

# WATER NEWS



Winter 2009 – Spring 2010  
Volume 10 Issue 2

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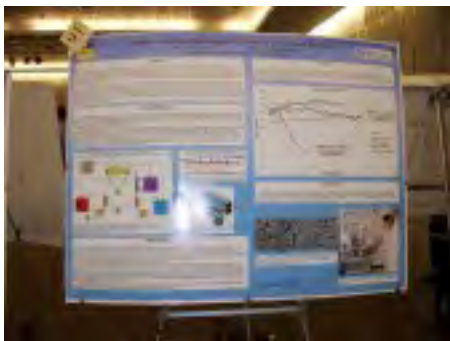
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## DWRC Annual Luncheon and Poster Session – April 23, 2010

At the University of Delaware's Trabant University Center, 2009-10 **DWRC** interns, graduate fellows, advisors, and **DWRC** Advisory Panel members enjoyed lunch and learned about research projects and interests. After lunch, the Advisory Panel held its annual meeting. The interns went on to discuss posters summarizing their projects as part of the larger UD 2010 Undergraduate Scholars poster session.



The posters of 2009-10 **DWRC** interns (from left to right below): Victoria Bryan, Aaron Hallett, and Suneil Seetharam  
(All April 23, 2010 photos by M. Pautler)



### DWRC Annual Poster Session – April 23, 2010



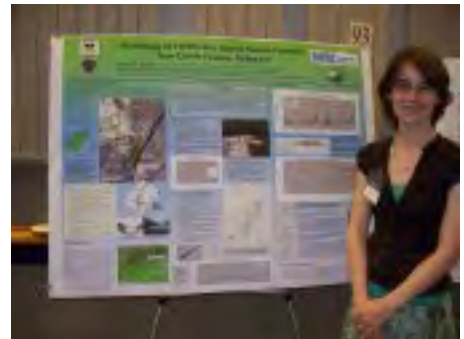
"With the assistance of Dr. Duke, I was able to develop a research question that would allow me to further explore connections between law, economics and environmental management. The **DWRC's** generous funding allowed me to study this intersection in the context of the Delaware River Basin Compact, an important river governance law that required further analysis, specifically in the context of other federal environmental laws. Our work, which concluded that compacts may not be as efficient as previously suggested, has important ramifications for interstate water management. My experience with the **DWRC** was beneficial to developing my research and analytical skills, and provided me with an opportunity to engage in significant and timely research, an experience that I will draw on greatly in future academic and professional endeavors."

– *Michael Ruppel*

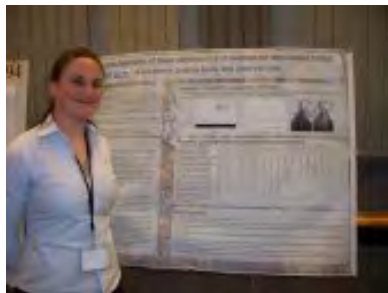


"My two internships with the **DWRC** have been a truly wonderful experience. Now, as I go on to pursue a masters' degree next year, I will already have many of the research skills I need!" –

*Kelsey Lanan*



"Through my research, I developed an appreciation for organisms as seemingly simple as fungi for their abilities to aid us in some of our most complex environmental problems, like soil contamination, in my case." – *Brian Jayne*



2009-10  
**DWRC**  
interns  
(clockwise  
from top left):  
Anna Bevan,  
Megan  
Furman,  
Emily Olson,  
and Jennalee  
Rufft



Established in 2000, the **DWRC's** undergraduate internship program has supported more than 100 water resources research and education projects. Undergraduate student interns at the University of Delaware and Delaware State University, working with faculty advisors, have conducted projects covering a diverse range of water-related topics. Some examples of their research, and a complete list of all internship projects, are provided in the brochure published by the **DWRC** found, at <http://ag.udel.edu/dwrc/internships.html>. To request a hard copy, please e-mail the Editor ([mpautler@udel.edu](mailto:mpautler@udel.edu)).

### INTRODUCING OUR 2010-11 SPRING INTERNS



The 2010-11 Spring interns are shown attending a welcome meeting, along with their advisors, on June 2, 2010. (Photo by M. Pautler)

**Intern: Kristin Berry**

**Advisor: Ms. Rebecca Rothweiler, Delaware Department of Natural Resources and Environmental Control & Ms. Katy O'Connell, UD College of Agriculture and Natural Resources Education and Outreach for the Delaware Wetlands**

**Intern: Aidan Galasso**

**Advisor: Dr. Janet Johnson**

**UD Department of Political Science & International Relations**

An Analysis of the Impact of Marcellus Shale Development on Water Resources in Pennsylvania

**Intern: Stephanie Hahn**

**Advisor: Dr. Anastasia Chirnside  
UD Department of Bioresources Engineering**

The Use of Recycled Water for Irrigation of Turf and Landscape Plants

**Intern: Mara Hyatt**

**Advisor: Dr. Eric Wommack**

**UD Department of Plant and Soil Sciences**

The Prevalence of Pathogenic Bacteria in Delmarva Waters from a Virus Point of View

**Intern: Michelle Lepori-Bui**

**Advisor: Dr. Delphis Levia  
UD Department of Geography**

A Watershed Scale Forest Inventory of the Fair Hill Natural Resource Management Area Experimental Watershed in Relation to Precipitation Partitioning

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## **DWRC** Spotlight on Undergraduate Internships

**Intern: Kate Miller**

**Advisor: Dr. Janet Johnson**

**UD Department of Political Science & International Relations**

The Impacts of Redefining “Navigable Waters” under the Clean Water Act



(Page 5 photos by D. Quigley)

**Intern: Kevin Myers**

**Advisor: Mr. A. Scott Andres**

**Delaware Geological Survey**

Characterization of Submarine Groundwater Discharge Sites in a Coastal Lagoon

**Intern: Jasmine Porter**

**Advisor: Dr. Gulnihal Ozbay**

**Delaware State University Department of Agriculture and Natural Resources**

Oyster Restoration Efforts at Delaware Inland Bays: Utilizing Rip-Rap as a Substrate for Oysters



**Intern: Suneil Seetharam**

**Advisor: Dr. Shreeram Inamdar**

**UD Department of Bioresources Engineering**

Quality of Dissolved Organic Matter in Runoff from Various Watershed Sources

**Intern: Courtney Simmons**

**Advisor: Dr. Steven Hastings**

**UD Department of Food and Resource Economics**

The History and Effectiveness of Wetland Mitigation



**Intern: Hannah Starke**

**Advisor: Mr. Chad Nelson**

**UD Department of Plant and Soil Sciences**

Resurfacing Silver Brook Stream and Comparison to Connected Water Bodies



**Intern: Katie Yost**

**Advisor: Dr. Douglas Tallamy**

**UD Department of Entomology and Wildlife Ecology**

Assessment of Changes in Invertebrate Populations Resulting from Wetland Restoration

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## DWRC Spotlight on Graduate Research

**DWRC** graduate fellow Maryam Akhavan continues to pursue her Ph.D. at UD, working on the project, “Modeling Hydrologic and Geochemical Effects of Land-Based Wastewater Disposal,” under the co-supervision of Mr. Scott Andres, Delaware Geological Survey and Dr. Paul Imhoff, UD Civil and Environmental Engineering. For the 2009-10 academic year, Maryam summarized her work as follows:



*Maryam Akhavan explains her research project on April 23, 2010. (Photo by M. Pautler)*

“Land-based wastewater disposal (LBWD) systems are used extensively in the Mid-Atlantic region. While spray irrigation and large community septic systems are the most common methods of LBWD, because of rising land costs rapid infiltration basin systems (RIBS) are increasingly employed. In RIBS treated wastewater is infiltrated at high rates in a basin where further treatment occurs in soils and the vadose zone before the water recharges groundwater. Because the influent wastewater is usually enriched in nitrogen and phosphorus compounds, there is particular concern that a RIBS may contaminate groundwater or nearby surface waters if not designed and operated properly.

RIBS are operated in repetitive cycles of flooding, infiltration, and drying. Key operational parameters include the ratio of wetting to drying time and the hydraulic loading rate, which affect pollutant residence time and nitrogen and phosphorus loads to the aquifer. They also alter water saturation and air content of the soil, which have an impact on nitrogen removal via denitrification. Optimum values of the wetting-drying cycle ratio and the hydraulic loading are expected to vary with the quality of applied wastewater, soil type, treatment objective, and climate. Wastewater is typically distributed at a limited number of discharge points in RIBS and basins are not usually completely flooded. Instead, use of a low loading rates, limited discharge points, and the overdesign of the required infiltration area causes non-homogeneous distribution of wastewater and unusual surface water flow patterns. For this reason, consideration of surface water flow coupled with subsurface flow is essential for simulating water movement and contaminant transport beneath the basins.

In this study, numerical modeling is used to investigate the effect of different wastewater application rates and soil parameters on the hydraulic performance and treatment efficiency of RIBS. TOUGH2, a general-purpose numerical simulation program for multi-phase fluid flow in porous media, is used for modeling fluid movement. TOUGHREACT-N will be used to look at the fate of nitrogen and phosphorus. In work to date we have focused on the hydraulic aspects of RIBS performance. A major result has been to recognize the importance of surface water flow in RIBS operations, which required us to modify TOUGH2 to include both surface and subsurface water flow to investigate the influence of non-uniform application of wastewater on RIBS performance. We are the first to examine the interaction of surface and subsurface flow on wastewater distribution beneath RIBS. In order to obtain optimum values for the wetting-drying cycle ratio and hydraulic loading rate, alternative loading cycles and application rates were tested for different soil types and conditions. These results indicate that using a long flooding cycle causes the saturated water front to extend to greater depth than shorter cycles. Simulations on the hydraulic aspects of RIBS operation will be completed in summer 2010, after which we will initiate simulations of nitrogen and phosphorus transport. The goal of this work is to develop a modeling framework to describe RIBS performance, validate this framework using data from a recently completed field study by the Delaware Geological Survey at the Cape Henlopen State Park RIBS, and then use our approach to develop general guidelines for the design and operation of RIBS.”

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The **DWRC** is pleased to announce the award of the following two graduate student fellowships:

“Quantifying the Role of Carbon Amount and Quality for Transport of Contaminants on Our Landscapes: A Watershed Scale Model”

Faculty Advisor: Dr. Shreeram Inamdar, UD Bioresources Engineering

Ph.D. Candidate: Mr. Gurbir Dhillon, UD Plant and Soil Sciences, starting in Fall 2010

“Microbiome of the Eastern Oyster, *Crassostrea virginica*”

Faculty Advisor: Dr. K. Eric Wommack, UD Plant and Soil Sciences

Ph.D. Candidate: Mr. Eric Sakowski, UD Biological Sciences, starting in Fall 2010



Scott Andres and Edward Walther of the Delaware Geological Survey presented **Development and application of a GIS screening tool for assessing suitability of land for rapid infiltration basin systems** and Andres participated in a panel discussion co-sponsored by the U.S. Subcommittee on Groundwater, **National Ground Water Monitoring Network: Listening Session**, both at the National Ground Water Association Summit, held April 12-15, 2010, in Denver, CO.



## DWRC Notices and Calendar

### UPCOMING MEETINGS

#### **Delaware Section of the American Water Resources Association (AWRA) & the Delaware Student Section of the AWRA**

Visit <http://www.deawra.org/> or contact [de.awra@gmail.com](mailto:de.awra@gmail.com) for information and updates

Oct. 12 - Nov. 15, 2010 – 3<sup>rd</sup> annual scavenger hunt

Oct. 26, 2010 – The Water Resources Association of the Delaware River Basin Fall Conference will be held in Hawley, PA. Call 610-917-0090 or e-mail [wradrb@comcast.net](mailto:wradrb@comcast.net) for more information.

Nov. 1-4, 2010 – Hosting, along with the New Jersey AWRA - 2010 AWRA Conference, Philadelphia, PA.  
**REGISTER NOW!** <http://www.awra.org/meetings/Philadelphia2010/index.shtml>

In April 2010, the **DWRC's** information booth, presented in conjunction with UD's Institute of Soil and Environmental Quality, the Delaware Biotechnology Institute, and the Delaware Environmental Institute (DENIN), won first place in the UD College of Agriculture and Natural Resources' "University Category for the 2010 Ag Day Exhibitor Competition." Sharing this award are (left to right) Maria Pautler, **DWRC**, and Amy Broadhurst, DENIN. (Photo by N. Pautler)



# Delaware Water Resources Center Advisory Panel

## The Delaware Water Resources Center

The Delaware Water Resources Center (DWRC), established in 1965, is part of a network of 54 Water Resources Research Institutes throughout the nation. The DWRC receives funding through Section 104 of the Water Resources Research Act of 1984. The US Geological Survey administers the provisions of the Act and provides oversight of the nation's Water Resources Centers. The primary goals of the DWRC are: to support research that will provide solutions to Delaware's priority water problems, to promote the training and education of future water scientists, engineers, and policymakers, and to disseminate research results to water managers and the public. For more information, visit our website:

<http://ag.udel.edu/dwrc/>

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