



# WATER RESOURCES RESEARCH CENTER

## Supporting Research, Education, and Outreach on Water Resources Issues

### MISSION

WRRC is a center within The College of Natural Sciences 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, and
- ▶ 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 for 2013 include:

- Approaches for Quantifying Groundwater - Surface Water Interactions in the Northeast U.S.,
- Prioritization of Stream Restoration Sites for Maximum Stream Ecological Benefit,
- Water and Agriculture, and
- Water Sustainability from Land to Stream.

### RESEARCH

#### Research Grants

The Center supports faculty and graduate student water resources research related to

water resources including water quality, long-term environmental monitoring, hydrologic modeling, watershed planning, management, protection, policy and the impacts of climate change.

#### 2012 Research Awards

The WRRC has partnered with Dr. Bruce Jackson and colleagues at MassBay Community College to excite nontraditional high school (HS) scholars by engaging them in the design, construction, and utilization of a Robotic Underwater Sampling and Surveillance (RUSS) system. The prototype submersible RUSS vehicle will be utilized to measure the levels of submerged aquatic vegetation (SAV) blooms in the Charles River (MA) at the organismal, molecular and atomic levels.



Four graduate student projects are also funded:

- ▶ *Elucidating the Impact of Upgrading Wastewater Treatment for Nitrogen Removal on Eutrophication and Toxic Algal Bloom in Long Island Sound*, overseen by Dr. Chul Park of UMass Amherst Civil and Environmental Engineering. This project evaluates the true impact of upgrading waste water treatment facilities for nitrogen re-

moval on receiving water eutrophication and toxic algal bloom.

- ▶ *Modeling of Road Salt Contamination and Transport in Ground Water*, under the supervision of Dr. Rudolph Hon, Department of Earth and Environmental Sciences, Boston College. Hon's project monitors and models road salt impact on water quality in a Norwell, Massachusetts aquifer, to determine subsurface road salt pathways toward public wells.
- ▶ *Land Use, Land Cover and Stormwater Management in Massachusetts Under Conditions of Climate Change: Modeling the Linkages*, by Elizabeth Brabec of UMass Amherst Landscape Architecture and Regional Planning. Brabec's project develops land use and stormwater management models to provide a basis for understanding the effectiveness of stormwater best management practices (BMPs) at the neighborhood scale and demonstrates the need for integrating non-structural BMPs into watershed scale planning. The project will provide guidance for mitigation of flood risk under climate change scenarios in the Boston Metro Area and other urbanized watersheds.
- ▶ *Biopolymer Sorbents for Tungsten Removal*, led by Jessica Schiffman of the UMass Amherst Department of Chemical Engineering. Schiffman is designing and synthesizing the renewable biopolymer chitosan into novel nano-constructs that will efficiently remove tungsten from dilute aqueous solutions.

#### 2013 Research Awards:

- ▶ *Triclosan in Wastewater Effluent*, by Dr. Jonathan Roling of Bridgewater State University.
- ▶ *Linking groundwater heatflow to fish habitat in stream catchments with till-mantled bedrock*, by Dr. David Boutt of UMass Amherst Geosciences.

- ▶ *A modeling framework for integrating climate, environment, and biology*, by Dr. Austin Polebitski of UMass Amherst Civil & Environmental Engineering.
- ▶ *Nitrogen loading to northeast estuaries: lessons from science*, by Christopher Neill of Woods Hole Marine Biological Laboratory (MBL).
- ▶ *Acid rain response and recovery in New England forests: application of the novel calcium isotope tracer to the Hubbard Brook streamwater sample archive*, by Dr. Andrew Kurtz of Boston University Dept. of Earth & Environment.



### 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

This study has been conducted jointly by WRRC and CDM Smith, building upon earlier work conducted by the USGS. Over the years, it has included both data collection and analysis and modeling of surface water flow and quality. Currently sampling is conducted April through November to determine nutrient and chlorophyll levels, macrophyte coverage, and river response to reduced pollutant loads. A computer model of the Blackstone River watershed enables evaluation of the effectiveness of future pollution control strategies on downstream river quality.



### Information Technology

The Center is active in exploring **Information Technology** applications for formal and informal education including an NSF-funded project involving four botany courses on the Amherst and Boston campuses, the Connecticut River Tri-State

initiative which addresses major bacterial pollution, and The River's Calendar phenology monitoring project with Trout Unlimited.

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## 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. Analyses also show an increase in salt in Commonwealth waterways. See <http://wrrc.umass.edu/research/acid-rain-monitoring-project>.

### 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. See <http://www.mastep.net/>.

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