Online Proceedings

Session 1N

McNair Session - Problems of Access, Sustainability, and Health in the Social and Physical Environment

Session Moderator: Clarence Spigner, Health Services
MGH 287
12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Predicting Streamflow, Snowpack, and Stream Temperature Sensitivities to Climate Change in the Pacific Northwest's Green River Basin
Jane Harrell, Senior, Atmospheric Sciences: Climate
McNair Scholar
Mentor: Bart Nijssen, Civil and Environmental Engineering
Mentor: Yifan Chang
Mentor: Andrew Bennett

Climate change will have significant impacts on Pacific Northwest hydrology. Rising temperatures and shifts in precipitation will lead to changes in snowpack, runoff, and streamflow timing, impacts that will have implications for water and environmental resource management. The Pacific Northwest's Green River Basin is a valuable water supply and provides habitat to several cold-water aquatic species including the threatened Puget Sound Chinook salmon, but also has a major flood risk. Streamflow in the basin is seasonally regulated for flood prevention and ecosystem health, and changes in the annual hydrologic cycle will have consequences for flood risk and ecosystem habitat. To investigate the implications of climate change on streamflow, snowpack, and stream temperatures in the Green River Basin, climate sensitivity analysis and future climate impacts are simulated using two watershed models with varying spatial and process complexity: 1) the conceptual Snow17/Sacramento Soil Moisture Accounting model (Snow17/Sac) implemented with two elevation zones and 2) the process-oriented Structure for Unifying Multiple Modeling Alternatives (SUMMA) model implemented using twelve USGS HUC-12 subareas. Stream temperature climate sensitivities are modeled using the River Basin Model (RBM) Semi-Lagrangian Stream Temperature model. Future climate change impacts on basin hydrology and stream temperatures are assessed using an ensemble of statistically downscaled climate projections from 34 Global Climate Models (GCMs) run as part of the Intergovernmental Program on Climate Change 5th Assessment Report. The future warming scenarios show moderate changes in streamflow volume, shifts in streamflow timing, and reductions in snowpack, which differ depending on the watershed model. The presentation provides key results and findings from the study, and comments on potential impacts on stream temperature and fish.

Poster Session 2

MGH 206, Easel 172
1:00 PM to 2:30 PM

Phenotypic Plasticity and Transgenerational Epigenetic Modification of *Arabidopsis thaliana* in Response to Variable Conditions Predicted with Climate Change
Jackelyn Tolentino Garcia, Senior, Biology (Bothell Campus)
Mary Gates Scholar
Mentor: Cynthia Chang, Biology
Mentor: Thelma Madzima, STEM - Biological Sciences

With our rapidly changing climate, plant communities are predicted to experience more variable conditions. Climate change predicts that there will be longer periods of drought followed by heavy rainfall at unpredictable intervals. With this, plants may experience selective pressures to combat the stress that come with these variable conditions, which ultimately may influence plant evolution. Phenotypic plasticity and epigenetic modification are two factors we believe may strongly influence the adaptative ability of plants. I predict that these variable conditions will promote phenotypic plasticity and epigenetic "memory" (where plants' stressful experience can be inherited from parent to offspring), and potentially help offspring plants cope with the same abiotic stress. We have implemented an experimental design mimicking the predicted variable conditions of climate change. For two generations, we exposed plants to either drought or non-drought conditions. Then in the third generation, we took seeds from parents that experienced those conditions and exposed them to either drought, non-drought, or variable watering in a cross-replicated design. I hypothesize that there is inherited epigenetic memory, and that the different treatment groups will pass memory that will benefits plants if the offspring was exposed to the same condition its parent expe-

rienced.

SESSION 2R

NEW TREATMENTS FOR OLD DISEASES

Session Moderator: Benjamin Freedman, Medicine/Nephrology

JHN 111

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Chitosan-Based Tissue Scaffolds for High-Throughput Screening of Human Glioblastoma Therapeutics

Colin Alexander Lester, Senior, Mat Sci & Engr: Nanosci & Moleculr Engr
Mentor: Miqin Zhang, Materials Science & Engineering
Mentor: Olivia FC Chang, Materials Science and engineering

Glioblastoma multiforme (GBM) is a highly aggressive variant of brain cancer that has been a focal point of chemotherapeutic development for years. However, initial drug screening using traditional *in vitro* culture of GBM cells frequently produces encouraging results that do not translate well to animal models and clinical application. To address this disparity, implementation of three-dimensional tumor modeling can better emulate the microenvironment that tumor cells experience *in situ*, improving accuracy of early *in vitro* screening. We developed two chitosan-based polymer blends to produce biocompatible, porous scaffolds that mimic the extracellular matrix and promote cell adhesion. Scaffold production was done in 96-well cell culture plates for high-throughput drug screening with a large sample size. These scaffolds were used to grow human GBM cell lines U-118 MG, U-87 MG and GBM6 for 14 days, confirming cell compatibility with the materials and promoting formation of tumor spheroids. The cultures were treated with the established chemotherapeutic agent temozolomide (TMZ) for 72 hours, and cells were then tested for metabolic activity using the Alamar Blue resazurin assay. We demonstrated increased resistance to chemotherapeutics in cells with this induced morphology relative to cells grown in two-dimensions for all cell lines and both scaffold compositions. Additionally, based on gene and protein expression analysis, GBM cell spheroids more strongly expressed cancer stem cell characteristics and greater malignancy. The presence of GBM resistance to chemotherapy and enhanced characteristics associated with *in situ* tumors indicates the potential of using chitosan-based tissue scaffolds for more accurate high-throughput screening of novel GBM treatments.

POSTER SESSION 4

MGH 241, Easel 128

4:00 PM to 6:00 PM

Boom and Bust: Successional Shifts and New Additions to the Ground Beetle (Coleoptera:Carabidae) Community on Mount St. Helens

Camilo Jose Acosta Garcia, Senior, Biology (Bothell Campus)
Mary Gates Scholar
Mentor: Michele Price, STEM-Biology
Mentor: Cynthia Chang, Biology

Mount St. Helens erupted on May 18, 1980, demolishing an area of 600km2 and removing all fauna and flora in the area north of the mountain. The eruption converted the substrate in the area into a mixture of pumice pebbles and ash. Research has shown that ground beetles (Coleoptera: Carabidae) comprise 14% of the total beetle diversity out of 39 families observed making this the second most abundant family in the study area. Ground beetles are often used as bioindicators for ecosystem response along disturbance gradients. Their well-known taxonomy and short reproductive cycle make them effective monitors of ecosystem changes over time. Carabids have unique sensitivity to the changes of microhabitats during the progression of succession, seen through the loss and gain of species in the population over time as the successional landscape changes. My study aims to determine whether assemblages of ground beetles remain a model for relay successional patterns, as well as contribute to the ongoing monitoring of invertebrate biodiversity in this post eruption landscape. Pitfall traps were used to monitor carabid diversity at three locations: along Spirit Lake and two locations on the pumice plains. Traps were put in transects of five set 10m apart and checked weekly to ensure changes in phenology and species diversity over time were recorded. Over 300 carabid specimens and 20 carabid species were caught, with two species not previously recorded in the study area: *Pterostichus lama*(Ménétriés) and *Agonum cupreum*(Dejean). *Agonum cupripenne*(Say) was found in great abundance along Spirit Lake and in much higher numbers than previously recorded. This example may suggest the "boom and bust" model for carabid community assembly remains valid 40 years after successional processes began in this ecosystem.