved into limestone, are theorized to have formed from prolonged water-induced weathering. Film flow results from non-saturated conditions, allowing for a three-phase interaction of carbon dioxide, water and calcium carbonate. Conduits form from the prolonged erosional evolution of micro-fissures in the epikarst; such micro-fissures are less than 2 mm in diameter and are exposed to thin water films less than 0.6 mm in height. To explore the importance of the diverse fluid dynamics within the explanation of non-saturated micro-fissure development, the calcium dissolution rate per unit area of exposure was compared between wavy mono-films and that of continual capillary rivulets. Under carbon dioxide saturated conditions, the calcium dissolution rates at 0, 10, 20, and 30 degrees Celsius were compared to determine the dominant transport mechanisms relative to the unique fluid flows.

Title	Characterization of organic carbon influence on bacterial community dynamics to control a simultaneous anammox and denitrificati
Author(s)	Richard Hilliard, Chemical, Biological, and Environmental Engineering, Oregon State University
Abstract	This study explored the effects of complex organic carbon mixtures on anammox metabolism and the community dynamics of anammox (AMX) and partially denitrifying bacteria (P-DNB) in a bench-scale Simultaneous Anammox and Denitrification (SAD) biofilm reactor system to simulate a Subsurface Constructed Wetland (SSCW). AMX bacteria catalyze the anaerobic oxidation of ammonium with nitrite to form dinitrogen gas, enabling a number of novel and energy saving N-removal processes for a variety of wastewaters. The limitations on these processes arise from inhibition of the AMX reaction by organic carbon, slow growth and low yield, and the need for nitrite (rare in wastewaters due to its reactivity). The SAD biofilm reactor meets these challenges by maintaining an anaerobic environment, retaining and encouraging AMX biomass, and providing the necessary nitrite by way of P-DNB reducing nitrate (much more common in wastewaters) to nitrite. The P-DNB biomass, which grow about ten times faster than AMX, is controlled by the organic carbon addition in accordance with a C/N ratio < 2. Community changes in the SAD biofilm were quantified by Real-Time qPCR and nitrogen removal was quantified using ion chromatography. Organic carbon was characterized from a variety of leachate sources including corn cobs/stoval, leaf litter, and barley/wheat straw and characterized using TOC analyses and HPLC Refractive Index Detection.

Title	Oceans, Coasts, and Watersheds Project
Author(s)	Matthias Fostvedt, Environmental and Natural Resources (ENR) Law Center, University of Oregon School of Law
Abstract	The Oceans, Coasts, and Watersheds Project (OCWP) is an Oregon Law interdisciplinary project that explores the intersection of law, policy, and science in both marine and freshwater environments. For the 2016-2017 academic year, the OCWP Fellows are focusing on topics including the conservation of Washington State estuaries, protecting public water resources from the impacts of factory farming, and regulating California desalination facilities. This poster will present a brief synopsis of the OCWP Fellows' research thus far, and provide a unique perspective on the law and policy surrounding these various water resources challenges.

Title	Geological and hydrological influences on nitrogen and phosphorus concentrations in forested headwater catchments of the norther
Author(s)	Casey Steadman, FERM/WRS, OSU
Abstract	Headwater streams play a vital role in the watershed ecosystem and likely play a pivotal role in the ecological state of rivers downstream yet data is lacking pertaining to natural variability of water chemistry in the headwaters. Considering the critical environmental issue of increasing nitrogen (N) and phosphorus (P) fluxes through river systems, it is essential to improve understanding of local and non-local watershed characteristics that influence natural spatiotemporal variability of these limiting nutrients. To evaluate N and P heterogeneity and explore potential drivers for differences across diverse catchments, hydrology data and water chemistry samples of different temporal resolution were collected from 19 sites across four catchments in the Trask Paired Watershed Study in coastal Oregon from 2006 to 2010. Preliminary data analysis reveal multiple potential drivers of N and P heterogeneity. N:P ratios (dissolved inorganic nitrogen : soluble reactive phosphorus) appear to be related to geology and geomorphology. For example, Pothole Ck generally had the lowest N:P ratio (31:1) and is underlain by geological formations that are less resistant to erosion (sedimentary rock, landslide topography) and have greater potential for groundwater storage and hyporheic exchange than other catchments in the study. In contrast, Upper Main, Rock, and Gus Cks had ~3.7-6.5-times higher N:P ratios (115:1, 141:1, 202:1, respectively) than Pothole Ck and were underlain by more erosion-resistant geologic units (diabase) with limited groundwater storage and hyporheic exchange potential. Storm samples collected in 2010 reveal distinct hydrological controls on nutrient concentrations. Pothole Ck shows the strongest positive correlation between soluble reactive phosphorus and 50-day antecedent precipitation index during the rising limb (r^2 = .43) and the falling limb (r^2 = .36) of the annual hydrograph. In contrast, all basins exhibit negative correlations between dissolved inorganic nitrogen and 50-day antecedent precipitation index during the rising limb of the annual hydrograph with Gus Ck showing the strongest correlation (r^2 = 0.54).

Title	Identifying the primary sources of suspended sediment in Oregon Coast Range headwater streams following forest harvesting
Author(s)	Aaron Rachels, Water Resources Science, Oregon State University
Abstract	Historically, it is understood that timber-harvesting can increase fine sediment input to streams through increased hillslope and streambank erosion and mass wasting along roads. However, under modern harvesting practices, the relative importance of each of these sources and their variability are poorly understood. We will present the progress of an ongoing study investigating the primary sources of suspended sediment in Oregon Coast Range streams influenced by forest harvesting. A better understanding of these sources could contribute to more

	effective best management practices for forest harvesting in the future. Two catchments, Enos Creek (harvested 2016) and Scheele Creek (reference), were instrumented in fall 2016. At present, Phillips samplers (5-6 per catchment) have been deployed longitudinally down the streams to enable robust characterization of suspended sediments— the collected samples integrate the chemical signatures of upstream sediment exports over relatively long time scales (e.g., months) and enable the collection of sufficient quantities of fine sediment without significantly altering sediment properties. Samples will be collected from the Phillips samplers at regular intervals (every 1 month over ~2 wet seasons at minimum; ~132 samples total) and returned to the laboratory for sediment source fingerprinting analysis. The fingerprinting technique compares the chemical properties of stream sediment samples with the chemical properties of potential source areas, such as 1) roads, 2) stream banks, 3) general harvest areas or forest soils, or 4) gully erosional features. After establishing a fingerprint for each source, suspended sediment samples are then analyzed for all relevant chemical parameters, and an un-mixing model will be developed to quantify the proportions of the suspended sediment in each stream from each of the sources. To design a robust model for sediment-source identification, different types of physical or chemical data are required—we will analyze sediment samples using a combination of: a) sediment physical properties (i.e., color and density), b) stable isotopes and C/N ratios (i.e., δ15N, δ13C, and C/N), and c) radiogenic isotopes (137Cs, 214Th and 210Pb). The application of this approach will enable a robust analysis of the primary fine sediment sources and their variability both longitudinally along the stream and through time.

Title	Managing street tree canopy and composition to reduce urban air and runoff temperatures
Author(s)	Lauren Burns, School of the Environment, Washington State University Vancouver
Abstract	Warm stormwater runoff from streets has the potential to increase urban stream temperatures and degrade sensitive and threatened downstream cold-water aquatic habitats. Under future climate scenarios that predict lower streamflows and rising in-stream water temperatures, urban stormwater runoff may further imperil these species. To aid cities in adapting to changing climate while protecting local species of concern we propose looking towards managing urban tree canopy, especially canopy overhanging paved streets, as one strategy to help cool cities, manage runoff, and reduce runoff temperatures. While urban forestry benefits have been widely researched, including knowledge of street trees' benefits for reducing runoff volumes, little data exist on the interrelationship between urban forests and runoff temperatures. To test the importance of the amount and type of street tree cover in determining runoff temperature, we measured temperature, water, and weather variables (air, pavement, and runoff temperatures, runoff volumes, precipitation, solar radiation), in addition to tree metrics (type, height, canopy cover fraction) for 12 street blocks in inner Portland, Oregon. The sites spanned low vs. high street tree canopy cover for both deciduous and evergreen tree types (3 streets for each of the 4 combinations) of dense residential neighborhoods. Preliminary results indicate statistically significant differences in summer and early

	fall runoff temperatures related to both the amount and type of street tree canopy cover and quantifiable, significant differences in pavement, air, and runoff temperatures in full sun vs. under street tree shade. Continued study will fit the field data into a numerical model suitable for predicting benefits of different street tree planting decisions for mitigating high-temperature urban runoff. This work may help better inform city managers and planners of their options for reducing sources of urban heating and protecting already stressed aquatic ecosystems by better managing the existing urban forest resource.