Maryland Water Resources Research Center
Department of Civil & Environmental Engineering
University of Maryland
College Park, Maryland 20742

FALL 2004 Dr. Allen P. Davis, *Director* Dr. Phil Kearney, *Assoc. Director*
www.waterresources.umd.edu

Fall Conference

For the third year the Center will hold a Fall water resources conference. On October 22, 2004 the Maryland Water Resources Research Center and the Maryland Sea Grant College will cosponsor a symposium on *Wastewater Treatment Plants and the Chesapeake Bay: Processes and Problems,* in the Margaret Brent Conference Room, Stamp Student Union Building, University of Maryland. An agenda for the conference is found on page 2 of this newsletter. The first presentation will examine the chemical and biological processes in a wastewater treatment plant. Subsequent talks will discuss the discharges of endocrine disrupters, recent advances in wastewater disinfection chemistry, nutrient discharges and the future impacts of the Chesapeake Bay Restoration Fund (flush tax) on wastewater treatment plants. Wastewater treatment plants have been identified as major contributors of nitrogen into the Chesapeake Bay. It is estimated that Maryland's 66 sewage treatment plants release 16.3 million pounds of nitrogen pollution into the bay annually. To upgrade these plants will take any where from an estimated $750 million to $1 billion. The symposium is free of charge and all are welcome. If you plan to attend, please register electronically at our website: www.waterresources.umd.edu.

From The Director's Desk

Greetings. The Maryland Water Resources Research Center continues to reach out to various agencies and organizations on Maryland water issues. Throughout this newsletter, you will see evidence of these efforts. Our symposium in October is co-sponsored by the Maryland Sea Grant College. Sea Grant and the Water Center share many related goals and objectives. Wastewater discharges into the Chesapeake Bay have been frequently in the news lately with the passage of the Maryland "flush tax" and I hope that you will be able to join us at this forum, which promises to be most informative. Additionally, the Center is pursuing a seed grant initiative to provide information linking Maryland water supply to land use and growth, in collaboration with the National Center for Smart Growth Research and Education. Also, our request for proposals this year has two specific collaborations with the Maryland Department of Natural Resources. With limited resources available to all, these partnerships are important to maximize the impact of available resources.

Request for Proposals - 2005 Funding

Proposals for 2005 *Maryland Water Resources Research Center* funds are now being solicited. The Center is seeking requests for three types of proposals this year (with their estimated funding levels): regular research projects ($15k to $30k), summer graduate fellowships ($3.6k) and seed research projects ($2k to $5k). We are particularly interested in seed research proposals aimed at developing exploratory projects, with the deliverable being a major proposal for submission

In this Newsletter

WASTEWATER TREATMENT PLANTS AND THE CHESAPEAKE BAY: PROCESSES AND PROBLEMS

Sponsored by:

Maryland Water Resources Research Center
Maryland Sea Grant College

October 22, 2004
Margaret Brent Room
Stamp Student Union Building
University of Maryland
College Park, MD 20742

Municipal wastewater treatment plants have been traditionally designed for the removal of particulate matter and biodegradable organic material. Recent research has shown that other compounds are being discharged in these wastewater effluents that raise environmental concern. This half-day seminar will discuss four current issues in point source discharges, current research on these issues, and ways to address these discharge problems.

8:30 - 8:40	**Welcome + Opening Remarks**
8:40 - 9:00	***An Overview of Municipal Wastewater Treatment.*** **Eric Seagren, Civil and Environmental Engineering, University of Maryland**
9:00 - 9:35	***Endocrine Disruptors in Municipal Wastewater Discharges.*** **Alba Torrents, Civil and Environmental Engineering, University of Maryland**
9:35 - 10:10	***A New Look at Dechlorination.*** **George Helz, Chemistry and Biochemistry, University of Maryland**
10:10 - 10:25	***Break***
10:25 - 11:00	***Nutrient Discharges.*** **Clifford Randall, Civil and Environmental Engineering, Virginia Tech University**
11:00 - 11:35	***Implications of the Flush Tax on Sewage Treatment Plants*****, Cy Jones Washington Suburban Sanitary Commission, Laurel MD**
11:35 - 12:00	**Wrap-up and Discussion**

Contact Persons

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to another agency such as the U.S.G.S. National Competitive Grants Program. The PI would be the team leader in developing a broad-based project

on a high priority subject. For information on proposal preparation, please go to our website www.waterresources.umd.edu. Specific questions may be addressed to the Associate Director at (301-405-6829) or e-mail *pk56@umail.umd.edu.* Routed proposals are due in the WRRC office (1147 Martin Hall, University of Maryland, College Park 20742) by close of business (4:30 PM) on Friday, November 12, 2004.

Two specific research topics are of interest to the MD Department of Natural Resources. Project proposals addressing these issues will be given special consideration.

***Develop Techniques to Identify Sources of Contaminants in Surface Water*- Research is needed to develop techniques that will identify the sources of pollutants in MD surface waters. Techniques must be developed to separate municipal point source from runoff or from agricultural contributions at a receptor (sampling location). One possibility would be to develop unique markers that could be spiked in certain effluents to allow calculation of source contributions of aquatic contaminants. Certain small units of this project could be proposed, i.e., identify sources, develop source inventories, model source-receptor relationship.**

***Public Access to Treatment Facility Release Information*- Produce an "electronic map" of all Chesapeake Bay pollutant point sources and link it to contaminant type and amount. This information would be useful in monitoring progress and efficacy of the "flush tax" as monitoring data at Tributary Strategy Basin outlets is developed by the Bay Programs Non-Tidal Tributary Workgroup. The map could serve as a hub to monitoring results and data.**

Questions on these two topics should be addressed to Paul Miller, 410-260-8616 or pmiller@mdr.state.md.us

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2005 Summer Fellowship Program.

For the fifth year, the Center will offer summer assistantships to selected outstanding graduate students. Selection of awardees will be made in December based on a) evaluations of student's records, b) strength of advisor's recommendation, and c) prospects that the research will benefit our understanding and management of Maryland's water resources. The most important benefit of this project will be simply its contribution to the research and educational missions of the Center. Interested applicants should contact Dr. P. C. Kearney for details at *pk56@umail.umd.edu* . Summer Fellowship proposals must be submitted to our office by November 12, 2004. Guidelines can be found at the Center website at www.waterresources.umd.edu.

Criteria for Summer Student Assistantships

We require that all candidates must:
1. Have been enrolled in a graduate degree program at the University of Maryland for at least the two semesters preceding the summer in which support is requested.
2. Have accumulated at least 15 course credits toward their degree.
3. Have a minimum GPA in graduate school of 3.0.
4. Submit a short proposal for M.S. or Ph.D. thesis research that relates to the broader mission of the Water Resources Research Center.
5. Arrange for a supporting letter from their research advisor.
6. Certify that he or she will spend full time during the summer on the research project.
7. Agree to provide the Center with a 2-page report at the completion of the summer research.

Dr. Jennifer Becker Receives Prestigious Presidential Award

During a ceremony at the White House on May 4, 2004, President Bush named Jennifer Becker, Assistant Professor in Biological Resources Engineering, one of 20 of the nation's most promising young scientists and engineers. Becker was honored with the *2002 National Science Foundation Presidential Early Career Awards for Scientists and Engineers* (PECASE) for her research on how certain types of microbial interactions occur in chlorinated solvents, such as tetrachloroethene and trichloroethene, considered the most common contaminants of groundwater. Her research may contribute to new tools to help predict effectiveness of bioaugmentation strategies. In addition, Jennifer's education program includes a diverse hands-on learning experience for pre-college students and mentoring activities for student summertime research projects. Of the 2900 CAREER awards made since the program began in 1996, only 140 have received presidential

recognition. (Taken from the A.J. Clark School of Engineering website, www.eng.umd.edu)

Galloway Joins U of MD

Dr. Gerald Galloway has joined the Department of Civil and Environmental Engineering at College Park. He was recently elected to the National Academy of Engineering, the highest professional honor bestowed on an engineer. Previously, he served as secretary of the United States Section of the International Joint Commission in Washington, D.C, which prevents and resolves disputes between the United States and Canada under the 1909 Boundary Waters Treaty. A civil engineer, public administrator and geographer, Dr. Galloway has served as a consultant to the Executive Office of the President, and has assisted the U.S. Water Resources Council, World Bank, Organization of American States, Tennessee Valley Authority, U.S Army Corps of Engineers and various other organizations in water resources related activities. From 1989-1990. Galloway was president of the Universities Council on Water Resources, an association of nearly 100 universities and colleges active in water resources research and education. He served as a presidential appointee to the Mississippi River Commission (1988-1995) and was assigned by the White House to lead the Interagency Floodplain Management Review Committee (1993-1994) in assessing the causes of the 1993 Mississippi River floods and proposing a long-term approach to floodplain management. In April 1998 he was appointed by President Clinton to serve as a member of the American Heritage Rivers Initiative Advisory Committee. He has lectured and written extensively on the management of water resources. Dr. Galloway is a Fellow of the American Society of Civil Engineers, and the Society of American Military Engineers.

Dr. Galloway graduated from the U.S. Military Academy with a Bachelor of Science degree and was commissioned into the Army as a Second Lieutenant in the U.S. Army Corps of Engineers. During his 38-year career in the military, he served in various command and staff assignments in Germany, Southeast Asia and the United States. He commanded the Army Corps of Engineers District in Vicksburg, Mississippi (1974-1977). In 1979, he joined the faculty of the U.S. Military Academy at West Point, serving successively as Professor of Geography and Computer Science, and Professor and founding Head of the Department of Geography and Environmental Engineering. In 1990 he was promoted to Brigadier General and appointed the ninth Dean of the Academic Board (Chief Academic Officer) of the Military Academy. He retired from active duty in 1995.

Dr. Galloway holds master's degrees from Princeton, Penn State, and the U.S. Army Command and General Staff College. Dr. Galloway received his Ph.D. degree in geography from the University of North Carolina.

College Park Campus Continues Storm Water Initiatives

A multi-jurisdictional partnership, known at the Anacostia Low Impact Development Initiative, has been established to demonstrate low impact development storm water management techniques in the watershed. As part of this initiative, eight new bioretention cells have been installed on the University of Maryland campus near Campus Creek and the Comcast Center parking lots. These cells will slow runoff and filter pollutants before discharge to the Creek. A comprehensive monitoring program will begin this fall on one of the facilities. Parameters to be monitored include flows, several heavy metals, nutrients, toxic organics, and bacterial pathogens. These cells will continue to demonstrate the University of

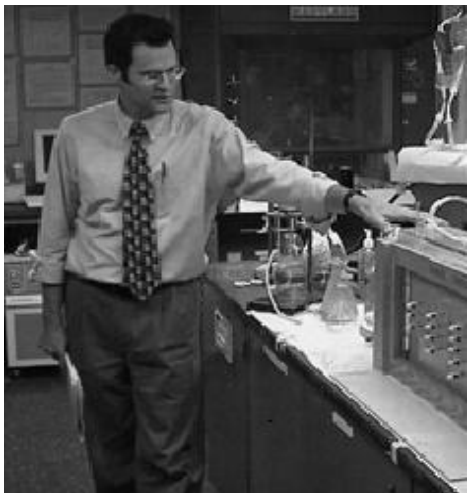
Maryland as a leader in environmental stewardship and to improve water quality in the Anacostia River and the Chesapeake Bay.

Collaborations

A number of organizations share goals similar to those of the Maryland Water Resources Research Center. Two nearby organizations are the Maryland Sea Grant College and The National Center for Smart Growth Research and Education. The Maryland Sea Grant College supports innovative marine research and education, with a special focus on the Chesapeake Bay. With funding from the National Oceanic and Atmospheric Administration and the State of Maryland, Sea Grant-supported research targets practical problems, with the aim of promoting wise decision-making. By serving as a gateway to relevant and reliable scientific information, Sea Grant helps assure that individuals can make informed choices about the use and stewardship of marine resources. First established in 1977, Maryland Sea Grant is part of a network of 30 university-based Sea Grant programs around the country. For more information on the College visit their website at www.mdsg.umd.edu Sea Grant is cosponsor of our Fall Conference *Wastewater Treatment Plants and the Chesapeake Bay: Processes and Problems,* We look forward to a continuing working relationship with this important Maryland Program

The mission of the National Center for Smart Growth Research and Education is to bring the diverse resources of the University of Maryland and a network of national experts to bear on issues in land development, resource preservation and urban growth -- the nature of our communities, our landscape and our quality of life -- through interdisciplinary research, outreach and education, thereby establishing the University as the national leader in this field. The National Center for Smart Growth conducts independent, objective research in four general areas: land use and the environment; transportation and public health; housing and community development; and international development issues. For more information on the Smart Growth Center visit their website at www.smartgrowth.umd.edu The Water Center is cooperating with the Smart Growth Center on developing a seed proposal on *Modeling the Impact of Smart Growth on Future Water Supply*.

Featured Scientist Dr. Eric Seagren



Dr. Eric Seagren is an associate professor of environmental engineering in the Department of Civil and Environmental Engineering at the University of Maryland, College Park. Eric moved to the University of Maryland in January of 1997, after working as a postdoctoral fellow at Northwestern University in Evanston, IL, following the completion of his Ph.D. work at the University of Illinois, Urbana-Champaign.

Eric's academic program has included teaching, or co-teaching, nine different courses since arriving at Maryland, primarily in the area of environmental engineering and science. Currently, Eric co-teaches with Professor Alba Torrents, two undergraduate courses: *Applied Engineering Science,* a sophomore-level course that provides an examination of the fundamental and applied aspects of chemistry, biology, and geochemistry for civil and environmental engineering students; and *Environmental Engineering Science*, a senior-level course with a lab, which covers the basic physical, chemical and biological processes that occur in engineered and natural environmental systems, as well as the parameters used to describe the quality of water, air and land. Also at the undergraduate level, Eric teaches the junior-level course *Introduction to Environmental Engineering*, which introduces students to the physical, chemical, and biological systems relating to the quality of land, water, and air environments, in addition to examining current environmental pollution problems and methods of pollution

abatement. At the graduate level, Eric offers a course on the remedial technology of *Bioremediation*. In this class, students are introduced to the microbiological and engineering fundamentals of bioremediation, as well as the application of bioremediation in practice. Topics covered include: current and emerging bioremediation technologies; relevant microbial ecology, biochemistry and physiology; site data; design and operation of engineered bioremediation systems; and monitoring methods for evaluating the success of bioremediation projects.

Eric's broad research goal is to advance the science and applications of the field of environmental biotechnology. Within the field of environmental biotechnology, his specific active research areas include: the in situ bioremediation of contaminated subsurface environments, especially the bioremediation of nonaqueous phase liquid (NAPL) contaminants; the monitoring and evaluation of the performance of bioremediation, including natural attenuation projects; the development of in situ biological treatment systems for urban stormwater runoff, specifically bioretention; and various aspects of biological treatment of domestic wastewater and sludges. Currently, a major emphasis in Eric's laboratory is on research investigating the impact of scale-dependent subsurface heterogeneities on in situ bioremediation. This research is supported by a National Science Foundation CAREER award. In situ bioremediation is a technology that offers great potential for the clean-up of environmental contamination because of the vast array of contaminants that microorganisms can destroy or transform. However, although microorganisms have great potential for destroying or transforming contaminants, in situ bioremediation techniques are made technologically challenging by the inherently complex and heterogeneous nature of the subsurface environment. The physical and chemical heterogeneities of the subsurface occur at several scales and affect in situ biodegradation by controlling the availability of the nutrients and substrates that drive the microbiological processes. This is important because field and laboratory studies suggest that a large fraction of pollutants present in environmental systems are unavailable for microbial degradation. Thus, not understanding or accounting for the interactions between these scale-dependent physical/chemical heterogeneities and microbiological processes may reduce the effectiveness of field-scale in situ bioremediation. However, the interactions between these processes and in situ biodegradation are still not well understood and are being investigated in this project using an integrated laboratory, field, and modeling approach.

Featured Scientist: Dr. William Lamp

Dr. William Lamp is an associate professor in the Department of Entomology, College of Life Sciences, University of Maryland, College Park. He started at College Park in 1985, providing research and instruction to support Integrated Pest Management (IPM) efforts within the Department. His applied ecological research on plant-insect interactions has lead to a greater understanding of the plants response to sap-feeding by insect pests. However, recognizing the growing importance of water-related issues, his lab has begun to focus on macroinvertebrates that inhabit headwater streams.

In recent years, applied ecologists have recognized the utility of biological monitoring methods, with particular attention given to methods based on sampling benthic macroinvertebrates. Unlike chemical data, which provides water quality information at a discrete point in time, biological organisms are long-term integrators of environmental stresses. In addition, macroinvertebrates are especially effective for detecting non-point source pollution because of the spectrum of responses among species to environmental stresses and their long-term response to environmental stress. Finally, macroinvertebrates are also good environmental indicators because they are common components of freshwater ecosystems, they are relatively sessile in their aquatic phase, and they can be inexpensively sampled. To aid in the use of macroinvertebrates as environmental indicators, Lamp teaches two courses to help train undergraduate (BSCI 467, *Freshwater Biology*) and

graduate (ENTM 667, *Aquatic Entomology*) students on their biology and identification.

Headwater streams comprise the largest proportion of stream distances in the landscape, yet are easily overlooked. As a result, human development (e.g., agriculture, urbanization) and ecosystem management practices are often associated with the destruction or degradation of these habitats. As the beginning of the hierarchy of the river continuum, small headwater streams serve as sources for organic matter, as well as sources of drifting organisms (e.g., algae, invertebrates) that colonize downstream habitats. In addition, first-order streams are endpoints for many migrating organisms, including spawning fishes and terrestrially-dispersing adults of aquatic insects. Recent research in Lamp's laboratory at the University of Maryland has focused on developing methods to assess environmental degradation within such streams. Using macroinvertebrates as sentinels for habitat degradation, Lamp and his students have investigated the impact of golf course management on macroinvertebrates in small Piedmont streams, as well as the relationship between land use on macroinvertebrate structure and function in Coastal Plain streams. Currently, one of his students, Ms. Saundra Crane King, is studying the impact of road salt applications on macroinvertebrates in headwater streams. A second student, Ms. Megan DeOcampo, is examining the response of a stonefly shredder to the stoichiometry of leaf detritus as impacted by water chemistry and tree species. A third student, Ms. Laurie Alexander, is investigating patterns of abundance and population genetics of a headwater-inhabiting mayfly, asking if changing land use has influenced gene flow among small populations. Finally, undergraduates in his lab are assisting to determine the effect of deposition of Bt corn leaves in small streams on leaf shredders and leaf decomposition rates. The long-term goal of his lab is to understand the functional relationships of arthropod species within headwater streams, and to determine how headwater stream structure and function change when exposed to gradients of human influence.

Comments and suggestions on the newsletter are always welcome. To add or withdraw your name from our mailing list, please contact us.

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