SESSION 1S

NOVEL APPROACHES TO CONSERVATION

Session Moderator: Bonnie Becker, Interdisciplinary Arts & Sciences (Tacoma Campus)

026 JHN
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Characterizing Microplastics of Surface Waters from the Puget Sound, Washington

Lauren Rochelle (Lauren) Johnson, Senior, Environmental Science, UW Tacoma
Mentor: Julie Masura, Environmental Science, Interdisciplinary Arts & Sciences

Plastic marine debris is found in coastal and marine waters worldwide. There has been an increase in the study of microplastics, synthetic polymers < 5 mm, throughout the world. Researchers at the Center for Urban Waters, University of Washington Tacoma have collaborated with Sound Experience, a local boat-based environmental education group, trained by our research group on sample collection. This presentation describes the 2012 and 2013 surveys of waters from Puget Sound, Washington. Undergraduate student researchers from the Center for Urban Waters analyzed the environmental samples using a wet-peroxide oxidation method. This survey measured variable concentrations of microplastics in this region’s surface water ranging from 0.05 to 31% microplastics of the dry mass with an average concentration of 7% microplastics of the dry mass. These results and their analysis in relation to environmental factors in the area lead to a greater understanding of the plastic contamination within the Puget Sound region.

POSTER SESSION 3

Trophic Status of Wapato Lake, Tacoma, WA

Alexandra Diane (Ali) Ehle, Senior, Environmental Science, UW Tacoma
Mentor: Jim Gawel, Environmental Science

Over half of the world’s population lives in urban areas. With that percentage increasing each year, enormous stress is put on the ecological health of freshwater lakes. Moreover, the urban poor are reliant on these resources for recreation and nutrition, while at the same time their health is increasingly threatened by harmful algal blooms caused by cultural eutrophication. Basic water quality monitoring data is sparse for many small lakes in Washington, despite heavy use by the public. Data collected on urban lakes using standard water quality tests are key to understanding how lakes across the country affected by anthropogenic pollution can be restored for public use. This study uses basic water quality monitoring data to determine trophic status of Wapato Lake in Tacoma, Washington. The lake has historic problems with toxic algae blooms, a result of anthropogenic nutrient input. Water samples were collected at various depths using a Niskin bottle for determination of total phosphorus and to visually identify important plankton species, both toxic and beneficial. Other water quality parameters were measured in situ, including Secchi depth and vertical profiles of temperature, specific conductivity, dissolved oxygen, pH, and chlorophyll using a multiparameter water quality probe (HydroLab MS5 or Quanta). Aquatic birds were also counted each visit, as waterfowl were shown to contribute significant nutrients to the lake in a previous study. This year-long study is still in progress. Preliminary results indicate Wapato Lake is a non-stratified lake due to shallow depth, and a very productive lake, with Secchi depth between 1.25 and 2 meters for the duration of the study. In comparison with previous years, data show an increase in maximum total phosphorus concentrations, unchanged productivity as measured by Secchi depth, and a dramatic decrease in waterfowl present around the lake. Recommendations for improvements in water quality will be presented.

POSTER SESSION 3

Physical and Microbial Drivers of Hypoxia in Bellingham Bay

Natasha Christman, Sophomore, Oceanography
Mentor: Jude Apple, Shannon Point Marine Center, Western Washington University

Bottom water hypoxia is a feature of many coastal embay-
ments and fjords in the Salish Sea. Ongoing research in Bellingham Bay (Bellingham, WA USA) by Northwest Indiana College and Western Washington University has identified a seasonally recurring area of low dissolved oxygen near the center of the bay. Similar to other regions of the Salish Sea, hypoxia in Bellingham Bay may be a naturally occurring phenomenon, yet the extent of eutrophication and anthropogenic nutrient loading’s influence on patterns of hypoxia is poorly understood. The present study has continued an established monitoring program documenting the range, duration and severity of hypoxia in Bellingham Bay, while adding an experimental component investigating factors that regulate respiration of heterotrophic bacterioplankton. Profiles of water column parameters and sample collection were performed on six regularly scheduled cruises. Dissolved oxygen concentrations below the hypoxic threshold were observed in bottom waters in the center of Bellingham Bay for most of the summer, although the layer of hypoxic water appeared to migrate upwards into the water column in late July. Manipulative experiments were conducted on collected water samples to investigate effects of temperature and organic carbon on water column respiration. These experiments revealed that temperature had a negligible effect on water column respiration, while organic carbon stimulated oxygen consumption and was thus identified as a possible limiting factor. The study’s findings broaden our knowledge of factors regulating oxygen dynamics in coastal embayments of the Salish Sea and provide further insight into the potential effects of anthropogenic stressors and climate change on Salish Sea water quality.

**POSTER SESSION 3**

**Balcony, Easel 87**

2:30 PM to 4:00 PM

**Stress Responses from Metal Pollutants of *Picea rubens* (Red Spruce) and Mycorrhizal Fungi in Forest Communities along an Elevational Gradient within the Appalachian Mountains**

*Sharon Ellen (Sharon) Hunter, Senior, Environmental Science, UW Tacoma*

*Mary Gates Scholar*

*Mentor: Erica Cline, Environmental Science, Interdisciplinary Arts & Sciences*

*Mentor: Jim Gawel, Environmental Science*

Forests in the Appalachian Mountains are downwind from coal-fired power plants and other industrial sources in the Midwest, thus forests are exposed to relatively high concentrations of metal pollutants. Despite heightened public concern and tighter regulations to reduce anthropogenic pollutants, spruce-fir forests in the Appalachian Mountains are declining. In previous work at our study site, elevated phytochelatins were correlated with red spruce (*Picea rubens*) forest decline by altitude. Phytochelatins are metal-binding peptides synthesized from glutathione, from the precursor cysteine. Phytochelatins provide a sensitive and direct indication of metals stress at the cellular level. Metal analysis in soils can reflect historical metals deposition, while lichens can reflect recent deposition. In previous research, we studied metal stress and phytochelatin production in *P. rubens* from six mountains in the Appalachian Mountains. We found that patterns of foliar uptake and PC production are complex, but appear consistent with induction by Zn and Cd in organic soil. Our current purpose was to collect data along an elevational gradient on Whiteface Mountain, New York to supplement the east-west transect data collected previously and to characterize mycorrhizal fungus communities on sapling and mature tree roots. In recent work, we i) explored elevation patterns in the dominance of mycorrhizal species using PCR, DNA sequencing, and BLAST search; ii) measured Cd, Cu, Hg, Pb, and Zn in organic soil, mineral soil and metals uptake in *P. rubens* foliage and lichens; and iii) assessed *P. rubens* phytochelatin, glutathione, and cysteine production in order to monitor ongoing changes in red spruce response to metals deposition. While there was a consistent trend of increasing Pb and Zn with elevation in mineral soils, reflecting historic deposition patterns, there was no evidence for any systematic variation in metals content of foliage with elevation. Phytochelatin and mycorrhizal analyses are ongoing.

**POSTER SESSION 3**

**Balcony, Easel 86**

2:30 PM to 4:00 PM

**Mussel Cultivation as a Mitigation Tool for Eutrophic Waters in Puget Sound, Washington**

*Ashley Nicole (Ashley) Lawton, Senior, Environmental Science, UW Tacoma, Tacoma Dual Enrollment*

*Mentor: Bonnie Becker, Interdisciplinary Arts & Sciences (Tacoma Campus)*

Eutrophication, an excess of nutrients from anthropogenic sources, can lead to a range of environmental problems including hypoxia and loss of biodiversity. This study, a collaboration between University of Washington Tacoma and the Pacific Shellfish Institute, examined the potential of using mussel cultivation as a mitigation tool in eutrophic waters. Mussels are filter feeding bivalves that have the ability to remove nitrogen and other nutrients from the water through bioextraction. Artificial habitats similar to what is used in mussel farming were created in Budd Inlet Olympia, WA and in the Thea Foss Waterway Tacoma, WA to collect naturally occurring sets by the native bay mussel *Mytilus trossulus*. The purpose of this study is to determine the viability of mussels as a tool for remediation in Puget Sound by monitoring their growth, biomass and nutrient content. We are examining how various factors such as location, depth, time of deployment,
and season affect a range of parameters, in order to create a set of best practices for future mitigation work. Next steps include the composting of resulting biomass, and analysis for pollution uptake within the mussels.

**Poster Session 3**

**Balcony, Easel 88**

2:30 PM to 4:00 PM

**Effects of Forest Soil Inoculation on Conifer Seedling Mycorrhizal Diversity as Preparation for Planting at the Elwha Restoration Site**

Rachel E. Struck, Junior, Environmental Science, UW Tacoma

Julia M. Dolan, Junior, Environmental Science, UW Tacoma

Lisa A. (Lisa) Hamaker, Senior, Computer Science and Systems, Environmental Science, UW Tacoma

Pedro Chong Mendoza, Senior, Environmental Science, UW Tacoma

Mentor: Erica Cline, Environmental Science, Interdisciplinary Arts & Sciences

After removing the Elwha dam, sediments were exposed which pose a challenge for revegetation, due to lack of nutrients and organic matter. Ectomycorrhizal fungi (EMF) are known to facilitate uptake of nutrients and water and therefore effective colonization of seedlings would be expected to promote seedling establishment, survival and growth. Seedlings were planted in nursery potting soil mixed with local forest soil, compared to potting soil alone, to determine whether this practice will promote colonization and diversity of EMF on *Abies grandis* (grand fir) and *Pseudotsuga menziesii* (Douglas-fir) seedlings before outplanting at the Elwha restoration site. EMF species will be identified by examining morphology and then, for each morphotype, DNA extraction, PCR using ITS-1F and ITS-4 primers, and sequence analysis will be used to compare sequences to published fungal sequences using the BLAST algorithm. While molecular analyses are not yet complete, preliminary analysis of morphotypes revealed a consistent trend of increased diversity due to inoculation, based on an increased number of unique morphotypes per seedling, from 3.8 to 4.5 for grand fir, which was not significant, and from 4.2 to 5.6 for Douglas-fir, which was weakly significant (2 tailed t-test, p=0.093). This suggests that pre-inoculation with forest soil may promote colonization and therefore aid in restoration efforts.