WATER RESOURCES RESEARCH CENTER

Supporting Research, Education, and Outreach on Water Resources Issues

MISSION

WRRC is a center within The Environmental Institute whose mission is to support research, education, and outreach on water resources issues of state, regional, and national importance as part of the national system of institutes authorized under the Water Resources Research Act of 1964.

VISION

- To serve as the liaison between federal, state and local representatives and water/environment expertise at UMass Amherst
- To address water resource needs of the Commonwealth and New England through research, creative partnerships, and information transfer
- To actively engage federal and state agencies in interdisciplinary University water resources research, education and outreach efforts

WORKSHOP SERIES

The WRRC Workshop Series provides faculty, students, regulators, industry, consultants, agencies, non-profits and the general public forums in which to share water resource research needs, results, and visions for the future. The workshops planned include

- Fluvial Geomorphology Workshop
- Glass Half Full: Valuing Water in the 21st Century (partnership with Tufts University)
- Rivers Calendar Symposium: Effects of Climate Change on Phenology of Riparian Systems
- Water Managers Workshop

RESEARCH

Research Grants

The Center supports faculty and graduate student water resources research related to impacts of climate change on water resources, long-term environmental monitoring, hydrologic modeling, watershed planning, management, protection, and policy.

2011 Research Awards

The Water Center is funding a research project headed by Dr. Andrew Ramsburg of Tufts University entitled ***Elucidation of the Rates and Extents of Pharmaceutical Biotransformation during Nitrification***. The objective of this project is to assess pharmaceutical attenuation within water treatment systems designed and operated for enhanced nutrient removal. It will integrate laboratory experiments and mathematical modeling to quantitatively assess the fate of pharmaceuticals during nitrification in wastewater treatment facilities.

Four graduate student projects are also funded:

- ***Assessing Human Impacts and Contaminant Trapping within Oxbow Lake, Northampton, Massachusetts***, overseen by Dr. Jonathan Woodruff of UMass Amherst Geosciences. He proposes to obtain sediment and associated heavy metal inventories in the Connecticut River floodplain to evaluate changes in the rate of deposition since the formation of the floodplain lake in 1840 AD.
- ***Authentic Research Projects for Undergraduates based on Groundwater Contamination Issues Related to Arsenic***, under the supervision of Dr. Julian Tyson of UMass Amherst Chemistry. Tyson's project uses the issue of arsenic pollution in groundwater to train future water resources professionals by creating authentic research experiences for first-year undergraduates under mentorship from his graduate students.
- ***A Remote Sensing Algal Production Model to Monitor Water Quality and Nonpoint Pollution in New England Lakes***, supervised by Dr. Mi-Hyun Park of UMass Amherst Civil & Environmental Engineering, will use remote sensing to monitor the spatial and temporal distributions of algal blooms and to develop algal production models in Lake Champlain, with application to other New England lakes.
- ***Monitoring and Understanding Water Quality at Three Potential Charles River Swimming Sites***, led by Dr. Ferdi Hellweger of Northeastern University Civil & Environmental Engineering, focuses on monitoring and understanding water quality at three potential Charles River swimming sites over a wide range of precipitation events, to relate high-resolution data to long-term monitoring data collected by CRWA and MWRA. This study will also relate data to dam operation and wind variables.

Recent Research Awards:

- ***Characterizing and Quantifying Recharge at the Bedrock Interface*** by David Boutt and Stephen Mabee of Geosciences at UMass Amherst
- ***Developing a Physically-Based and Policy-Relevant River Classification Scheme for Sustainable Water and Ecosystem Management Decisions*** by Ellen M. Douglas of Environmental, Earth and Ocean Sciences of UMass Boston
- ***An Assessment Methodology for Differential Impact on Environmental Justice Populations of Releases of Industrial Toxics to Water in Massachusetts*** by Michael Ash of Economics at UMass Amherst

- ***Estimation of Climatic and Anthropogenic Influences on Freshwater Availability*** by Yushiou Tsai with Richard Vogel of Civil & Environmental Engineering, Tufts University
- ***Monitoring and Modeling Chromophoric Dissolved Organic Matter in Neponset River and Boston Harbor Using GIS and Hyperspectral Remote Sensing*** by Qian Yu of Geosciences at UMass Amherst
- ***Characterization of Wastewater Effluent from Western Massachusetts Publicly-owned Treatment Works Using Metaproteomic Analysis*** by Pamela Westgate with Chul Park of Civil & Environmental Engineering at UMass Amherst
- ***Characterization of Flow and Water Quality of Stormwater Runoff from a Green Roof*** by Suzanne LePage with Paul Mathisen at Worcester Polytechnic Institute
- ***Bacterial Toxicity of Oxide Nanoparticles and Their Adhesion*** by Wei Jiang with Baoshan Xing of Plant, Soil and Insect Sciences at UMass Amherst

CURRENT PROJECTS

Acid Rain Monitoring Project

The Center coordinates annual volunteer sampling of 150 surface water sites across Massachusetts for analytes indicative of the long term effects of acid deposition. In addition, the Center makes available the full ARM database (more than 40,000 records from nearly 4,000 lakes and stream collected since 1983) through the web. Results point to a slight improvement in acidity of surface waters due to the reduction in sulfur dioxide emissions, with no reduction in nitrates in water. Cation analyses also show an increase in salt in Commonwealth waterways.

Stormwater BMP Clearinghouse

The Center is working on a stormwater clearinghouse project that enables users to search a web based database for stormwater Best Management Practices (BMPs) and find innovative technologies available to treat stormwater.

The Stream Continuity Project

The Center is working with UMass Extension to inventory and address barriers to fish movement and stream continuity created by road crossings, and maintains a database of New England crossings surveys. WRRC's involvement includes volunteer survey coordination and management of a database of surveyed crossings in Massachusetts, Vermont, New Hampshire, Rhode Island and Connecticut. The project will result in a priority scheme for culvert replacement on a watershed basis.

Blackstone River Water Quality Study

The Blackstone River Water Quality Study assesses existing water quality conditions, identifies sources and quantifies pollutant loads to the river, develops modeling tools for determining the fate and transport of nutrients along the river, to evaluate the effectiveness of various management strategies for improving water quality and ecosystem health along the Blackstone River. Sampling is conducted May through December to determine nutrient and chlorophyll levels and to assess macrophyte coverage.

Information Technology

The Center is active in exploring **Information Technology** applications for formal and informal education; in an NSF-funded project involving four botany courses on the Amherst and Boston campuses; in the Connecticut River Tri-State initiative which addresses major bacterial pollution; and in The River's Calendar phenology monitoring project with Trout Unlimited.

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The WRRC is affiliated with the Center for Agriculture in the College of Natural Sciences.