UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

Online Proceedings

Poster Session 1

MGH 241, Easel 137

11:00 AM to 1:00 PM

Understanding Seattle's Water Resources through the Half of 21st Century

Kateryna Gomozova, Fifth Year, Civil Engineering
Mary Gates Scholar
Mentor: Bart Nijssen, Civil and Environmental Engineering
Mentor: Oriana Chegwidden, Civil and Environmental Engineering

Freshwater is one of the most valuable resources in Washington State. In recent decades, water supply has been affected due to climate change and population growth. Understanding changes in water supply and demand is crucial for ensuring an abundance of water for residential, economic, and industrial needs. The proposed research analyzes changes in the streamflow regime of the Cedar and Tolt Rivers which provide drinking water for the greater Seattle area. The main goal is to calculate the water budgets for the Cedar and Tolt watersheds and estimate how the inputs and outputs to these budgets change over the 21st century. An existing ensemble of streamflow projections for the Cedar and Tolt Rivers are used to analyze changes in water supply. The mean streamflow for each month is compared between a 30-year control period (water years 1971-2000) and a 30-year future period (water years 2031-2060). For each of these periods, I determine "optimistic" and "pessimistic" scenarios for the streamflow. For the "drought" month the highest streamflow value is considered as "optimistic", and the lowest as "pessimistic" since the goal is to assess potential shortages. I use existing monthly demand values provided by Seattle Public Utilities and create different future scenarios, based on the predictions of population and employment growth. Supply and demand values are compared to evaluate (1) the potential for water shortage and (2) water management and conservation methods to satisfy the unmet demand. One potential water management method is the construction of a new reservoir. The results of the research are aimed at helping to inform society and water managers about the potential changes in the water system. Based on this information, they might be able to introduce changes in their future plans to accommodate the predicted needs.

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.