Atwood, Meredith – PhD Candidate, Yale University
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Abstract: Biogeochemistry Influences Carbon Sources for Small Pond Food Webs

Small ponds are globally abundant: 90% of all lakes and ponds are less than a hectare in size. Small ponds also provide critical habitat for many organisms, including species of amphibians and invertebrates which can live nowhere else. These small ponds are of major significance; yet, little is known about energy pathways and basal resources in small ponds. Freshwater ecosystems can be supported by two basal resources: autochthonous production (generated within the system) and allochthonous subsidies (generated externally to the system). Food webs of small freshwater systems may rely more upon allochthonous subsidies because they generally receive more allochthonous carbon relative to surface area and water volume. In this study, I evaluated the carbon sources and food web structure in the smallest of ponds: temporary ponds. I surveyed six temporary ponds in northeastern Connecticut for two years (2012-2013), examining both environmental conditions and food web structure using stable isotope analysis. In 2012, pond consumers shifted their carbon source seasonally. In May, consumers matched basal resources (typically algae), but by June and July the carbon source of consumers was more depleted in $^{13}$C than any food source measured. During this time, dissolved oxygen levels crashed and carbon dioxide concentrations were supersaturated relative to atmospheric conditions. Collectively, this suggests high decomposition of allochthonous leaf litter, which consumed oxygen, and produced carbon dioxide and likely biogenic methane. As biogenic methane is very depleted in $^{13}$C and produced under anoxic conditions, methane likely provided an additional carbon source to the food web in 2012. This is further supported by the results from 2013, which showed no seasonal depletion in consumer $^{13}$C concomitant with higher dissolved oxygen levels due to high precipitation in June. Methane concentrations were likely lower in 2013 due to higher oxygen levels, and did not subsidize the food web. Overall, small pond food webs are sensitive to pond biogeochemistry, which can be influenced by decomposition of allochthonous leaf litter and environmental conditions.

Bliss-Ketchum, Leslie – PhD Candidate, Portland State University
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Abstract: Exemplary ecosystem initiative award winner: Lava Butte US 97 wildlife crossings in Bend, Oregon

New management approaches, including inter-agency collaboration, have been emerging to address multifaceted environmental challenges including mitigation of the ecological effects of roads. The Lava Butte US 97 wildlife crossings project in central Oregon is an example of collaborative cross-agency planning efforts and unique applied solutions to habitat connectivity.
and animal-vehicle collisions. The planning process incorporated several concepts: early interagency coordination with an emphasis on meeting mission objectives; an interagency mitigation design team that met regularly to plan, discuss and solve project issues; collaborative funding using several sources; and an agreement to monitor effectiveness of the project. Each agency involved committed to furthering its portion of the objectives with specific actions: managing land adjacent to the crossing structures to enhance effectiveness (USDA Forest Service); monitoring and maintaining fencing (ODFW); and promoting public awareness of the project at Lava Lands Visitor Center (all) with the structures funded by ODOT.

The Lava Butte project relied on both the Oregon Wildlife Movement Strategy and GPS research on mule deer migration (funded by ODOT and conducted by ODFW) to inform the need for crossing structures in the vicinity. The primary objectives for the crossing structures and other features are to reduce animal-vehicle collisions, restore the mule deer migration pathway, and provide habitat connectivity for all species to cross US Highway 97 successfully. The 4 mile project area includes two large bridge wildlife crossing structures. One is a dedicated wildlife crossing and the other a combined wildlife and vehicle crossing at Crawford Road, a seasonally closed access road to the Lava Lands Visitor Center. Both crossing structures were enhanced with strategically placed habitat structure and native vegetation to facilitate connectivity of plants, invertebrates, small and large animals. Additional project features include exclusionary fencing, four escape ramp structures, bat crevices incorporated into the undercrossing bridge structure, and ElectroBraid™ mats at vehicle access areas.

Interagency collaboration incorporating the Eco-Logical framework on this project is yielding encouraging results at this early stage. Monitoring began in summer of 2012 and documented mule deer, badger, coyote, and ground squirrel using the two crossing structures. The efforts of multiple agency partners working together and implementing best practices features resulted in the selection of the Lava Butte project as an Exemplary Ecosystem Initiative Projects winner by the Federal Highway Administration for 2012 and highlights Lava Butte as an example project.

2 Brittain, Jeff – MS Student, Portland State University
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Abstract: The response of alpine plankton communities in lakes of different fish stocking histories to atmospheric nitrogen deposition simulations in Mount Rainier National Park

Non-native fish introductions have been widespread in the western United States since the 1800s, drastically reducing the number of naturally fishless lakes and consequently threatening native species that adapted to survive without this top predator. The introduction of fish to these environments has proven to have cascading food web repercussions in both aquatic and terrestrial habitats by reducing populations of amphibians and invertebrates. Planktonic communities have shown marked declines to introduced predators as well as shifts in community composition in response to allochthonous nutrient inputs. In recent decades, atmospheric nitrogen deposition has been recognized as an anthropogenic contributor to acidification and eutrophication of remote wilderness ecosystems. This study seeks to identify the response of two alpine lakes with distinct fish stocking histories to acidification and eutrophication manipulations of alpine plankton communities in Mount Rainier National Park.
Treatment and control mesocosms were placed at the park headquarters, while reference mesocosms were placed along the lakeshores. A single episodic pulse was simulated by adding either potassium nitrate, hydrochloric acid, or a combination of the two in treatment tanks and observing the responses over a period of 42d. It is expected that the lake without a current fish population will be less sensitive to the treatments due to a larger diversity in its zooplankton community. The differences between these community structures are expected to yield contrasting responses to manipulations and display how fish presence coupled with atmospheric deposition can affect native aquatic diversity, and will reveal site specific reactions to treatments and allow for comparisons to other lakes in the region.

Chiapella, Ariana – PhD Student, Portland State University  
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Adviser: Dr. Angela Strecker  
Abstract: A Snapshot of PCBs in the Hoosic River: Biomagnification and Risk of Human Exposure  

This poster is a compilation of research that was completed prior to enrollment at Portland State University, and provides a contextual framework of prior experience and origins of research interests. In 2011, crayfish tissue samples were analyzed alongside data from an ongoing monitoring project of polychlorinated biphenyl (PCB) levels in sediments in the Hoosic River in North Adams, Massachusetts. A method for the processing and analysis of crayfish tissue was developed through literary research and lab trials. A redefining of the gas chromatography mass spectrometer (GC/MS) parameters resulted in a reduced analysis time from twenty minutes (as used in previous years) to less than eight minutes per sample. The preliminary tissue data was then mapped alongside sediment data for each sample site using ArcGIS. FEMA 100-year floodplain and land-use parcel (high density residential and public institutions) layers were added to provide a visual of sediment exposure risk. Present data shows contaminant levels that do not exceed EPA limits, although PCBs do appear to be biomagnifying in the food chain. In the future, this type of monitoring should be coupled with ecological study to understand the implications that persistent organic pollutants (POPs) have for food web dynamics.

Cimino, Sam – MEM Student, Portland State University  
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Abstract: Developing an understanding of the distribution vectors of invasive species and identifying shifts in food-web structure due to New Zealand mudsnail (Potamopyrgus antipodarum) invasion  

Public awareness, more specifically boater awareness, of invasive species and proper boat cleaning procedures, may prove to be highly beneficial in reducing the transport and establishment of aquatic invasive species (AIS) like the New Zealand mudsnail (NZMS) (Potamopyrgus antipodarum). Although efforts are being made to mitigate NZMS spread, NZMS have been found to thrive in a variety of habitats including brackish water estuaries and
freshwater lakes. Educational signs instructing one on identifying AIS, properly checking one’s boat for attached aquatic “hitchhikers”, and thoroughly cleaning one’s boat can be seen throughout the state of Oregon at public lake and estuary boat ramps; but have these efforts made an impact on the public? The Tenmile Lake Watershed Council, Oregon State Marine Board, and USFS have undertaken an initiative to increase public awareness of invasive species and proper cleaning procedures by building a boat wash station at the Tenmile Lake boat launch. In the summer of 2012, 199 qualitative human subject surveys were administered at Tenmile Lake in Lakeside, Oregon to boaters on their boating habits and knowledge of AIS prior to building the boat wash (“pre-boat wash”). An extension of the 2012 study was conducted in the summer of 2013 to 200 boaters after the completion of the Tenmile Lake boat wash station (“post-boat wash”). Comparisons between the two surveys seek to identify the potential knowledge gaps boaters have on invasive species and proper boat cleaning procedures in hopes to reduce further AIS spread. Understanding the transportation vectors of NZMS is essential in controlling their spread; however, identifying how NZMS affect their invaded food-webs may provide greater knowledge in mitigating this AIS. Little work has been done attempting to understand the NZMS’s role or niche in the invaded environments. The focus of this corresponding study is to compare the magnitude of the differences in food-web position and feeding niche fulfillment of the NZMS and benthic invertebrate competitors in four freshwater lake and four brackish estuary ecosystems. Freshwater lake and estuarine food-webs with NZMS were quantitatively compared to reference locations (2 lake and 2 estuary) of the same ecosystem-type. In addition, the feeding niche fulfillment (specialized or generalized) and trophic position of NZMS and the remaining benthic food-web will be identified using stable isotope ratio analyses. This study seeks to improve understanding of the effect NZMS have at high and low abundance on freshwater lake and brackish estuarine benthic food-webs.

5 Copp, Sara – MS Student, Portland State University
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Abstract: English ivy (Hedera helix) Impacts on Urban Forest Understory Communities

Invasive species degrade ecosystems by altering natural processes and decreasing the abundance and diversity of native flora. The rate of invasion is dependent on the invading species traits, propagule pressure of the NIS, and the susceptibility of the environment to invasion (invisibility). Communities that are highly invasible are said to have major fluctuations in resource supply that allow invasive species to exploit limiting resources. Invaders with the ability to exploit limiting resources will reduce resources for the local species. In temperate, mixed deciduous and conifer forests communities of the Pacific Northwest, urban forests with seasonally limiting moisture are being dominated by nonnative English Ivy (Hedera helix). Once established, h. helix forms dense patches of continuous cover that seems to exclude understory species. An observational study was conducted to begin to understand if H. helix exploits soil moisture to invade the forest understory, and consequently, alter the understory community. In the summer of 2013, 128 plots established in two larger research plots were used to assess understory composition and soil moisture conditions in varying degrees of H. helix invasion. Initial findings show that as H. helix invades the understory, overall total understory cover, total understory diversity, and understory evenness significantly decreases. Percent
volumetric water content of the soil is significantly higher in dense patches of *H. helix* suggesting that *H. helix* may retain rather than completely exploiting available soil moisture. Overall, *H. helix* is a superior competitor in urban forests, as it forms dense patches it alters the understory plant communities

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**Adviser: Dr. Yangdong Pan**

**Abstract: An evaluation of a 2006 street tree inventory in Portland, OR**

The results from a 2006 street tree inventory in Portland, OR were analyzed to identify the dominant street trees and the most abundant street trees associated with sidewalk damage. Data from 500 random street segments include street tree identification to the finest taxonomic resolution, DBH, height, leaf and wood condition, topping, land use, and degree of sidewalk damage. Maple and Prunus species made up about 41% of all street trees inventoried and 45% of all street trees associated with sidewalk damage. Norway maple (*Acer platanoides*) was the most abundant street tree inventoried and the most frequent street tree associated with sidewalk damage. The DBH of about 85% of all street trees inventoried was less than 18”, the DBH of about 40% of all street trees surveyed was between 6-18”, but street trees from this class made up about 50% of all street trees associated with sidewalk damage. Non-parametric CART modeling identified DBH as the strongest predictor for sidewalk damage and DBH explained about 41% of the variation in the presence of sidewalk damage versus about 11% of the variation in the degree of sidewalk damage. Street trees are valuable resource and provide a myriad of environmental benefits, but require substantial economic expenditure to repair sidewalk damage. Results from this study provide valuable insight into the composition of street trees, the street trees associated with sidewalk damage, and potentially the prime factor influencing sidewalk damage associated with street trees in Portland, OR.

**Edward, Patrick – PhD Candidate, Portland State University**

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**Adviser: Dr. Yangdong Pan**

**Abstract: An in situ Experiment to Examine the Effect of Fine Sediment Addition on Stream Invertebrates**

This poster presents preliminary results from an in situ manipulative experiment to examine effects of fine sediment (<2 mm) addition on stream invertebrates in small streams of the north Coast Range. Eight streams were selected for study using: watershed size, geologic heterogeneity, logging history, land development and stream flow. The experiment utilized small mesocosms (.02 m2) designed to allow water flow-through and could be sealed when removed from the stream, thereby preventing the loss of stream invertebrates and sediment. Eighty containers were placed in groups of ten at each stream and allowed to colonize for four to five weeks. Over four days, 100-800 grams of sediment were added to five containers and the remaining containers were used as controls.† Over the duration of the study, 16 of the containers were lost or broken resulting in 29 controls and 36 treatments. This study presents
data from 37 containers (18 controls and 19 treatments) in four streams. Average wet sediment mass remaining in the containers was 345 grams (range=20-400) grams, average invertebrate abundance was 151 (range =143-701) and genus-level taxa richness was 15 (10-19). Several taxa and functional aspects of the invertebrate community were negatively correlated with fine sediment mass including: Rithrogena (R2=-0.29), Baetis (R2=-0.25), scrapers (R2=-0.30), and collectors (R2=-0.26). The Fine Sediment Biotic Index (FSBI) was positively correlated (R2=-0.21) with sediment addition. This study demonstrates that the mesocosms described in this poster may be useful approach for conducting insect/sediment experiments in streams.

6 Elder, Tim – PhD Student, Portland State University
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Abstract: Factors Influencing the Survival of Juvenile Salmonids Migrating Through the Lower Columbia River Hydrosystem

Pacific salmon populations have been in decline for decades. Juvenile and adult salmon runs on the Columbia and Snake Rivers have been impacted by a wide variety of environmental and anthropogenic factors, including hydropower development and associated reservoirs. This study examines the environmental variables affecting the survival of juvenile Chinook salmon (Oncorhynchus tshawytscha) and steelhead (O. mykiss) passing through three lower Columbia River hydropower projects. In the spring of 2011, the Juvenile Salmon Acoustic Telemetry System (JSATS) was used to track 15,458 individual salmon on their outward migration. Acoustic telemetry offers several advantages over traditional passive telemetry by increasing the horizontal detection area, allowing for multi-dimensional tracking at dam faces, in-river monitoring and specific route of passage survival estimates. Acoustic transmitters and passive integrated transponders were surgically implanted into yearling Chinook salmon (n=7,692) and yearling steelhead (n=7,766) at the John Day Smolt Monitoring Facility. The fish were tracked through the lower Columbia River hydropower system to Rkm 86 using in-river autonomous hydrophone arrays and dam-mounted hydrophones. Based on initial findings, the most influential environmental variables affecting the survival of juvenile salmonids is fish travel time, fish length and spill volumes.

Accounting for the confounding environmental and anthropogenic factors involved with the survival of Columbia River salmon remains a major obstacle in addressing the decline of anadromous fishes in this system. Continued investigation into the effects of environmental variables on fish passing through the hydrosystem will help inform future management options for endangered and threatened species on the Columbia River.

Ellison, Mike – PhD Candidate, Portland State University
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Abstract: Engaging High School Students in Authentic Science and Engineering

Engaging all students in “authentic” science inquiry is now widely accepted as the primary strategy for K-12 science education to produce science literate citizens. Science inquiry
is a cognitively complex activity that requires sustained and self-regulated engagement from students. Making school science activities authentic by making them relevant to students through, for example, carrying them out in local contexts is a common feature of STEM reform proposals. Although the benefits of authenticity are frequently cited, little empirical research confirming the claims exists.

An 8-month case study of 74 students and 1 teacher in a ninth grade science classroom in a 6-12 options public school uses a model of authentic science and engineering pedagogy to explore relationships between science pedagogy, and student engagement and self-regulation. The school explicitly recruited a population with greater proportions of students traditionally underrepresented in STEM careers. The school’s vision is to have all students graduate prepared to attend and succeed at the college level, especially in health careers and engineering. The school used a curriculum model based on contextualizing instruction in questions that are both conceptually-rich and meaningful to students.

A theoretical model of authentic pedagogy developed for the study identified three components of authenticity: affordances for construction of knowledge, for science and engineering meaning making, and for student perception that the curriculum activities have value beyond the classroom. Twelve distinct elements of authenticity representing these three components were coded as high, moderate, or low authenticity from field notes during classroom instruction. Concurrently, systematic observations of student behavioral engagement were recorded.

A sample of 60 lesson observations from the lessons devoted to instruction for and completion of the three projects at the end of each of the three school trimesters are examined in this poster. Authentic pedagogy measurements and student behavioral engagement observations are used to describe how instruction changed across the school year and whether student engagement is related to the elements of authentic pedagogy in the theoretical model. Friedman’s Test for nonparametric data is used to determine if the authenticity of pedagogy changed over the school year. The Wilcoxon signed-ranks test will determine significant differences between pairs of projects. Cochran’s Q test will determine if there are significant differences in the behavioral engagement among a sample of about 1500 individual engagement observations of 40 students from the same lessons from each of the three end of trimester projects. The Wilcoxon matched-pairs test will determine if there are significant differences within pairs of projects. All significance testing will be conducted at $\alpha = 0.05$.

**Fisher de Leon, Anna Denisse – PhD Student, Portland State University**

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**Adviser: Dr. Alan Yeakley**

**Abstract: Do trees reduce water temperatures in restored riparian areas?**

An estimated 940 river segments in Oregon alone are listed as water quality limited for temperature (Annear, 2007). This increase of water temperature has been identified as one of the drivers that have caused a decline in cold water fish populations throughout this region (Young et al., 1999). For this reason, the reduction of water temperature is an important component for restoration efforts in the Pacific Northwest (Booth and Jackson, 1997). Studies have shown that shading from riparian vegetation plays a fundamental role in maintaining lower water temperatures in small streams by intercepting direct solar radiation, limiting solar
radiation to the stream and depressing local air (Beschta et al., 1987; Caissie, 2005) and therefore the reestablishment of riparian vegetation should result in a reduction of maximum water temperatures and daily fluctuations of stream temperature (DEQ, 2006).

However, while vegetative buffers have been found effective in reducing water temperatures in agricultural and timber harvest settings, few studies have determined whether vegetative buffers in highly impacted urbanized streams can provide enough cover to decrease water temperatures (LeBlanc et al., 1997; Webb et al., 2008). This problem is exacerbated by the fact that very little monitoring takes place after restoration projects are completed.

The main purposes of this survey were: 1) to collect data that would serve as a baseline for future data collection efforts, especially for the East Lents site as an effort to capture water temperature changes as vegetation becomes re-established after the restoration project; 2) to determine best field protocols for data collection; and 3) to use collected and ancillary data to calibrate a water temperature model used in future work.

Goldsmith, Kaity – MEM Student, Portland State University
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Abstract: Information Needs Assessment for Coastal and Marine Management and Policy in the Pacific Northwest: Ecosystem services under changing climatic, land use and demographic conditions

Changing climatic conditions are projected to alter the provisioning of ecosystem services provided by estuarine, coastal and nearshore marine ecosystems, necessitating mitigation and adaptation policies and management. The current paradigm of siloed research efforts occurring in parallel to, but not in collaboration with, decision-makers will be insufficient for the rapid responses required to adapt to and mitigate for changing climatic, land use and demographic conditions in coastal areas. This project proposes to employ a different paradigm- one in which research occurs through an interactive and iterative process of engaging decision-makers in the identification of priority research needs (biophysical, economic, and social) and through which researchers analyze and present data in a format that is most likely to be utilized to implement immediate changes. Such an approach can lead to more beneficial and relevant policy and management practices. In collaboration and consultation with the Environmental Protection Agency, interviews and focus groups will be conducted with decision-makers ranging from policymakers to managers. Collected data from decision-makers will be analyzed and synthesized to develop a portfolio of current and future research needs. Preliminary results show the need for increased research that is temporally and spatially appropriate for the pressing issues decision-makers are currently facing. From this portfolio, the project will then identify (1) existing data that could fill research needs, if presented in a format useful to decision-makers and (2) data gaps that require additional research efforts to fill. The project will then use a synthesis session with decision-makers and researchers to match researchers that have relevant data with decision-makers who have identified data gaps to allow for more intuitive and responsive action on the part of decision-makers. Data gaps for which no data currently exists will be compiled into a portfolio of priority research questions and made accessible to the research community (both scientists and funding agencies). The products of the
A synthesis session will include a) a network of decision-makers and researchers that are cognizant of data needs and/or data resources and are willing to share and/or collaborate; b) a portfolio of current research that addresses existing needs identified by decision-makers; c) a clear articulation of the format of data that would most effectively address current and future research needs; and d) a priority list of unfulfilled research needs as identified by the suite of decision-makers participating in the process.

7 Grabowski, Zbigniew – PhD Student, Portland State University
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Advisers: Dr. Heejun Chang and Dr. Elise Granek
Abstract: Bringing Salmon Back to Salmon Creek: a framework for analyzing watershed scale land use changes and water quality trends

Riparian restoration activities aim to physically improve in and around channel habitat. However, changes in the physical and chemical suitability of riparian habitats often depend upon watershed scale processes. Gauging restoration effectiveness therefore requires robust frameworks for analyzing the status and trends of biologically relevant water quality indicators and their watershed scale drivers. Here we present the results of a combined water quality and land cover analysis that will serve as the backdrop for further restoration and infrastructure improvement effectiveness studies. Despite noticeable shifts in land cover at the sub-catchment scale we detect relatively few significant trends in water quality variables over the study period. However, significant differences exist between sub-catchments subject to different historical regimes of land use change (outside of the water quality data period). Within sub-catchments subject to extensive historical urban and agricultural development, hydrological regime shifts may prove resilient to interventions. However, within watersheds undergoing rapid urbanization, it may be possible to prevent water quality degradation through extensive preventative restoration and infrastructural improvements. Pulling apart these various influences on water quality require stable statistical methodologies, and here we provide such a framework, along with suggestions for further development.

8 Grund, Yuan – MS Student, Portland State University
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Abstract: Analysis of Long-term Observation of Environmental Influences on Oswego Lake Phytoplankton in 3 Sites

Cyanobacteria are highly diverse phytoplankton. They are generally considered to beneficially contribute to photosynthesis and nitrogen fixation, and they perform an important ecosystem function as primary producers in many food chains. However, recently increasing concern regarding cyanobacteria is focused on the fact that cyanobacteria form harmful blooms that impose significant biological and economic impacts on freshwater systems.

Urban lakes have unique economic value to local residents, such as water supply, recreation and property value. However, compared to non-urban lakes, urban lakes are usually characterized by small, shallow shape and eutrophication that favor cyanobacteria blooms.
Given the vulnerability of urban lakes to algal blooms, it is crucial to develop effective lake management strategies to predict, prevent and control blooms in urban lakes.

Oswego Lake is located in Clackamas County, Oregon. The lakeshore is completely surrounded by private residential homes. Oswego Lake has experienced significant cyanobacteria blooms in the early 2000s. With great efforts of monitoring and management, water quality of the Lake has substantially improved. Effective control of blooms has resulted from restricting nutrient loading and increasing water movement. Long-term data and management practices on Oswego Lake since 1999 provide valuable information for lake studies.

This study used Oswego Lake as an example of urban lakes to analyze the influence of environmental factors on the variation of phytoplankton communities during 12 years (2001 - 2012) in comparison of 3 sites of the lake. Lakewood Bay and West Bay are adjoining to the main lake on the east and the west sides respectively. Lakewood Bay and West Bay are smaller and shallower, both less than 4 meters in depth. The main lake has maximum depth more than 16 meters. The study was focus on cyanobacteria in relationship of other phytoplankton. Phytoplankton percent compositions of 3 sites have been studied in time series. The results indicated that cyanobacteria blooms in Oswego Lake presented seasonal pattern, but overall decreasing during the study period. However, phytoplankton composition patterns were different among 3 sites. Non-metric multidimensional scaling (NMDs) method was used to analyze the environmental influences on the variation of cyanobacteria in the lake. The results showed that cyanobacteria were associated with summer season (July, August and September), and strongly driven by turbidity and total phosphorus. The results also showed different patterns of phytoplankton composition and different strength and direction of environmental factors in NMDs space.

Hart, Ted – PhD Candidate, Portland State University
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Abstract: Root Growth affects on Infiltration in stormwater bioretention facilities in Portland, OR

With an increase in impervious surfaces, stormwater has become one of the greatest water quality and flooding threats within urban areas. To mitigate these threats, stormwater bioretention facilities (SBFs) have become one of the most frequently used stormwater management tools in urbanized watersheds. The two primary purposes of these facilities are to reduce peak flow and retain pollutants. Researchers have shown that roots can greatly increase water infiltration and retain pollutants in greenhouse, lab, and field settings. However, no researchers this has not been determined within in situ SBFs. I am currently investigating whether greater spring root growth results in greater infiltration rates compared to winter among two different plant assemblages (high and low root growth). Using models, I’m also researching the accuracy of a root infiltration model for estimating in situ SBF infiltration rates and if a cluster of larger root growth SBFs (Juncus patens) can increase infiltration rate/groundwater recharge compared to smaller root growth SBFs (Carex sp).

A large (i.e. Juncus patens and one tree) and small (i.e. Carex sp) root growth groups will be measured with 5 replicates/assemblage and one control (no vegetation). Facility
characteristics (i.e. bulk density) will be measured and facilities selected that are as similar as possible (i.e. plant percent cover). Roots will be measured during winter (low growth and high stormwater input) and spring (high growth and moderate stormwater input). Soil moisture (TDR) will be measured once a week and water level (HOBO water level gage) will be recorded every 5 min to determine infiltration rate. Infiltration rates using root data with the bioretention cell (BRC) model will be compared to field data (gage). Infiltration rates found with the large root growth assemblage will be used in HydroCAD to quantify the collective effect in a typical 15 facility cluster.

I hypothesize that 1) Greater root growth and infiltration rates will occur during the spring, 2) the assemblage with greater root growth (i.e. surface area) will show greater infiltration rates, 3) the BRC model will not accurately predict infiltration rates due to the many other factors not included in this model shown to greatly affect SBF infiltration (i.e. temperature), 4) the scaled up HydroCAD model will show that greater infiltration rates can collectively increase infiltration rate/groundwater recharge.

This work will inform stormwater managers about the potential of using greater root growth vegetation to increase stormwater infiltration, and thus affect SBF primary functions.

9 Hood, Paula – MS Student, Portland State University
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Abstract: Effects of forest thinning and associated roads on instream fine sediments and macroinvertebrate community structure in the Clackamas Basin in the Western Cascades, Oregon

Timber harvests and their associated skid trails and roads can have significant impacts on the magnitude and timing of sediment loading into streams in forested watersheds. Loss of vegetation, soil compaction, use of heavy equipment, and alteration of natural hydrologic patterns can create erosion, increase landslide rates, and generate fine sediments which may ultimately be delivered into streams. Fish, amphibians, and macroinvertebrate communities may be negatively impacted by excess fine sediment inputs due to logging. Within the last decade, approximately 18,000 acres of forest on Forest Service lands within the Clackamas River Basin have been logged or are slated to be logged. Most of this logging utilizes thinning, a technique that leaves some trees within the sale unit un-harvested. The ecological impacts of thinning on ecosystems, particularly stream ecosystems, are not fully understood and need further study. My hypothesis is that turbidity, embeddedness, and suspended sediment concentrations will increase in streams adjacent to thinned forests. I also hypothesize that macroinvertebrate community structure will be different in reference and managed watersheds. My objective is to determine if selective logging and the roads associated with it have an impact on instream fine sediment levels. I sampled turbidity and macroinvertebrates in four managed and three reference streams in the Clackamas River Basin in spring and summer of 2013. Water quality parameters such as temperature, dissolved oxygen, conductivity, and flow were also measured. A final round of sampling will be conducted during rain events in the fall of 2013. EPA rapid habitat assessments, canopy cover, pebble counts, and embeddedness were determined during summer 2013 for each stream. Analyses will be completed after fall sampling. Water quality parameters in reference and logged sites will be compared using t-tests or rank based equivalents.
Macroinvertebrate community structure will be characterized using NMDS plots, PCA bi-plots and cluster analyses.

10 Johnson, Gunnar – PhD Student, Portland State University
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Abstract: Preliminary Rock Glacier Inventory of the American West

While massive ice glaciers are a fundamental element of the alpine cryosphere, rock glaciers are also major components in many regions. Rock glaciers are dynamic alpine landscape features composed of disorganized, moving conglomerations of rock and ice. Perennial ice features in mountains span a continuum of ice content, with alpine glaciers at one end and stagnant rock glaciers at the other. Geomorphological debates rage about their initial formation, with the two main theories being 1) groundwater seep into talus slopes and subsequent freeze, and 2) debris slides mantling retreating pure ice glaciers. While alpine glaciers are easily identified using traditional remote sensing techniques, rock glaciers present challenges due to their surface composition, which is, radiometrically, virtually identical to surrounding talus and scree. Visual clues like flow banding and surface deformation are sufficient for identification of most rock glaciers but difficult to automate. As such, no continental scale inventories of rock glaciers exist. I will fill this gap with a manually classified inventory based on visual identification of rock glaciers from satellite images.

11 Jordan, Meredith – MS Student, Portland State University
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Abstract: A mesocosm study of climate change and eutrophication effects on zooplankton communities in a mercury-contaminated reservoir

Mercury (Hg) bioaccumulation in fish is a thoroughly researched area, in part due to the impacts of this neurotoxin on human health through fish consumption. Existing literature shows divergent results on how climate change and eutrophication, two widespread anthropogenic stressors on lakes and reservoirs, alter Hg concentrations in the lowest trophic levels. The goal of this study was to determine how the interaction of warming and eutrophication might affect mercury concentrations and ecological processes in freshwater zooplankton. In the summer of 2013, a mesocosm experiment was conducted using Hg-contaminated water and zooplankton communities from Cottage Grove Reservoir, Oregon, which regularly exceeds water quality standards for Hg (concentrations greater than 0.35 ppm). Four treatment combinations were applied: nutrient enrichment, temperature increase, a combination of nutrients and increased temperature, and a control. 16 100-gallon tanks were set up with “greenhouse” canopies to allow for a passive temperature increase of approximately 2°C as compared to controls. Nutrient treatment tanks had nitrogen and phosphorous concentrations increased by approximately ten-fold over average reservoir concentrations (0.19 mg·L⁻¹ total N, 0.013 mg·L⁻¹ total P). Samples of zooplankton and water for total Hg and methylmercury analysis were taken at the experiment start and end points. Anticipated results are that zooplankton in warming and warming/nutrient
treatments will have higher Hg concentrations as compared to controls, and concentrations in zooplankton in nutrient treatment tanks will have lower Hg concentrations as compared to controls. Results from this study could have management implications for controlling non-point nutrient inputs to warming, Hg-contaminated systems.

12 Karr, Lindsey – MEM Student, Portland State University
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Adviser: Dr. Jeffrey Gerwing
Abstract: The spread of exotic invasive plants along NF-99 on Mount St. Helens, Washington

Exotic invasive species are known to compete with native species, threaten biodiversity and alter food webs and nutrient cycling. In some areas of Mount St. Helens, they are also influencing the natural primary succession so unique to the landscape. A massive eruption in 1980 and roads have altered the vegetation cover and created ideal conditions for many non-native invasive plants. However, the richness and abundance of the plants and how they are spreading from roads is unknown. This study looks at species richness and cover of exotic plants in different vegetative strata along the roadside, spreading perpendicularly from the road as well as into the Pyroclastic Flow area. Data was collected in one meter quadrats along 70 meter transects, 20 transects in each of five vegetative strata. Fifteen exotic species were found in blast zones and intact forest areas, while only one species, Hypochaeris radicata, was found in the pyroclastic flow area. Noxious weed managers and land managers of Skamania County and Gifford Pinchot National Forest will use these data to inform decisions on weed control and planting along NF-99.

13 Kendrick, Christine – PhD Candidate, Portland State University
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Adviser: Dr. Linda George
Abstract: Investigating the role of traffic management and environmental conditions on transportation-related air pollutants from a heavily trafficked urban arterial.

Urban roadside environments have elevated levels of particle mass, particle number concentrations, nitric oxide (NO) and nitrogen dioxide (NO2) from traffic emissions that affect surrounding neighborhoods out to 500m and also impact short-term and long-term exposures for daily commuter populations within the roadway. Through a partnership with the City of Portland, a long term continuous roadside air quality monitoring station (nitrogen oxides, PM1, PM2.5, PM10, ultrafine particle number, meteorology) has been established on a major urban arterial (SE Powell) to increase understanding of how traffic parameters, signalization and meteorology affect the magnitudes of these pollutants at the roadside. The arterial corridor has a diverse mix of traffic (buses, trucks, cars, and pedestrians) and the intersecting road, SE 26th, also includes bicycles. Based on nearly one full year of data collection we find that NO and NO2 roadside measurements show a relationship with the local measures of congestion and traffic volumes while particle mass (PM1, PM2.5, PM10) does not. Nitrogen oxide concentrations appear to be very sensitive to traffic management parameters suggesting optimization of traffic flow may have implications for urban traffic emissions. Episodic measurements of ultrafine
particles (UFPs, <100nm) show UFPs correlate well with NOx and traffic volumes and will be added to the dataset throughout the upcoming year. Characterization of the traffic and meteorological conditions that explain roadside pollutant concentrations are important to help increase understanding of exposure concentrations and health impacts. This dataset also creates a baseline for testing changes made to the traffic signal system on Powell to investigate possible ways of improving traffic management that translate to decreased roadside pollutant concentrations.

14 Kidd, Sarah – PhD Student, Portland State University
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Adviser: Dr. Alan Yeakley
Abstract: Modeling restoration trajectories of ecosystem services: A study of Young’s bay tidal wetland reconnection projects

The objective of this proposed study is to identify the rate of ecosystem service recovery in tidally reconnected oligohaline (salinity 0.5-5 ppt) wetlands on historically diked agricultural lands in the Columbia River Estuary. A “space-for-time substitution” 53 year chronosequence of tidal wetland restoration sites will be used to create short and long term functional restoration trajectory models and identify rates of ecosystem service recovery. Projects to be evaluated include sites breached in 1959, 1970, 1980, 2004, 2005, 2006, 2011, 2012, and 2 sites slated for restoration in 2014 and 1 in 2015 all within the Young's Bay Watershed (see maps). All of these sites will be monitored in parallel in conjunction with two natural wetlands (reference wetland) and two diked pastures (pre-restoration) in the watershed. This study will evaluate changes in plant community biodiversity, carbon sequestration, soil development, and water quality. This selected suite of supporting and regulating ecosystem services are directly tied to the production of provisioning and cultural services in these systems, influencing both local and regional human wellbeing (Figure 1). In this region native tidal wetland plant species such as bulrush (Scirpus sp.) and wapato (Sagittaria latifolia) hold significance cultural value for local Native American Tribes. By evaluating restoration of these cultural keystone species, restoration trajectories of this cultural ecosystem service can also be evaluated. Information from this study can also be used in decision making processes to evaluate the socio-economic and ecological tradeoffs resultant from these restoration land conversion activities.

15 Lopez-Johnson, Siena – MS Student, Portland State University
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Advisers: Gene Foster and Dr. Yangdong Pan
Abstract: Pacific Lamprey - Effects of Passage Structure Modifications

Pacific Lamprey (Lampetra tridenta), an endemic species to the Columbia Basin, has experienced staggering decreases in returns to spawning territories in recent decades. As an anadromous species present for thousands of years, many tribes in the basin are dependent on Lamprey as a source of food and tradition but have been deprived of the resource due to anthropogenic threats including passage at mainstem dams. The objective of this study is to
evaluate use (n=75) of a volitional exit pipe installed in 2012 at a Pacific Lamprey Passage Structure (LPS) on Cascade Island (CI) at Bonneville Dam including number of fish successfully exiting, time spent in the LPS and exit pipe, and number of fish experiencing fallback in the structure. The exit pipe was installed to avoid trap and haul methods and simulate more natural conditions of passage in hopes of increasing passage over the dam. Travel time of fish using the structure to the next mainstem dam will also be assessed. The experimental design was carried out over a two-month period in July and August of 2013 utilizing a total of 75 fish. All 75 fish were pit tagged and 50 fish were surgically implanted with radio tags as well. During the study, five releases of 15 fish were carried out. Pit tag detectors in the LPS and a fixed site radio receiver logged data following each release. Several other radio receivers are positioned at fixed sites on the river heading towards the Dalles dam and several pit tag detectors are positioned at the Dalles as well, this data will be queried in later months. All of the above data will be compared to previous years trap and haul data from fish at the CI LPS. Anticipated results are that fish to successfully travel through the LPS and use the volitional exit will exhibit faster travel times to the Dalles dam compared to trap and haul methods in previous years.

Luintel, Harisharan – PhD Student, Portland State University
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Advisers: Dr. Robert Scheller and Dr. Randall Bluffstone

Abstract: Local Assessment of Global Environmental Policy: Understanding Implication of REDD+ in Nepal’s Forest Management

In search of solution to climate change, the role of forest has been recognized and the scheme to promote forest conservation has been evolving at global level such as reducing emissions from deforestation and forest degradation (REDD+). However, there are different views and speculations in understanding ecological and socio-economic implications of REDD+ on the local forest management among scholars, policy makers and practitioners.

In this context, the proposed study attempts to enhance the understanding of ecological and socio-economic implications of REDD+ on the forests and forest managing communities in the developing countries by bringing empirical insights. By taking case of Nepal’s decentralized forestry, the study brings insights on how REDD+ is interpreted and applied at the local level that shape management of forest and reconfigure social relations of power in terms of forest resource governance, institution building and benefit sharing. Primarily, the study examines how REDD+ initiative reinforces or transforms existing power relations among forestry actors at local level; examines how REDD+ initiative affects forest management planning and thereby the condition of forest; and examines how and to what extent the cost and benefits flow to the forest dependent communities under REDD+ scheme. Specifically, the study answers following five questions. (i) How does REDD+ initiatives affect community forestry policy in Nepal? (ii) How does REDD+ initiatives affect intra-community power relations and communities’ behaviour to manage forest? (iii) How and to what extent does REDD+ scheme affect forest management plan; how they are interpreted and implemented and therefore local forest conditions are affected? (iv) What trade off in terms of control over forest and benefit sharing might be made by the communities under REDD+? and (v) Whether REDD+ benefits flow up to the forest dependents poor and marginalized?
The research follows analysis of following six elements. (i) REDD+ action area in which all REDD+ activities are situated, (ii) international context that shape overall REDD+ architecture, (iii) national forestry environment that provide space to REDD+ scheme to operate in the country, (iv) nature and level of international REDD+ support around which whole REDD+ activities revolve, (v) major in-country REDD+ actors that carry out REDD+ activities, and (vi) REDD+ outcomes realized by forest managing communities. Similarly, a methodological framework that shows types and sources of data, their collection methodology, and indicators of REDD+ outcomes is developed to organize research effectively.

Mainard, Jacinda – PhD Student, Portland State University
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Adviser: Dr. Linda George
Abstract: Investigating the Impact of a Large Power Plant on the Atmospheric Chemistry of the Columbia River Gorge

The Columbia River Gorge (CRG) is home to the largest river in the Pacific Northwest and is a designated National Scenic Area potentially vulnerable to emission sources just outside its boundaries. Portland-Vancouver metropolitan area is on the western terminus, and the Boardman coal-fired power plant on the eastern terminus. Due to the CRG’s unique topography, meteorology and proximity to these large sources, it can be studied as an “environmental exhaust pipe” with the two large sources of pollutants at either end. The transport, transformation and deposition of air pollutants is a concern for human and ecosystem health on rural and tribal lands located within the CRG downwind of these emission sources. To study the influence of the large coal-fired plant on the CRG and surrounding areas, we analyzed speciated particulate data collected at the Interagency Monitoring of Protected Visual Environments (IMPROVE) Wishram, WA CRG site (128 km west of Boardman), Boardman coal power plant nitrogen oxide emissions, and our measurements of ambient nitrogen oxides at Wishram beginning in December 2012. Our analysis indicates that NOx mixing ratios, particulate nitrates, and aerosol light extinction at Wishram are associated with NOx emissions from the plant suggesting that the power plant has a significant influence on the atmospheric chemistry of the CRG. Next steps include modeling the transport, chemistry and deposition for the Columbia River Gorge using WRF-CHEM and comparing with surface observations made by the IMPROVE measurements as well as our co-located gas phase and aerosol measurements.

Mogilewsky, Monica – PhD Student, Portland State University
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Adviser: Dr. Natalie Vasey
Abstract: Adapting remote sampling of biomaterial for conservation of canopy dwelling primates: A study with red ruffed lemurs, Varecia rubra, in Masoala peninsula, Madagascar

Red ruffed lemurs, Varecia rubra, are one of the world’s most endangered primates and are unique to Madagascar’s Masoala Peninsula. Threatened by habitat loss, fragmentation, and hunting, red ruffed lemurs spend most of their time in the canopy above 15 m and are particularly reliant on the most commercially valuable tree species. Human population growth
will inevitably lead to more logging and other resource extraction. These forest changes result in an increasingly fragmented habitat that negatively impacts the gene flow and overall genetic health of the red ruffed lemur population. Consequently, effective conservation efforts require an understanding of gene flow between red ruffed lemur populations and how it is impacted by these anthropogenic activities. Collection of DNA is critical to understanding gene flow but is logistically challenging for researchers who study canopy dwelling vertebrates. At the same time, high quality DNA extracted from hair samples can be used to quantify gene flow and identify key dispersal corridors. Our project takes advantage of this with a novel hair trap design that allows hair samples to be collected inexpensively and reliably without the risks associated with handling wild animals. A safe and simple system for installing, baiting, and retrieving the traps was developed in collaboration with canopy experts. The hair trap was first tested in captivity, resulting in successful collection of hair samples with intact hair bulbs from 5 different individuals. Multiple hair traps were then installed in the canopy at the Masoala National Park for five days during September 2013. In the field, despite observing multiple individuals in and near the installed hair traps, none of the lemurs accessed the hair trap or attempted to recover the fruit bait within the hair trap. Because observations confirmed that the lemurs were not averse to the hair traps, future research efforts will focus on adjusting the type of bait used to attract individuals to the hair trap, increasing distribution of the hair traps, and extending the amount of time animals have to habituate to the hair traps.

Mohammad, Basma – PhD Student, Portland State University  
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Adviser: Dr. Alan Yeakley  
Abstract: Investigating lamprey presence, distribution, and movement with passive fish sediment traps at Sunnyside Canal, Washington

Pacific lamprey (Entosphenus tridentatus), an ancient fish of great tribal importance, has experienced severe population declines recently throughout the Northwestern region of the United States. For tribes of the Pacific Northwest region, Pacific lampreys are a sacred fish culturally as important as salmonids. A severe decline in Pacific lamprey numbers at traditional harvest sites, such as Willamette Falls, is cause for alarm for tribes and natural resource managers alike.

In agricultural regions, fish entrainment into irrigation canals, (synonymous with water diversions), may be among the top causes for lamprey population and species declines. Past irrigation canal surveys in Yakima River Subbasins (2010-2012) have repeatedly documented hundreds and thousands of larval lamprey stranded each year after irrigation canals were emptied of water (dewatered) in the fall. In Yakima River Sub basins, Pacific lamprey are thought to be restricted to stream reaches lower in the Subbasin. Fish entrainment into irrigation canals may also impact the freshwater resident, nonanadromous lamprey—the Western Brook lamprey, Lampetra richardsonii.

We developed a pilot monitoring project at Sunnyside Canal (near Wapato, WA) to investigate the effectiveness of passive sediment fish traps in capturing larval lamprey moving into the canal. Since larval lamprey live exclusively in fine sediment, we experimented with different sediment amendments, or ingredients, to attract the fish into our traps. Using these passive fish collectors, we attempted to evaluate the presence, distribution, and movement
behavior of the fish by placing traps strategically in the Sunnyside Canal, both upstream and downstream of the canal’s rotating, or rotary, drum screens.

We found that captured larval lamprey ranged in size between 14mm-60mm, indicating the presence of at least three age classes of fish (0+ to 2+). Capture efficiency was highly dependent on habitat conditions and trap acclimation time. Areas with increased flow tended to deposit less fine sediment on the canal bottom and even scoured fine sediment from passive traps, thereby reducing trapping efficiency. Traps that acclimated for less than seven days tended to attract fewer lamprey and fewer aquatic macroinvertebrates. Even though we documented more lamprey in traps downstream of the fish screens, we recommend future studies to further examine the mechanism through which lamprey pass through these rotary drum screens.

19 Peters, Joseph – MEM Student, Portland State University
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Presenting Undergraduate work from Florida International University
Adviser: Dr. Elise Granek (PSU) and Dr. Craig Layman (FIU)
Abstract: Comparison of fish community structure of restored and intact mangrove habitats along urban coastlines in Biscayne Bay, Florida

Globally, mangrove ecosystems have substantially declined, largely as a result of human impacts. As declines continue, many of the ecosystem services mangroves provide are lost or altered. Shoreline stabilization has gained importance as chronic erosion wears away coastlines once mangroves are removed. In many areas limestone boulders called riprap have been employed in order to offset continued erosion associated with mangrove clearing. In urban coastal areas adjacent to Biscayne Bay, Florida, as much as 80 percent of mangroves have been lost. More recently, riprap has been used in conjunction with mangroves to restore wetland ecosystems throughout the Bay. This riprap-mangrove habitat provides structure for marine organisms to colonize. However, fish assemblages and benthic composition could vary between this restored hybridized habitat and natural mangrove systems. Comparisons of fish and benthic community structure were made, to determine if abundance, species richness, and overall diversity differed between the two habitat types. Visual census and benthic quadrat surveys were conducted in mangrove and mangrove-riprap sites within two regions of the Bay. Total fish abundance was greater in mangroves, but the effect of habitat type on species richness varied between regions. The community structure of fishes and the composition of benthic organisms differed significantly between intact and restored habitats. Because species composition is so distinct, it is likely that the two communities do no function in the same manner. In areas with altered shorelines, it may be important to consider the function of added anthropogenic structure for mangrove communities.

20 Roa, Meenakshi – PhD Student, Portland State University
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Abstract: Using a high resolution observation-based model (Land Use Regression) to assess the role of sources and sinks of nitrogen oxides in the urban environment

Heavily trafficked roadways are the largest non-point sources of nitrogen oxides and particulate matter in many urban environments. Nitrogen dioxide (NO$_2$) can both cause and exacerbate respiratory problems, while particulate matter has been linked to a decrease in life expectancy and an increase in the incidence of stroke, cancer and cardiovascular disease. Since NO$_2$ levels in an urban area vary at a scale of ~500m, to correctly assess the health impact or urban NO$_2$, NO$_2$ levels have to measured or modeled at a fine spatial resolution.

Unfortunately, high resolution bottom-up modeling of NO$_2$ is not possible due to the lack detailed emission data at this scale. In the summer of 2012 and 2013, we measured NO$_2$ and NO (a proxy for particulate matter) at ~150 sites in the Portland Metro area using passive Ogawa samplers. Based on the field measurements, we developed land use regression (LUR) models for NO$_2$ and NO (Adjusted R$^2$ = 0.80 and 0.49) in the Portland area. The LUR model we developed for NO$_2$ is:

$$\text{NO}_2(i) = 7.7 + 1.1 \times 10^{-8} \times \text{FWY}_{\text{AADT}}_{1200} + 6.5 \times 10^{-4} \times \text{MAJ}_{\text{ART}}_{500} + 1.7 \times 10^{-3} \times \text{ARTERIES}_{350} + 1.8 \times 10^{-8} \times \text{STREETS}(\text{POP})_{800} + 1.0 \times 10^{-3} \times \text{RAILS}_{350} - 1.0 \times 10^{-2} \times \text{ELEVATION} + 1.4 \times 10^{-5} \times (\text{ELEVATION})^2 - 5.73 \times 10^{-6} \times \text{TREES}_{400} + 1.1 \times 10^{-4} \times \text{X\_DIST}$$

The NO$_2$ model indicates that each 1km of freeway carrying an annual average daily traffic (AADT) of $10^5$ vehicles that lies within 1200m of a site is associated with a 1.1 ppb increase in NO$_2$ at the site, while each 10 ha of trees within 350m of the site is associated with a 0.57 ppb decrease in NO$_2$. Using BenMAP, we estimated that the reduction in NO$_2$ associated with trees in the Portland area resulted in ~10,000 fewer cases of asthma exacerbation in 4 to 12 year olds and ~50 fewer emergency room visits for all ages on an annualized basis.

The LUR models were applied to a 1km grid in the Portland Metro to develop a highly spatially resolved map of summer-time NO$_2$ and NO. This map will be used for:

i. More correctly assessing the health impact of NO$_2$ and NO in the Metro area,

ii. Assessing exposure of cyclists, school children and other susceptible populations,

iii. Planning for a healthier city.

21 Sahatjian, Brittany – MEM Student, Portland State University
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Abstract: Prioritizing Riparian Restoration Efforts in the Johnson Creek Watershed through Effective Shade Modeling

The influence of stream temperature on the survival and reproductive success of anadromous salmonid populations has become an increasingly concerning issue in the Pacific Northwest. Enhancing riparian vegetation (canopy height, density, and buffer extent) is widely accepted as one of the most effective strategies for reducing stream temperatures, while also providing numerous ancillary benefits. Effective shade is defined as the percentage of direct beam solar radiation attenuated and scattered by riparian vegetation before reaching the stream.
surface and is a commonly used criteria for choosing where to restore riparian vegetation. This project aims to prioritize sites for riparian restoration through effective shade modeling within the geographic extent of the Johnson Creek watershed. Model inputs included a limited set of channel morphology and near stream vegetation attributes and were sampled from high spatial resolution LiDAR derived raster datasets (6 ft.) using Python script programming tools. A separate raster was created to depict restored conditions, in which the maximum height of near stream vegetation is set equal to 27 meters. Using a data intensive stream temperature model, Heat Source, effective shade simulations were performed along the mainstem Johnson Creek and all tributary streams over the duration of a single day in August. Model outputs provided average solar flux attenuation rates for near stream vegetation under current and restored conditions, the difference of which represented the potential increase in solar flux attenuation that would result from restoration. Model outputs were used to prioritize restoration efforts at the taxlot and subwatershed scale. Under a restoration scenario, 544.9 acres would be restored resulting in the additional solar flux attenuation of 201,562 watts/m²*d⁻¹. Restoring only 22% of all taxlots, 41% of all subwatersheds, or 20% of all restorable acres would accomplish 50% of the solar reduction target. Restoring 39% of all taxlots, 64% of all subwatersheds or 54% of all restorable acres would accomplish 90% of the solar reduction target. A large portion of taxlots (40%) exhibited no difference in solar flux attenuation between current and restored conditions. Spatial patterns are generally lacking and each priority ranking is evenly dispersed throughout the watershed. All taxlots should be further screened prior to final prioritization for opportunistic prospects such as landowner willingness, community support or proximity to existing restoration projects, and fundraising opportunities.

Schoenen, Jodi – PhD Student, Portland State University
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Adviser: Dr. Robert Scheller and Darrell Brown
Abstract: A socio-ecological approach to understanding landscape legacy and ecosystem change: The Rogue River Basin, Oregon

The Rogue River Basin in Oregon serves as a microcosm for the complex issues around ecosystem services being experienced throughout the West. Pressures from urbanizing areas, changing climate, and shifting economies and cultures are major issues within the Rogue River Basin and all along the western United States. Despite the threatened status of the Rogue River Basin and its importance for biodiversity and hydrology, there has been no research that specifically examines how coupled biophysical and social forces within the basin have affected the flow of ecosystem services across time and ownership boundaries. This research focuses on telling the stories of the Rogue River basin through a biophysical and socio-ecological lens in order to illuminate the drivers of change on ecological systems in the region. This poster summarizes and presents proposed research that will be conducted beginning in summer 2013.

Smith, Randall – PhD Student, Portland State University
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Adviser: Dr. Erik Sanchez
Abstract: Environmental Microscopy: Surface Films And Biological Habitat At The Air-Water Interface And Images Of Structure

Our research on imaging and structure of mixed valent, metallic oxide surface films, that occur naturally in wetland environments, is formed around the concept of Environmental Microscopy as a tool to analyze and define both structure and function at the air-water interface. Previous research has minimized two important aspects of metallic-oxide films: 1) that little biological activity appears in these films, and that 2) iron oxides are the only major component of these reflective surface films. We have found that colonizing biological activity is robust, and that several transition metallic oxides other than iron can and do occur in these films. While iron oxides are certainly the most common set of compounds, a wide variety of transition elements are important components of the oxide surface film environment and habitat. Ferromanganese surface films were found in the Sandy River watershed and wetlands, and an unusual biofilm of nickel-zinc were found in the Johnson Creek watershed and wetlands. While there is, as yet, no direct correlation with known contamination. Metallic-oxide surface films allow for excellent documentation of biogeochemistry and mineral cycling by structure as well as by spectroscopic analysis. Energy Dispersive Spectroscopy(EDS) was the main method used in this analysis. Biotic components of these films suggest that a more complex model of surface film and neustonic biota are necessary, and can be used to document environmental stability and change. Surface films now appear to be a good environmental analytical component for any aquatic environment, including both historical and current aquatic regimes. The relationships of surface films and the neuston are an innovative, comparative set of methods for wetland assessments.

22 Summers, Brent – MEM Student, Portland State University
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Abstract: Effect Forest Collaboratives have on Timber Sale Project Appeal Rates

The United States Forest Service (USFS) has used collaborative planning over the past few decades as a strategy to engage stakeholders about proposed projects on National Forests. Various studies have found that collaborative planning efforts are well engrained into project-level planning and management in the USFS. One of the most controversial types of projects is timber sales. These projects trigger the National Environmental Policy Act (NEPA) process and thus are subject to appeal upon a decision being declared. Studies have shown that timber sale projects have been the greatest appealed project type across all USFS Regions. Due to the mandatory NEPA public review period, private citizens and organizations can review the proposed project action and appeal that project if desired.

Forest collaborative establishment began in Oregon in 1998. Currently there are twenty-tree forest collaboratives in Oregon that interact with the USFS on National Forest lands. While it is generally believed that these forest collaboratives are decreasing project-level appeals, there is no empirical evidence to back up this belief. This project focuses on appeals of timber sale projects and the effects forest collaboratives have on appeals. The study area includes four National Forests and five forest collaboratives. Data from four separate USFS databases will be collected from various USFS regional managers. These databases included NEPA document
information, on the ground forest activities, timber sale contact information, and timber sale financial information. The data will be compiled and analyzed in the context if a timber sale project was a forest collaborative involved project or not. The log odds ratio will be calculated to determine if forest collaboratives are influencing the rate of timber sale project appeals. The hypothesis of this project is that overall as the number of forest collaboratives increases, project-level appeals will decrease. When examining individual forest collaboratives, the log odds ratio will decrease as time from forest collaborative establishment increases. This project is expected to confirm the general belief that forest collaboratives are reducing the number of timber sale project appeals across the four National Forests in the study area.

23 Truitt, Amy – PhD Student, Portland State University
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Adviser: Dr. Catherine de Rivera
Abstract: Emerging insect pathology research metamorphosing conservation strategies: Wolbachia and an imperiled butterfly

In the past few decades we have witnessed severe declines, and even collapses, of pollinator species. The net effect of losing insect pollinator biodiversity is incomprehensible, as up to 75% of agriculture and 94% angiosperm abundance and diversity rely on animal pollination. Anthropogenic disturbances such as habitat fragmentation, monoculture farming, and climate change are driving many pollinator species to the brink of, or even to, extinction. Ecologists and conservation managers have been seeking to develop and implement effective strategies to save pollinator species. These strategies aim to resuscitate imperiled populations, while maintaining or increasing genetic diversity. Population augmentation, such as assisted migration, assisted colonization, and captive rearing and release, is increasingly being employed as a conservation method for species, including insect pollinators that are on the trajectory to extinction. Can population augmentation between populations such as captive rearing and release effectively conserve imperiled populations of insect pollinators, or are these methods too risky? Here we examine the effects Wolbachia, a reproductive parasitic endosymbiotic bacteria, have on the population dynamics of an imperiled butterfly species.

24 Turner, Brian – PhD Candidate, Portland State University
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Adviser: Dr. Catherine de Rivera
Abstract: Inducible defenses in introduced versus native populations of the purple varnish clam, Nuttallia obscurata

Invasive species that can identify and respond to novel, native predators in a manner that reduces predation risk, such as the expression of inducible defenses, will be more likely to establish and spread. Few studies have examined if native predators trigger inducible defenses in invasive species, and those that have used species that have coexisted for decades rather than prey naïve to predator cues. Naïve specimens, particularly from their native range, would best represent how a species responded to predator presence and activity during the earliest stages of the invasion process. The purple varnish clam, Nuttallia obscurata, was introduced to British Columbia from its native range in Asia and has expanded its range southward to Oregon. Crab
predators native to the Pacific Northwest (PNW) are known to consume *N. obscurata*, so it is probable that at least the oldest established populations have come to recognize native predator cues. Specimens of *N. obscurata* will be collected from their native range and from introduced populations into PNW. We plan to expose specimens from these different populations to cues from damaged conspecifics, Dungeness crabs (*Metacarcinus magister*), and the two combined. We hypothesize that only *N. obscurata* from PNW will respond to native predator cues by increasing burrowing depth. This study will provide insight into species interactions that occurred at the earliest stages of *N. obscurata*’s introduction and the role that geographic origin plays in relation to the vulnerability of invasive species to predation.

25 Van Winkle, Jill – MS Student, Portland State University

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The risk of spread and establishment of invasive species to interior habitat within urban parks is of great concern to park managers and ecologists. Informal trails (visitor-created, demand, social, or illegal trails) as a vector for this transmission is not well understood. A study of the informal trail network in Forest Park, Portland, Oregon, was conducted to characterize affects to plant communities. The system of informal trails was mapped and from this population (n=382) a systematic sample was selected for analysis. Thirty-two transects were placed along informal trails at intervals from their origin, with paired transects along formal trails for comparison. Percent cover by species was measured for quadrats at varying distances from the trail edge. For analysis, species were grouped by dispersal strategy, ecology, and native status. Additionally, richness and Shannon diversity were calculated for each quadrat. For all mapped trails, the relationship of informal trails to formal trails, other park features, and trail use level and type was evaluated. Quadrats located closer to formal trails showed higher richness and diversity, due to increased number of introduced and ruderal species. Formal trails exhibit these same patterns to a stronger degree and over a greater distance from the trail edge. “Hidden” behaviors appear to drive many informal trails: bathroom stops, party spots, waste dumping, private property access, and camps. The preliminary analysis presented here guides continued data analysis of the effects to forest plant communities from informal trails. It is hoped that this study will provide a better understanding of a relatively un-characterized factor affecting forest plant communities in parks and recreation areas.

26 von Behren, Christa – PhD Candidate, Portland State University

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Adviser: Dr. Alan Yeakley
Abstract: Riparian vegetation assemblages and associated landscape factors across an urbanizing metropolitan area

While diverse, native riparian vegetation provides important functions, it remains unclear to what extent these assemblages can persist in urban areas, and under what conditions.
We characterized forested riparian vegetation communities across the Portland-Vancouver metropolitan area and examined their relationships with surrounding land cover. We hypothesized that landscape forest cover would correlate with native and hydrophilic species in the riparian area. In each of 30 riparian sites, we recorded vegetation of all strata at 1 cm intervals along 3 transects using the line-intercept method. Land cover was characterized at 2 scales: within 500 m of each site; across the entire watershed. Multivariate analyses were used to evaluate relationships between species composition and land cover patterns. A classification tree was created to determine landscape predictors of riparian community type. Results indicated a strong relationship between watershed land cover and vegetation diversity and structural complexity. Our hypothesis of native species association with landscape forest cover in urban riparian areas was supported, but we found no clear relationship between land cover and wetland indicator status. Our results suggest that higher watershed forest cover (i.e. at least 15%) may allow the persistence of functionally diverse, native riparian vegetation communities in urban landscapes.

27 Yazzie, Kimberly – MEM Student, Portland State University  
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Advisers: Dr. Joseph Maser and Dr. Scott Burns  
Abstract: Estimating Recharge in the Columbia River Basalt Group in the Upper Umatilla Basin

Deep aquifer recharge in the Columbia River Basalt Group (CRBG) in the Umatilla River Basin, OR, is poorly understood. The long-term decline of groundwater storage and water levels in the basalt aquifers combined with increasing groundwater withdrawals present a serious environmental challenge for the Confederated Tribes of the Umatilla Reservation (CTUIR). This study will provide refined groundwater recharge estimates to help CTUIR better understand the hydrologic budget in the upper basin and inform water management decisions. The recharge estimates will further CTUIR’s goal in building a numerical model to help manage water allocation for present and future needs. The relationships between precipitation and groundwater recharge, and potential evapotranspiration and precipitation will be studied and defined. Based on the strengths and weaknesses of a variety of methods including the Deep Percolation Model (DPM), Precipitation Runoff Modeling System (PRMS), and the Variable Infiltration Capacity Macroscale Hydrologic Model (VIC), one method will be used to estimate recharge over a 40-year period in a study area of 913 mi². This study will contribute to an ongoing collaboration between CTUIR and the U.S. Geological Survey.