American Water Resources Association
2009 SPRING SPECIALTY CONFERENCE
Managing Water Resources Development in a Changing Climate
May 4-6, 2009
Anchorage, AK

Tuesday, May 5
3:30 PM – 5:00 PM
Session 24: Economic, Engineering and Science Impacts

2. Assessment of Learning Experiences of Undergraduate Researchers in an NSF/REU Site on Watershed Sciences and Engineering - Vinod Lohani, Vriginia Tech, Blacksburg, VA (co-author: Tamim Younos)

Education of young professions in critical research issues in watershed sciences is an important component of developing sustainable water management systems. This paper documents authors' experiences of implementing a successful NSF/REU site on watershed sciences and engineering at Virginia Tech. Faculty representing civil engineering, environmental engineering, geology, biology, crop and environmental sciences, environmental chemistry, water resources, etc. acted as research mentors. The goal of the site is to provide a diverse group of undergraduate students a stimulating interdisciplinary environment, where critical research questions within watershed sciences and engineering are addressed and their analytical skills and creativity as future scientists and engineers are nourished. Eight highly qualified students, hereafter referred to as REU fellows, were recruited each in summer 2007 and 2008. REU fellows came from a variety of disciplines including chemistry, ecology, geology, environmental, industrial, and electrical engineering. They conducted 10-week long research projects focusing on a variety of topics including ecological stoichiometry, microbial source tracking, cycling of metals in aquatic environments, drinking water chemistry, watershed instrumentation, LabVIEW enables watershed assessment system, and water-energy nexus. In order to improve communication skills, weekly seminars were organized. Fellows made periodic presentations of their research, prepared a final research report, and submitted a reflection essay. Assessment of learning outcomes was conducted by two external experts in academic assessment. One expert conducted pre- and post tests and focus group interview during the summer when fellows conducted their research and another expert met with the authors during fall to review the summer activities and made recommendations for further improving the learning experiences of fellows. Authors will share their experiences from 2007 and 2008 summer sessions and will also present brief research results of fellows who worked under their supervision.

3. NASA's Applied Science Program - Ted Engman, NASA/GSFC, Greenbelt, MD (co-authors: Steven Ambrose, Jared Entin, David Toll)

NASA's Earth science program develops a scientific understanding of Earth's system and their response to natural or human-induced changes and to improve prediction of climate, weather and natural hazards. NASA's Applied Science Program has the objective to accelerate the use of NASA science results in applications by helping to solve problems important to society and the economy. The primary goal of the Earth Science Applied Science Program is to improve future and current operational systems by infusing them with scientific knowledge of the Earth system gained through space-based observation, model results, and development and deployment of enabling technologies, systems, and capabilities. Water resources is one of nine elements in the Applied Sciences Program and it addresses concerns and decision making related to water quantity and water quality. The goal of the Water Resources Program is to encourage water management organizations to use Earth science data, models, technology and other capabilities in their decision support tools for problem solving related to water resource management Examples of the types of NASA contributions to the water management community include such possibilities as: • Using satellite observations to estimate hydrologic variables, i.e, snow water equivalent, soil moisture, aquifer volumes, reservoir storages, etc. • Model derived products, i.e., evapotranspiration, precipitation, runoff, ground water recharge, and other data assimilation products, etc. • Water quality, i.e., improved inputs from NASA models and satellite observations to nonpoint source models, turbidity, temperature, etc. Activities in the Applied Sciences Program are encouraged to follow a systems engineering approach to document the degree of success resulting from the adaptation of NASA science products into an operational environment. The activities are carried out through competitive grants that are peer reviewed to insure that they are technically feasible and address high priority Program goals. This paper uses examples to describe the Water

Resources Applied Sciences Program and the potential opportunities for using NASA science products for problem solving. The paper also describes how governmental, private and academic organizations can participate and compete for NASA support to enhance their problem solving mandates.

4. Spatially-explicit Economic Impact Assessment of Climate Change on the Water Resources of the Willamette River - Heejun Chang, Portland State University, Portland, OR (co-authors: Ilwon Jung, Brian Block, Sarah Praskievicz)

The water resources of the Willamette River basin in the Pacific Northwest (PNW) of America rely on winter precipitation and associated snowmelt in subsequent seasons. Changes in the timing and amount of runoff as a result of rising temperature and the redistribution of precipitation would have significant impacts on regional water resources. Recent general circulation model simulations project rising summer temperature and more precipitation in the winter months in the PNW. We use a hydro-economic model combined with a US Geological Survey's Precipitation Runoff Modeling System (PRMS) to determine the economic impacts of climate change on the various water use sectors. We use downscaled climate change scenarios at a 1/16 degree from the 4th assessment of the IPCC report to derive input climate data for the PRMS model. Once a range of runoff change scenarios are generated from the PRMS model, we then assess the benefits and costs of different water sectors, including hydropower generation, flood control, and municipal and agricultural water uses for a spatially-oriented water management. While annual runoff is not likely to change substantially, a reduction in summer flows is likely to have significant economic and ecological impacts on the regional water resources. The findings of this study suggest a possible locally-specific adaptive water management strategy for reallocating water for different water users in a changing climate.