New Jersey Flows

New Jersey Water Resources Research Institute

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NJWRRI: The Year In Review

Amidst continuing budget uncertainty, the New Jersey Water Resources Research Institute continues its charge to:

- sponsor research on all aspects of water quality, water quantity, water use, and the management of water resources
- train students at the undergraduate, graduate and postgraduate levels to become the next generation of water resource professionals for New JerseyJ
- facilitate the transfer of information from researchers to the public and to water resource managers

The year 2003 began with elimination from the federal budget of the National Institutes of Water Resources system of 54 water resources institutes in the nation's states and territories. A campaign of advocacy, education, and information aimed at our national legislators was led by New Jersey representative Pallone; restoration of the NIWR budget, seemingly a yearly event now, has consistently been led by a New Jersey congressman. On the eve of our nation's foray into the War in Iraq, NJWRRI representatives attended the national NIWR Annual Meeting and made Congressional visits on Capitol Hill to advocate for continuing water resources research in New Jersey and restoration of the national program, highlighting the breadth of research and educational efforts our Institute sponsors and partners on.

FY 2002 drew to a close and final reports were filed on a wide range of research, student training, and information transfer activities, highlighting research conducted on soil hydraulic properties, and pollutant transfer, engineering of systems for monitoring haloacetic acids and destroying VOC's, the biodegradation of MTBE, and several aspects of wetland ecology. This research supported 7 graduate students and 3 senior researchers. In addition an undergraduate internship program supported four students, working at teaching colleges thoughout the state in addition to the state university.

Information transfer activities included conferences, invited speakers, collaborations with other agencies in organizing water-related meetings and publication of ***New Jersey Flows*** newsletter. We organized a meeting, working jointly with the New Jersey District Office, US Geological Survey, to inform members of the New Jersey State Legislature about important water issues that would be of concern to the state at the start of the legislative session and intend to continue an information program to provide timely information about water issues to the state legislature.

NJWRRI sponsored a conference, "Watershed Management and the University," which explored the role that universities can take in helping develop watershed management programs with public and not-for-profit community groups. Speakers from five universities and colleges around the country came to share their experiences in setting up such programs, and speakers from eight institutions in New Jersey described their efforts to develop such programs. Over 100 people, representing 27 academic institutions, many watershed organizations and government agencies attended. Keynote speaker was Larry Baier, NJDEP.

One issue of the ***New Jersey Flows*** newsletter highlighted the many presentations at the National AWRA meeting that concerned New Jersey water resources and our newsletter continues to highlight ongoing New Jersey research, watershed entitites, and water research efforts by state and federal agencies.

The new FY 2005 budget once again eliminates the ***entire*** NIWR system of water resources institutes, not surprising given the climate of continuing de-emphasis on the importance of water resources. NJWRRI ***is dependent*** on funding from the USGS, Department of Interior and matches each Federal dollar received with at least $2 from non-Federal sources. Too, New Jersey currently ranks 48th in the nation in terms of tax dollars returned to benefit our state. **Funding of the Water Resources Research Institutes programs ensures that some tax dollars do return to address the real and current water problems of our state.**

NJWRRI provides for critical research targeted at problems in New Jersey, transfer of important water information to the water community, as well as training of our state's future water professionals through supportive grant funding.

Advocacy efforts on the state and national levels to restore full funding for Water Resources Research Institute programs will commence once more, for the ***fourth*** year, to restore the NIWR system, hopefully with leadership taken by another New Jersey congressional representative. **New Jersey's waters, their users, and their ecosystems continue to need our help. ***

The Director's Chair

by Joan G. Ehrenfeld, Ph.D., Director, New Jersey Water Resources Research Institute
Rutgers, The State University of New Jersey

This issue of the newsletter highlights the activities of the NJ WRRI over the past year – research conducted by faculty, by graduate students, and undergraduates, and our outreach activities. We also illustrate the range of water-related research and teaching at Rutgers, beyond what the WRRI supports, and we highlight another NJ Watershed, that of the Passaic River. News and book reviews focus attention on the looming water supply crisis, and water-related State legislation is summarized. *****

Volunteer Monitoring in New Jersey: a Tiered Approach

By Kerry Kirk Pflugh and Danielle Donkersloot, Outreach And Education Bureau, NJDEP Div. of Watershed Management

Water quality monitoring conducted by volunteers has been encouraged by USEPA since the early 1980s. Across the country, states reached out to the watershed community in a variety of ways. Some states gave the responsibility of establishing watershed stewardship programs to volunteer groups, others invited assistance in meeting regulatory water quality monitoring requirements, still others requested volunteers take on the responsibility of educating the public about the importance of good water quality.

The response by volunteer groups interested and engaged in volunteer monitoring activities has run the gamut as well. Many groups and individuals jumped into the activity with little guidance or training in data collection, management and most importantly, a project plan to guide the reason for the monitoring activity. As a result, many groups soon learned that the data they were collecting was of little use to States because the collection procedures and protocols did not follow strict quality assurance guidelines and techniques.

Since those early days, volunteer monitoring groups have become extremely sophisticated in their collection techniques and results reporting. Most follow detailed quality assurance project plans using protocols established by State monitoring programs. Yet there continues to be a disconnect between monitoring activities conducted by volunteers and those conducted by State agencies. While volunteer monitoring can never and should never replace State water quality monitoring programs, data collected by volunteers provides an enormous opportunity for state agencies to broaden the scope of their knowledge of state waters.

As with all states, NJ has a comprehensive regulatory water monitoring program that begins with water quality standards and monitors waterways for the purpose of determining impairments, assigning waterways to the Integrated lists and determining strategies for restoration of impaired waterways. But the reality is our state scientists can't cover every waterway in the state every year, which is why there is an important role for volunteer monitoring.

Volunteer Stream Monitoring: A Methods Manual, EPA

Volunteers can help the department in a variety of ways. Data from their efforts can help characterize water resources, identify water quality problems, monitor ecological conditions and aid in detecting episodic events and identifying trends or changes in water quality. This information can be helpful to state scientists in determining the health and vitality of aquatic ecosystems and in investigating problems such as nonpoint source pollution.

In New Jersey, volunteer monitors have lobbied the NJDEP for many years to provide a meaningful and uncomplicated volunteer monitoring program that would take the mystery out of when and how volunteer data could be used. Over the years the State has attempted to respond to volunteer monitors by providing support materials, training and encouragement to be watchdogs of local waters. Until recently, DEP did not have an organized program that provided guidance on when and how volunteer data could be used by the state.

In 2002, the Office of Outreach and Education in the Division of Watershed Management was assigned the task of creating a program that would encourage stewardship of our local waters, but also provide a mechanism, that would allow those volunteer monitors interested in submitting data to NJDEP to do so.

Building on the existing program which primarily encouraged stewardship, the Office of Outreach and Education established an Internal Advisory group of NJDEP data users and an External Advisory group of volunteer monitors to help in the development of a program that would meet both agency and volunteer needs.

After reviewing what other state were doing, it became clear that a range of options for volunteers should be offered. Additionally, it was felt that within these options clear guidance on what techniques, protocols, requirements for quality assurance, and how the agency would respond to the data collected should be spelled out. As a result, a four-tiered approach was created and the program became known as Watershed Watch.

While the department has encouraged volunteer water quality monitoring for many years, the Watershed Watch Network is the first time the department has created a systematic way for volunteers to work with the agency, get training and submit your data so that the data users in the department can respond in an appropriate manner. Ultimately what we want to achieve is a state -wide partnership with each of you so that together we can achieve Clean Water goals.

The mission of the Watershed Watch Program is to foster and develop a sense of stewardship toward local waters that serves to remind or give warning of the health of the watershed. Additionally, the new program attempts to provide acceptable protocols for volunteers if they chose to submit their data to the NJDEP and to assist volunteers in designing and building upon their existing programs.

The four tiers range from education and stewardship to community assessment and indicators. While a tiered approach is not a new concept, what is new is that New Jersey is assigning data collection protocols to the various tiers that will be linked to specific responses by the department from the various program that use volunteer data.

For example, if a volunteer group wishes to have the department use their data for listing on the Integrated list, certification of the program and QA/QC procedures will be required. However, if a group wishes to conduct a visual and biological assessment of their local waters to inform the community of the value of good water quality, this would not require certification and the department, if the data was submitted to the DEP, would add it to background information on the local waterway to potentially inform TMDL projects, or other restoration responses.

In addition to training, technical support and information materials that will be developed to support the Watershed Watch Network, NJDEP will also be creating a web-based data entry system that volunteers can directly input their data for state scientists to review. The system will allow greater communication between local volunteer monitoring groups and state scientists working together to meet water quality standards. *****

From Drought To Deluge

By Dr. David A. Robinson, New Jersey State Climatologist, Rutgers University

It was only 12 months ago that I last attended a drought meeting at the NJ Department of Environmental Protection. New Jersey had just experienced a wet fall, thus the water experts in the room were confident that for the time being thoughts of ongoing drought could be put aside. It had taken some time for our confidence to grow, as we were not far removed from the record dry fall 2001-winter 2002 period. Spring 2002 was wet enough to provide a reprieve from serious water concerns, but a hot, dry summer left us wondering if spring 2002 had only been a brief respite within an ongoing period of intermittent acute drought that dated back to 1998. However, by the end of 2002, 12-month precipitation totals were running close to the long-term mean, and other hydrological indicators such as stream flow, ground water and reservoir storage were at or above seasonal norms.

Recent years reminded us that drought has been and will continue to be of critical concern to residents of the Garden State. However the past several decades have been among the wettest in the past century. The 1971-2000 annual mean precipitation (rain and melted snow) across NJ of 47.19" is almost 2.5" greater than the 1895-2002 mean of 44.73".

2003 was the 5th wettest calendar year since 1895. Following are a few pertinent observations regarding recent statewide precipitation. The past few months of data are not yet available from all of the three dozen stations, thus some values are preliminary:

- 57.48" of precipitation fell in 2003. This is 10.29" above the 1971-2000 average.
- Precipitation was relatively well distributed throughout 2003.
- June 2003 rainfall totaled 8.61" (4.82" above average), the only month more than 2.00" above average.
- Five months (including December) were 0.50”-2.00” above average.
- Only January was more than 1.00” below average.
- 32.97” fell from June to November 2003. Only 1% of the six-month intervals since 1895 have been wetter.
- 9.79" fell during the six months ending in February 2002, making this the driest of any six month period on record.

2003 challenged but failed to exceed the calendar year record maximum of 59.98" set in 1996 (table 1). Despite this, a top ten finish is quite a reversal from the 4th driest year (35.66") experienced in 2001!

When will New Jersey be threatened again by drought? An accurate prediction could certainly be useful to those whose livelihoods are severely impacted by persistent dry weather or to those who manage NJ water supplies. However, beyond a season, where a modicum of predictive skill can be achieved, such predictions will likely elude us for years to come. Suffice it to say, that even in this overall wet era in New Jersey, drought is certain to return intermittently. This behooves us to closely monitor and use our precious water resources wisely, even as our precipitation gauges currently "overflow".

You are invited to monitor the latest conditions by visiting the Office of the NJ State Climatologist web site: (*http://climate.rutgers.edu/stateclim*).

Here you may link to our ongoing "NJ DroughtWatch" page or find the latest NJ weather conditions on our NJ Weather and Climate Network (NJWxNet) page. *****

Precip.	Year
59.98	1996
58.85	1975
58.33	1983
57.56	1972
57.48	2003
56.60	1979
55.56	1989
55.08	1903
54.73	1902
54.50	1952

Table 1. Ten wettest calendar years observed in New Jersey since statewide records began in 1895. Precipitation (rain and melted snow measured in inches) totals are averaged from approximate three dozen stations distributed throughout the Garden State and weighted spatially.

AWRA Conferences – see *www.awra.org*

2004 Spring Specialty Conference Preliminary Program - Geographic Information Systems (GIS) and Water Resources III, May 17-19, 2004

2004 Summer Specialty Conference - Riparian Ecosystems and Buffers: Multi-scale Structure, Function, and Management, June 28-30, 2004, Olympic Valley, CA

2004 International Specialty Conference - Good Water Governance For People & Nature: What Roles for Law, Institutions, Science & Finance?, August 29 - September 1, 2004, Dundee, Scotland

2004 Annual Conference - November 1-4, 2004, Sheraton World Resort, Orlando, Florida *****

EPA Funds Rowan University Project, NJWRRI Intern

By Kauser Jahan, Ph.D., PE, Civil and Environmental Engineering, Rowan University

Rowan University received funding from the USEPA for watershed assessment of two local creeks in the state. The project draws on two creeks in watershed management area (WMA) 18 in New Jersey. This lower Delaware River WMA encompasses eleven watersheds. Both of the selected projects are in close proximity to the main Glassboro campus and Camden Campus of Rowan University. One project in the Boroughs of Glassboro and Pitman, New Jersey focuses on the Chestnut Branch of the Mantua Creek. This Creek is of environmental importance because it is the headwaters for Alcyon Lake in Pitman, New Jersey, and flows adjacent to the nearby superfund site the LiPari Landfill. The other, in Waterfront South in the City of Camden, New Jersey, is close to another superfund site, the Welsbach and General Gas Mantle Company. Both projects seek to improve water quality in the watersheds through collaborative partnerships between Rowan University, municipalities on the stream, and local K-12 schools.

Sampling at Newton Creek

The project is multidisciplinary in nature and requires expertise from various disciplines. Tasks included watershed characterization through hydrologic and water quality assessment and modeling. Water quality parameters being monitored include pH, DO, temperature, solids, organics, chlorophyll A, bacteria, metals and nutrients (nitrate and phosphate). The NJWRRI intern A. Ayotomein was responsible for analyses of chlorophyll A, fecal coliform and nutrients. Three sites (upstream, midstream and downstream) were selected for study for each water body. Three sampling events have been conducted so far for the two water bodies. Trips to the Newton creek site in close proximity to the superfund cleanup indicated presence of litter. The midstream site near Collingswood, New Jersey showed profuse growth of aquatic planktons in the months of June and July. Stream bank erosion was also visible. The Chestnut branch showed lesser degrees of litter and bank erosion. Nutrient data indicated that both water bodie are being impacted by nonpoint source pollution as evidenced by high nitrate and phosphate concentrations. These high concentrations also explain the profuse plankton growth that was observed at certain sites. Nitrate and phosphate are typically discharged in rainfall events from fertilizers, detergents and agricultural runoff. High fecal coliform levels were determined in both creeks. The water quality is deemed unacceptable for partial body contact. Chlorophyll a concentrations were also elevated in Newton Creek. This project allowed the intern to gain experience in field measurements and also community outreach. A technical paper and presentation was also part of this research. *****

Evaluating Point-Nonpoint Source Pollutant Trading Opportunities

By Dr. Christopher Obropta, Specialist In Water Quality, Rutgers Cooperative Extension

NJAES NEW JERSEY AGRICULTURAL EXPERIMENT STATION

If New Jersey plans to successfully meet its goals to improve and preserve water quality, nutrient trading will have to play a significant role in obtaining cost-effective reductions. As the New Jersey Department of Environmental Protection (NJDEP) moves toward assigning the point source dischargers total phosphorus effluent limitations of 0.1 mg/l for discharges to waterways that are impaired for phosphorus, a potential for "point-nonpoint" source trading becomes a very attractive alternative to treatment plant upgrades. A trading policy provides profitable opportunities for sources with low treatment costs to reduce their loading beyond legal requirements, generate a credit, and sell these credits to dischargers with high treatment costs. This flexibility produces a less expensive outcome overall while achieving the desired environmental target. In addition to the economic benefits, a "point-nonpoint" source trading program also provides ancillary effects such as wetland restoration or the implementatin of BMPs that improve wildlife habitat in addition to improving water quality.

A methodology was developed to identify potential water quality trading opportunities within the Raritan River Basin that are both scientifically and economically feasible for total phosphorus. The focus of the trading opportunities is in areas where TMDLs have already been prepared or are pending. Since "point-nonpoint" trading opportunities can potentially yield the largest economic and wildlife habitat benefits, especially in areas where agricultural land use is significant, this project focuses on these opportunities. Using available databases and Geographic Information System (GIS) data, thirteen sub-watershed basins were initially identified as potential candidates for "point-nonpoint" source trading. Each of these sub-watershed basins were evaluated based upon point source loadings, nonpoint source loadings, land use/land cover characteristics, riparian buffer conditions, and soil properties. Based upon this evaluation and an examination of the economic parameters for each sub-watershed basin, three of the thirteen basins were identified as having the highest potential for successfully implementing a "point-nonpoint" source trading program that could restore water quality in its waterways.

The next steps in our pollutant trading initiative are to: 1) begin a similar evaluation in several Burlington County Watersheds, 2) hold a trading summit, and 3) start negotiations with the "point and nonpoint" sources of the areas that have been identify as having a high potential for a successful trading program. Several grant sources have been identified for these efforts, and we will attempt to secure funding to move forward with this initiative. *****

Trade: *A wastewater treatment in a plant discharge*

For: *A goose control buffer municipal park.*

Water Resources Engineering Education and Research

By Qizhong Guo, Ph.D., P.E.,
Department of Civil and Environmental Engineering,
Rutgers, The State University of New Jersey

Rutgers University's Department of Civil and Environmental Engineering (CEE) has an active program in the area of water resources and environmental engineering. This includes tenured and tenured-track, adjunct, and research faculty in the areas of potable and wastewater, surface and stormwater management, groundwater contamination and remediation, bioreactor engineering, and environmental chemistry. The current faculty and its graduate and undergraduate students engage in modeling efforts, laboratory analysis, and implementation of innovative techniques using field studies.

The Water Resources and Environmental Engineering program provides students the opportunity to study a broad range of topics related to environmental problems, and to pursue advanced research in specific areas of interest, with a focus on the application of modern quantitative techniques to practical problems in environmental engineering. The program educates engineers who will solve environmental and water resources problems by applying fundamental principles from natural sciences, mathematics, mechanics and other underlying disciplines. Students are provided with the fundamentals so they will be prepared to solve both current and future environmental problems. To achieve this objective, the program offers a breadth of possible research and study areas.

Equipment and Facilities

The Rutgers Hydroinformatics Laboratory (Dr. Qizhong Guo, Director) was established through Rutgers University SROA Program. Its goal is to improve management of water resources from technical and business sectors. Hydroinformatics integrates understanding of water quantity and water quality measurable parameters with IT sensors and software. The hydroinformatics laboratory builds capability for computer simulation of complex urban water systems. Benefits include advance warning of flood and drought conditions, and real-time control of water infrastructure systems.

Environmental technologies are based increasingly on molecular and nanoscale regimes because of complex chemical, physical and biological processes influencing a wide diversity of Earth systems. Consequently, high technology solutions to environmental problems often require scientific and engineering technologies centered on a process level understanding of complex chemical and physical interactions at the molecular level. The research programs using the Complex Mixture Analytical Facility (Dr. Monica Mazurek, Director) also support environmental goals for New Jersey, and provide undergraduate and graduate training for environmental and chemical engineering students, contributing to a highly skilled engineering workforce.

The Subsurface Contamination Research and Teaching Laboratory (SCRaTL) (Dr. Kenneth Lee, Director) contains state-of-the-art equipment for research and instructions. SCRaTL is equipped with three gas chromatographs (GCs), a total organic carbon (TOC) meter, a dissolved oxygen (DO) meter, a pH meter, a conductivity meter, a pilot-scaled photo-chemical remediation reactor, and numerous computers.

The Fluid Mechanics and Hydraulics Laboratory (Dr. Qizhong Guo, Director) contains state-of-the-art equipment for instructions and research. Three multipurpose hydraulic benches are equipped with attachments designed to demonstrate the basic principles of mass, momentum, and energy conservation and transfer. A tilting flume is available for similar experiments and demonstrations. Apparatus to study hydrology and sediment transport are also available.

Research Projects (Current and Recent)

Development of a Numerical Model to Assess the Impacts of Raw Water Quality on Conventional Drinking Water Treatment, sponsored by New Jersey Dept of Environmental Protection (NJDEP) (Q. Guo, PI)

Water Quality Modeling Study of Lower Maurice River Estuary, sponsored by Township of Commercial, NJ (Q. Guo, PI)

Study of Sewer and Storage Tank Sediment Flushing Device, sponsored by U.S. Environmental Protection Agency and US-Infrastructure, Inc. (Q. Guo, PI)

Implementation of Stormwater Detention Basin Retrofitting Techniques, sponsored by NJDEP (Q. Guo, PI).

Nitrogen Flux through Barnegat Inlet, sponsored by New Jersey Sea Grant and National Science Foundation (NSF), in collaboration with Rutgers Institute of Marine and Coastal Sciences (IMCS) (Q. Guo, PI).

Destruction of Volatile Organic Compounds Using the Photochemical Remediation Reactor, sponsored by New Jersey Water Resources Research Institute (NJWRRI) and Energia Inc., in collaboration with Rutgers Chemical and Biochemical Engineering Department (CBE) (K. Lee, PI).

Use of Hydrogen Release Compounds for PCE Enhanced Biodegradation in Fractured Rock Aquifers, sponsored by Rutgers Environmental Health and Safety and NJWRRI (K. Lee, PI).

Development of Polar Atmospheric Organic Compounds: Development of a Molecular Level Analytical Capability Using LC/MS APESI, sponsored by NSF (M. Mazurek, PI).

Biocomplexity: The Roles of Resources, Competition, and Predation in Microbial Degradation of Organic Matter, sponsored by NSF, in collaboration with Rutgers IMCS, Environmental Sciences Dept (Cook College) and CBE (M. Mazurek, Co-PI). *****

For additional see: *www.civeng.rutgers.edu/environmental*

A Common Vision for a Common Resource

Development of a Water Resources Plan for the Delaware River Basin

The Water Resources Plan for the Delaware River Basin (Basin Plan) is available for public review at *www.state.nj.us/drbc/basinplan.htm* (as well as a powerpoint presentation). Although the document is currently undergoing revisions to incorporate a wide range of comments, attention is drawn to this nearly-final product of a multi-year, multi-stakeholder effort. Since it is a long-range (30 year) plan, it indicates both policy direction and issue areas for research to support policy and decision making.

Spotlight on New Jersey Watersheds

The Passaic River Watershed, the Passaic River Coalition and Its Partners

By Ella F. Filippone, Executive Administrator, Passaic River Coalition

When the first settlers came to New Jersey, the pollution of the Passaic River began. The river was used, from its beginnings, in the myriad ways that society uses river. But the river offered something special, its waterpower, emanating from the Great Falls at Paterson. Over time, as industrial activity blossomed in the region, the river suffered increased pollution and public health problems associated with the pollution. The cities that had relied on the river for drinking water purchased lands in the headwaters of the Passaic River, in the Highlands, constructed water supply reservoirs, and developed transmission lines, bringing high quality waters to the urban residents. This remains the source of drinking water today for the residents of Newark, Paterson and Passaic. Although a sewage treatment plant was constructed to handle both industrial and residential wastes in the 1920's, the river continued to be plagued by many types of pollution. Indeed, by Earth Day 1970, the Passaic River had gained the distinction of being one of the most polluted rivers in the United States.

In 1969, a group of local citizens recognized that the river and its watershed needed help, and The Passaic River Coalition (PRC), an urban watershed association, was formed. It initially focused on flood control projects being recommended by the U.S. Army Corps of Engineers, but soon began to become involved in every aspect of water resources management. The river's shoreline and watershed had been impaired and altered by damming, channelization, and relocation of feeder streams, bulkheading, rip-rapping, draw down of ground water and stream flow, direct discharges of pollutants, and nonpoint pollution, destruction of wetlands, and elimination of stream buffers. Three centuries of urbanization of the Passaic River Basin had caused increases in sedimentation, in nutrient loadings and their consequent lowering of dissolved oxygen levels and in the frequency of flooding and flood-related events. A reduction in biological diversity of plant, fish, and animal species had occurred. Storm water runoff accelerated stream bank erosion and undercutting, and bacterial and trace metal contamination had degraded this river system. The Passaic River suffered from virtually every type of insult that a river can experience.

The Passaic River Coalition has, over the years, addressed a remarkably wide range of issues in trying to restore the river to ecological health. For example, in 1984, the Army Corps of Engineers recommended the construction of a 21-mile long, 40-foot wide flood tunnel to carry storm water from the upper to the lower valley. The Passaic River Coalition took the lead against this $1.9 billion project. The flood tunnel project was ultimately rejected by the State of New Jersey. In its place, in 1995 New Jersey developed a Blue Acres program to reduce flood damage by removing homes from flood-prone areas. Included within the Green Acres Bond Act, it appropriated $15 million to acquire houses in the floodway within the Passaic River Basin. Thus far, over 100 properties have been acquired. People were removed from areas prone to damaging floods, and the properties became part of a network of open space bordering the river.

Over the past thirty-five years, the PRC has taken action to protect and restore the river. We have talked to legislators in Congress and in the N.J. Legislature, promoting laws that protect water resources and rivers and funds to upgrade sewage treatment plants. We work with municipal officials to help them obtain funds for projects, and we work with the North Jersey District Water Supply Commission and Hackensack Water Company, helping them prepare environmental studies for their reservoirs. We have also initiated a groundwater protection program, establishing a Passaic Valley Ground Water Protection Committee, and helping to educate municipal official and the public about groundwater protection. As part of the effort to protect the entire river, the PRC worked with a consortium of environmental groups to acquire and protect the 17,500-acre Sterling Forest in New York, where some of the tributaries to the river originate and which serves as the headwater source for 20% of the drinking water consumed in North Jersey.

In the early 1990's, the PRC established a Land Trust, which continues to become a major part of our mission. By 2004, we expect to own over 1,000 acres of environmentally sensitive lands within the watershed. Our interests lie not only in the critical water supply areas of the Passaic River Basin, but also along the major rivers and streams from the headwaters to Newark Bay. The list of projects is long, and steadily one by one land is being purchased in cooperation with the State of New Jersey's Green Acres Program and the Land Trusts established by the Counties of Bergen, Morris, and Passaic.

Today, the PRC continues to be involved in projects to assure proper land and water management throughout the Passaic River Basin. We remain strong advocates for watershed management, and have established models for the identification of significant lands to be preserved for water supply, especially in the Highlands. We have created the wellhead protection ordinance and a stream corridor protection ordinance, which will be critical to implement current storm water initiatives. Our Geographic Information System program is a vital part of every

project in which we are involved. The PRC has helped develop Open Space Master Plans in Passaic and Essex Counties, and in countless municipalities, and has promoted the creation of natural resources inventories. Currently, the PRC is also involved in a major undertaking to improve the Greenwood Lake Subwatershed, which suffers from excessive weed growth associated with high levels of siltation and nutrients. The water quality issues in the lake stem from inapproprite land uses and practices that cause non-point source pollution. The PRC is part of the Greenwood Lake Commission, and will be able to bring about improvements in this major source of water.

Most recently, our most challenging project, the cleanup of the Lower Passaic, has come to fruition. Together with officials of New Jersey's government and our Congressional delegation, the Passaic was included in the Urban Rivers Restoration Initiative. In September, 2003, we stood on the banks of the Passaic River in Newark with Congressmen Menendez, Frelinghuysen, Pascrell, Rothman, and Payne as well as representatives of the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the N.J. Department of Environmental Protection, and the N.J. Department of Transportation to formally announce the work that would lead to the clean-up of this portion of the Passaic River, which has been characterized as "our most maligned public servant."

After thirty-five years as a watershed association, the PRC has had great achievements in cleaning up the river, in protecting land, and in working with citizens and municipalities to reduce the sources of damage to the river. Our original conception - that of emphasizing the ecological implications of changes to the river as a way of meeting the numerous and diverse needs of both nature and the human community - has stood the test of time. *****

USGS Publishes New CD-Rom, National Field Manual

The USGS has recently published a CD-Rom version of the National Field Manual for the Collection of Water-Quality Data, September 2003. This manual is published in nine chapters as Book 9, Section A of "Techniques of Water-Resources Investigations" (TWRI).

This resource is current with USGS scientific and tehcnical advances due to ongoing peer review and revision. It characterizes field methods, protocols, procedures and policy for collection of water quality samples and field measurements.

Revisions in 2004 are planned, however this most up-to-date version can be accesssed online at a USGS website: *http://pubs.water.usgs.gov/twri9A/*

The CD-Rom version of the manual or other information can be requested by emailing *nfm-owq@usgs.gov*

Also available from USGS:

WRI 03-4255. PENNSYLVANIA, NEW JERSEY

Historical ground-water-flow patterns and trends in iron concentrations in the Potomac-Raritan-Magothy aquifer system in parts of Philadelphia, Pennsylvania, and Camden and Gloucester Counties, New Jersey. By Ronald A. Sloto, 37 pages.

Available from the USGS Pennsylvania District office, (phone 717-730-6900) as U.S. Geological Survey Water-Resources Investigations. Report 03-4255

Photochemical Destruction of PCE

By Dr. Kenneth Y. Lee, Ph.D., Dept. of Civil & Environmental Engineering Dept., Rutgers, The State University of New Jersey

Soil and groundwater contaminated with volatile organic compounds (VOCs) are often remediated using soil venting or pump-and-treat followed by air stripping, combined with carbon adsorption to treat off-gases. In recent years, photochemical oxidation has been studied as an alternative remediation technology. The technology is based on a synergistic effect obtained when UV photo-initiation is combined with a reducing gas (e.g., hydrogen), oxidative atmosphere (ambient air), or combination of both. The advantages of photo-chemical oxidation are: (1) Photochemical process can be operated at ambient temperature and pressure, (2) complete and efficient destruction of a broad range of pollutants can be achieved, which produce innocuous final oxidation products such as CO_2, H_2O, and/or HCl, and (3) no chemical additives are required.

In this study, a custom designed pilot-scale photochemical remediation reactor was constructed for destruction of vapor-phase volatile organic halocarbons (VOHs), particularly chlorinated hydrocarbons such as PCE (tetrachloroethylene). The stainless steel reactor is of tubular-shape with an inner diameter of 32 cm and a length of 105 cm. The net volume of the reactor is approximately 73.7 liters. Special low-pressure mercury amalgam UV lamps (Heraeus Inc.) were used as the photo energy source. Two independent vapor-phase PCE destruction experiments were conducted using different influent contaminant concentrations. Influent vapor-phase PCE concentrations of 94.0 and 58.3 ppm_v with respective reactor residence times of 16.2 and 8.3 minutes were considered. The results showed PCE removal efficiency of over 99% for both experiments. Furthermore, no thermal destruction of PCE was observed near 140 °C. The results from this study are very encouraging, and pave the way for future chlorinated hydrocarbon destruction experiments using other widespread contaminants such as TCE (trichloroethylene) and TCA (trichloroethane). *****

Published results: Lee, K. Y., Lee, J-Y., Khinast, J, Stencel, J. R., and M. Lavid. Photochemical Remediation of Tetrachloroethylene: Reactor Design, Construction, and Preliminary Results, *Journal of Environmental Engineering*, ASCE, 130(1), 100-103, 2004.

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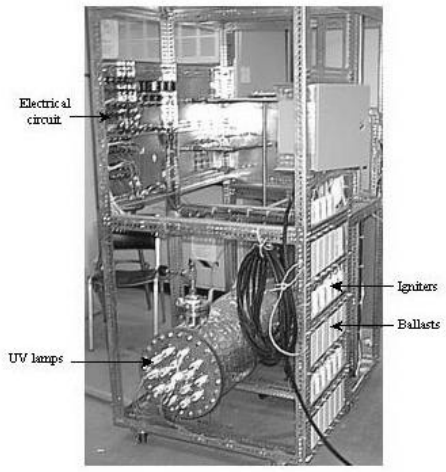

Anaerobic Microorganisms Feed on the Fuel Oxygenate MTBE

By Piyapawn Somsamak, Graduate program in Environmental Sciences, Rutgers University

Methyl *t*-butyl ether (MTBE) is a synthetic compound produced almost exclusively for use in gasoline formerly as octane enhancer and lately as fuel oxygenate to improve gasoline combustion. More than 30% of all gasoline in US contains oxygenated compounds, and MTBE is used about 80% of the time. MTBE is currently the focus of public concern, particularly in the US as MTBE has been detected in groundwater and surface water across the country. MTBE contains a tertiary carbon structure and an ether linked with methyl group. MTBE is water soluble, it does not bind readily to soil particles and naturally biodegrades at slow rate, thus allowing to travel quickly to underground water supplies. MTBE degradation under aerobic conditions has been well-demonstrated both in laboratory and at field sites. Since MTBE-contamination is widespread and most of the sites are subsurface with insignificant amount of oxygen, oxygenating the sites for bioremediation could be costly, and may be financially applicable for high-risk sites ony. Therefore, the fate of MTBE in natural environment is mainly dependent upon the activity of anaerobic microorganisms. Since anaerobic MTBE degradation is relatively rare, very little information on anaerobic MTBE degradation is available to date.

We have demonstrated that indigenous microorganisms in New Jersey sediments are able to biotransform MTBE to *t*-butyl alcohol under sulfate–reducing and methanogenic conditions (1, 2). The observation suggests that the initial step involves the attack at ether bond, and subsequently utilization of methyl group, but tertiary carbon structure is recalcitrant to biodegradation. We successfully enriched methanogenic MTBE- degrading cultures, using MTBE as a sole substrate and repeatedly transferred them until sediment-free cultures were obtained. In order to promote growth and enhance the biodegradation rate, various organic compounds, namely lactate, acetate, formate, pyruvate, propionate, yeast extract, and methanol were tested as co-substrates. None of these compounds could increase the MTBE degradation rate, except for the slight enhancement observed with 2-4 mg/L of methanol. In the presence of inhibitor of methanogenesis, significant prolonged-lag periods were observed before MTBE degradation proceeded. At this point, it is uncertain whether MTBE-degrading cultures prefer readily biodegradable organic compounds to MTBE or whether the addition f those compounds directly or indirectly create unfavorable conditions for MTBE-degrading microorganisms to function. Although there are many questions to be answered, our study is the first step to investigate the factors controlling anaerobic MTBE degradation and to gain insight about organisms, in order to "solve" the mystery of anaerobic MTBE degradation. *****

References: 1.Somsamak, P., Cowan, R.M. and Häggblom, M.M. (2001) Anaerobic biotransformation of fuel oxygenats under sulfate-reducing conditions. FEMS Microbiol. Ecol. 37 , 259-264.

2. Somsamak, P. and Häggblom, M.M. (2003) Anaerobic degradation of methyl *t*-butyl ether (MTBE) under methanogenic conditions Abstract Q39, American Society for Microbiology 103rd General Meeting, Washington, DC, May 18-22,2003.

Book Reviews

Water from Heaven: The Story of Water from the Big Bang to the Rise of Civilization, by Robert Kandel, 2003

This mesmerizing author traces the presence of water from the depths of the earth outward into space, and its history from ancient times to the present. The current status of water is explored along with problems of pollution and health. Kandel considers controversial environmental issues, "hydropolitics", and the decisionmaking that will affect water resources on into the future.

Water Wars: Drought, Flood, Folly and the Politics of Thirst by Diane Raines Ward

Diane Raines Ward takes the reader on a world tour to discover the controversies over water management, use and infrastructure in such unrelated places as California, Egypt and Holland. She notes paradoxically that today "1.4 billion [people], almost twenty percent of those living on the planet, don't have an adequate supply of clean water," while concurrently, "an overload of water endangers other peoples and places."

She identifies two significant factors driving our current struggle for water. First, ninety million people are added each year to earth's population, increasing the demand for water and yet making it less available due to related human, industrial and agricultural pollution. Second, the effect of global warming has the potential to make significant changes to our world. She presents a well-informed world view of water management and associated problems, and proposes possible solutions for further exploration.

Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters by Robert Jerome Glennon, 2002

In *Water Follies*, Robert Glennon describes how increases in groundwater pumping which have occurred across the country (water found underground, in springs or porous rocks called aquifers) has dried up wetlands, rivers and lakes. He relates how four states - Florida, Nebraska, Kansas and Mississippi - depend more on groundwater than surface water, using it at a rate faster than it can be recharged. He paints a scenario of the future for other states who continue to ignore the growing water crisis and the overconsumption of water by large entities. This book is particularly significant to those in New Jersey who may currently face decisionmaking on the use of our state's groundwater supplies.

Water: The Fate of Our Most Precious Resource by Marq De Villiers, 2000

The flyleaf of De Villier's eloquent book states "The presence of water has permitted the development of many great civilations; its absence ... has meant the death of many others." De Villiers places his chapters under four themes: The Where, What, and How Much of the Water World, Remaking the Water World, The Politics of Water, and What is to Be Done? Exploring the where's, why' and consequences of the current water-at-risk situation gaining upon us, the author elucidates a greater understanding with some solutions. *****

New Jersey Legislative Watch

Water-Related Bill Information - 2004-2005 New Jersey Legislative Session

Bill #	Ref. to Committee	Purpose
A105	Env/Solid Waste	Authorizes DEP to reduce or waive certain Water pollution penalties.
A284	Law Public Safety	Limits operation of personal watercraft in coastal wetlands.
A293	Env. Solid Waste	Appropriates $500,000 to DEP from "Drought Management Fund" for Water supply interconnection study.
A313	Env. Solid Waste	Requires owners of Water supply reservoirs prone to downstream flooding to implement flood protection programs.
A553	Env. Solid Waste	Provides a gross income tax deduction for certain Water supply and sewerage charges.
A585	Housing/Local Gov't	Authorizes counties, municipalities, municipal utilities authorities and sewerage authorities to impose intensity of use fee concerning sewer and Water connectors.
A673	Env. Solid Waste	Prohibits siting or construction of underground storage tanks within 50 feet of drinking Water wells, and within 100 yards under certain circumstances.
A692	AG/Nat. Resources	New Jersey Freedom to Fish Act.
A792	AG/Nat. Resources	Prohibits taking of horseshoe crabs.
A983	Env. Solid Waste	Establishes commission to study and promote desalination.
A991	AG/Nat. Resources	Exempts purchase of qualified Water conserving gardening devices from sales and use tax.
A1018	Ev. Solind Waste	Directs DEP to establish additional chemical surface Water quality monitoring stations and maintain existing chemical and biological stations; appropriates $800,000 over two fiscal years.
A1031	AG/Nat. Resources	Allocates at least $100 million from the Garden State Green Acres Preservation Trust Fund for coastal and inland Blue Acres land acquisition projects in flood-prone areas.
A1111	Env. Solid Waste	Appropriates $1 million to the DEP for watershed education grants.
A1112	Env. Solid Waste	Requires scheduled revisions to New Jersey Statewide Water Supply Plan.
A1114	AG/Nat. Resources	Establishes the New Jersey Aquaculture Assistance Program.
A1150, S454	Env. Solid Waste	Regulate development in certain areas with steep slopes to prevent pollution of waterways.
A1160	Env. Solid Waste	Prohibits sale of Gasoline containing MTBE; directs DEP to seek waiver from EPA oxygen requirements.
A1169	AG/Nat. Resources	Provides for roll-back taxes when certain watershed property is devoted to other uses.
A1289, S989	Env., Sol. Waste rec., Approp.	Establishes special environmental prosecutor.
A1308	Env. Solid Waste	Provides criteria to be used by DEP when determining if certain wetlands are part of surface water tributary system.
S668	Sen. Env. Committee	Appropriates $325,000 to the DEP for a grant to restore Hammonton Lake.
S956	Sen. Env. Committee	Requires that reservoir levels be set so as to protect surrounding areas from flooding and ensure adequate water supply.
A2336 S196	Env/Nat. Resourses Sen. Env. Committee	Authorizes the State, with prior approval by the State House Commission, to use eminent domain power to aquire lands for recreation and conservation purposes provided lands are protective of drinking water sources.
A2342 S192	Env. Solid Waste Sen. Env. Committee	“New Jersey Clean Water, Drought Mitigation and Water Resourse Security Trust Fund Act”.

New Jersey Enacts Tough Rules on Building Near Water Bodies

(reprinted from **enr.construction.com** - 01/12/04 issue**)**

New Jersey Gov. James McGreevey (D) announced Jan. 5 new anti-pollution measures to protect state waterways and limit waterfront development. The rules, to take effect next month, bar most new construction within 300 ft of classified pristine streams, rivers and reservoirs and would preserve about 300,000 acres. They also require developers to design stormwater runoff plans for building sites and set up a new stormwater discharge permit system for municipalities, highway systems and large public complexes. Environmentalists praised the rules, but builders strongly opposed them. "Homebuilding in these designated growth areas is already held to the nation’s highest environmental standards," says Patrick J. O’Keefe, CEO of the New Jersey Builders Association. *****

New Jersey Legislative Watch (Cont.)

New Bill Protects Water Supply with Water Tax

A bill jointly before the NJ Senate (S-192) Environment committee and the Assembly (A2342) Environmental Solid Waste committee establishes the NJ Clean Water, Drought Mitigation and Water Resource Security Trust Fund Act, which provides loans and grants to municipalities, counties and authorities for water resources and water quality projects. The Act provides for instituting a 3-cent levy on each 1,000 gallons shipped by public water purveyors, with an anticipated cost to most residential users of approximately $2.40 annually, according to industry estimates. Environmental programs and land preservation near drinking-water sources would benefit from this bill, part of a general movement of stricter control over water since DEP drought conservation measures began in 2002.

New Jersey American Water Co., the state's largest water provider, has stated they would prefer a 1-cent increase in the tax, which would be earmarked for upgrades to the state's water infrastructure, which sometimes proved unable to exchange water between systems to meet public demand during the 2002 drought.

Funds may be used for:

- protecting existing water supplies through the acquisition of watershed and wetlands areas as well as maintenance of existing publicopen space which protects water supplies
- restoring lakes, reservoirs, rivers and streams, and establishing new water impoundments
- preventing salt water intrusion into the State's surface and ground water sources
- protecting and upgrading water infrastructure
- conducting studies necessary for long-term water supply protection
- expanding the State's water monitoring network and drought monitoring *****

COMMENT ON OCCURRENCE OF UNREGULATED CONTAMINANTS IN DRINKING WATER

NJ DEP is requesting comments regarding several approaches to address the occurrence of unregulated organic contaminants in New Jersey's drinking water. The intent is to devise a program to address all drinking water sources in the state, with many of the options focused on ground water systems. See the Department's web site *www.nj.gov/dep/rules/ipr.html* for a discussion paper available.

Using Science to Protect Wetlands: Making Science Available to All, May 19, 2004 Rider University, Lawrenceville, NJ
A symposium sponsored by Friends for the Hamilton - Trenton - Bordentown Marsh; Stony Brook-Millstone Watershed Association (SBMWA); NJ Water Resources Research Institute; Delaware River Keeper and Rider University. This workshop includes panel discussions on wetland research and education, and on SBMWA's wetland research and policy development. It will also feature two talks on North Jersey swamps and on a tidal freshwater marsh. For program and registration see: *www.thewatershedinstitute.org/wsmworkshops.html*

NJWRRI FY 2004 Research Awards

New Jersey Water Resources Research Institute is proud to announce that funding for the FY 2004 State Water Resources Research Institute Program (104B) has been awarded to support the following research:

Graduate Research Grants Awarded

"The investigation of bacterially-mediated dechlorination of dioxins by dehalorespiring bacterial cultures and in dioxin-contaminated sediments from the Passaic River, New Jersey." Fang Liu, Rutgers University, Donna E. Fennell, Advisor

An Evaluation of Bioretention System Best Management Practices (BMPs) to Reduce Pollutant Concentrations of Stormwater and Their Potential to Contribute to Groundwater Pollution through Infiltration." Gregory Rusciano, Rutgers University, Chris Obropta, Advisor.

"Soil Moisture Regimes and Nitrate Leaching in Urban Wetlands." Emilie Stander, Rutgers University, Joan Ehrenfeld, Advisor.

Seed Dispersal Dynamics in Restored and Intact Salt Marshes: Implications for Restoration Success." Polly L. Hicks, Rutgers University, Jean Marie Hartman, Advisor.

"Use of stable isotope ratios of mercury to track and differentiate between sources of mercury pollution." Kritee, Rutgers University, Tamar Barkay, Advisor.

Senior Researcher Grants Awarded

"High resolution geophysical imaging as a novel method for noninvasive characterization of contaminated wetlands: application to Kearny Marsh." Lee D. Slater, Rutgers University-Newark.

"Fate of Brominated Flame Retardants in New Jersey Wastewater Treatment Facilities." Donna E. Fennell, Lisa A. Totten, Uta Krogmann. *****

Conference Calls

NJ-AWRA 2004 Mid-Atlantic Conference, April 29 & 30, 2004, Matamoras, PA - Focus on the new Phase II Stormwater Rules. See *www.awra.org/state/new_jersey/index.html*

National River Rally 2004, May 21 - 25, 2004 - Wintergreen Resort, Wintergreen, Virginia. See *www.rivernetwork.org*

First Annual Water Law, Policy and Science Conference, Finding Solutions to Multi-jurisdictional Water Conflicts March 4 – 5, 2004 - College of Law Auditorium, University of Nebraska-Lincoln, *http://snr.unl.edu/waterconference2004* or call Jacki Vogel, 402-472-7550

NJWEA 89th Annual Conference and Exposition May 4, - 7, 2004 - Rhw Tropicana Casino & Resort, Atlantic City, NJ For more information see *http://www.njwea.org/conferen.htm*

Water Environment Federation (WEF), Watershed 2004,July 11-14, 2004 - Hyatt Regency Dearborn, Dearborn, Michigan, See *www.wef.org/conferences/watershed04.jhtml*

The National View

Clean Water Act Under Threat – Make Your Views Known

During the past 30 years, the Clean Water Act has provided a bulwark against disposal of waste into waters and destruction of wetlands. Most Americans support protecting the water quality of streams and lakes, and conserving the remaining wetlands, which supply wildlife habitat, absorb floodwaters, and process pollution from water.

Previous to passage of the Clean Water Act, some 70% of America's waters were too polluted for swimming or to support fish and other aquatic life. Even today, 39% of rivers, 45% of lakes and 51% of estuaries are not safe for fishing or swimming.

A 2001 Supreme Court ruling threw into question whether federal Clean Water Act protections apply to any wetlands, streams and other waters that may be considered "isolated."

In January, 2003, the current national administration issued an immediate policy guidance that would lift protections from many small streams, ponds and wetlands that appear to be disconnected from major rivers and lakes. The administration also solicited public comment on an advance rulemaking proposal to change Clean Water Act rules. According to the USEPA, this guidance alone puts at risk 20% of the United States' remaining wetlands, about 20 million acres. Many more small streams and ponds could also be excluded.

On February 27th, 2003, the "Clean Water Authority Restoration Act of 2003" was introduced into Congress as HR 962 with bipartisan support of 112 co-sponsoring Representatives in the House, and as S473 with 4 Senators backing it in the Senate.

This bill clarifies that Congress intends for Clean Water Act protection to extend to all of the nation's waters, including the so-called "isolated" wetlands, streams, ponds and other waterbodies that play an integral role in our environment and the health of our communities. It specifically strikes the terminology ***"navigable waters of the United States"*** each place it appears and inserts ***"waters of the United States"***, thereby extending coverage to tidal waters, "the territorial seas, and all interstate and intrastate waters and their tributaries, including lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, natural ponds, and all impoundments of the foregoing."

In November, 2003 a bipartisan group of 218 members of the House of Representatives sent a letter to the President urging him not to cripple the Clean Water Act.

To ensure protection for all of the nation's waters - our rivers, lakes, ponds, streams and wetlands - your opinion on the Clean Water Authority Restoration Act (HR 962 & S 473) is needed. To make your views known to your congressional representatives, locate contact information for your representative at *www.house.gov* and your senators at *www.senate.gov* *****

Conservation Partnership to Protect New Jersey Streams Draining to Atlantic Ocean

A $100 Million Conservation Reserve Enhancement Program (CREP) between USDA and the State of New Jersey will improve the water quality of streams draining to the Atlantic Ocean by establishing stream buffers on agricultural land.

On February 3, 2004, Agricutural Secretary Veneman announced "This partnership will result in the planting of 30,000 acres of New Jersey farmland to grasses and trees to help prevent pollutants from entering waterways that feed into the Atlantic Ocean."

Establishing buffers, filter strips and grass along farmland streams potentially can prevent 26,000 pounds of phosphorous and seven million pounds of soil from polluting the state's waterways each year. Improving water will facilitate restoration stream ecological functions, enhance critical habitat for wildlife and decrease reduce biological impairment in the Atlantic Ocean.

Areas eligible for the CREP program include cropland and marginal pastureland in the Delaware and Wallkill watersheds and the Northeast, Raritan and Atlantic regions of the state.

The Conservation Reserve Enhancement Program will be voluntary, with participants paid to implement conservation practices on environmentally sensitive land in exchange for receiving annual rental payments paid on a per-acre basis, cost-share assistance and other financial incentives.

Enrollment in this program began on March 15, 2004. More information on this and other programs can be found at the Farm Service Agency's website at:

http://www.fsa.usda.gov/dafp/cepd/default.htm

or by contacting a local FSA office. *****

A must-have reference for those establishing buffers is the "Adopt-A-Buffer Toolkit: Monitoring and Maintaining Restoration Projects." Put out by the Delaware RiverKeeper, it is available for free online at: *www.delawareriverkeeper.org/monitoring/Toolkit-Final.pdf*

U.S. House Initiates New Website

The House Resources Committee has initiated a new website intended to disseminate timely news, issue briefs, legislation updates, and live audio from hearings, in an easy-access format. While still experimental, the committee solicits public opinion regarding the new layout. Of special consideration should be the Water and Power Subcommittee page, which has a great deal of information related to current water issues. Reports of interest currently available are "Water Infrastructure NOW! Recommendations for Clean and Safe Water in the 21st century" and "Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure". The site can be accessed at *www.house.gov/resources/* *****

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New Jersey Flows

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