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NC WRRI/NC Sea Grant Fund New Research Projects

by Rhett Register

The Water Resources Research Institute of the University of North Carolina system and North Carolina Sea Grant jointly provide competitive funding for projects that explore current water resources and coastal issues in North Carolina. Three projects were chosen for funding in 2014.

“These projects address the noted focus areas, and simultaneously meet the organizational priorities of both WRRI and NCSG. They also all include a thorough outreach plan, helping ensure that the data and products generated from these projects will have broad applicability,” notes John Fear, deputy director of both programs.

“Drought Resilience: An Integrative Project” will create video and online modules that educate audiences about water resources management and conservation. Lucy Laffitte, UNC-TV, is the principal investigator. Michele Drostin, Dana Haine and Kathleen Gray, from the University of North Carolina at Chapel Hill’s Institute for the Environment, are co-principal investigators.

“Land Application of Aquaculture Effluents To Prevent Surface Water Eutrophication and Promote Groundwater Re-Infiltration in Coastal North Carolina” will build and test a system that diverts wastewater from land-based aquaculture to woody biomass production.

Harry Daniels, North Carolina State University, is the principal investigator. Elizabeth Guthrie Nichols and Dennis W. Hazel, also from NC State, are the co-principal investigators.

“Coastal Groundwater Watch” involves citizen scientists. They will help develop adaptation and mitigation strategies to assess the potential effects of a progressively shallower water table caused by rising sea level. Alex Manda, principal investigator, and Tom Allen, co-principal investigator, are both from East Carolina University.

For more information, visit the WRRI website at www.ncsu.edu/wrri/ or contact John Fear, WRRI deputy director, at 919-515-9104, jmfear@ncsu.edu.

Christy Perrin joins WRRI



Christy Perrin, WRRI

Christy Perrin is now sustainable waters and communities coordinator at the Water Resources Research Institute of the University of North Carolina system.

“Christy brings a wealth of experience in working with communities to manage and protect water resources,” notes Susan White, executive director for WRRI. “We are pleased to have her join our team.”

Perrin’s responsibilities include

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NC Watershed Stewardship Network supports local watershed groups

by Christy Perrin, Sustainable Waters and Communities Coordinator, WRRI

Who leads and participates in efforts to safeguard North Carolina's creeks, rivers, lakes and estuaries? Is it the state government? Does the federal Clean Water Act provide enough regulatory authority to prevent degradation? Who should address previous degradation from development, agriculture and industry?

In a recent survey of residents in the Black Creek watershed in Cary, more than 50 percent of respondents said that state and local governments, local watershed groups, and private businesses should all contribute to managing watershed health.

The U.S. Environmental Protection Agency agrees. Since 1991, the USEPA has endorsed and supported a watershed approach to protecting our waters. This approach requires diverse participation in a science-based, collaborative partnership focused on distinctly defined drainage areas. Many citizen and local watershed organizations across North Carolina work diligently to protect and restore their water resources within this framework. These groups, however, often face challenges recruiting volunteers, finding technical resources, approaching private entities for support and financing their efforts.

In North Carolina, a diverse partnership of watershed professionals recognizes these challenges and is working to build the capacity of local watershed stewards to effectively protect and improve their local water resources.

The N.C. Watershed Stewardship Network, or NCWSN, arose from a needs assessment conducted by a small group of watershed professionals who pondered, "how can we



Michele Drostin moderates a discussion at a recent NCWSN meeting.

support and increase the numbers of people working locally across the state to protect and restore water resources?"

To answer the question, a group representing WRRI, UNC Institute for the Environment, NC Division of Water Resources, Triangle J Council of Governments, and the former Watershed Education for Communities and Officials NC Cooperative Extension Program, sent surveys to watershed professionals and volunteer groups across North Carolina. They also conducted focus groups with watershed volunteers.

The results show that people who work in the state's watersheds desire ways to connect with others to share skills, success stories and resources. They also reveal that the vast majority of respondents became involved because they felt a connection to their land and water resources.

These findings sparked an "aha" moment for the group. Providing access to skillbuilding, partners, and resources is one, albeit important, piece of the watershed restoration

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and conservation puzzle that the NCWSN can provide for improving North Carolina waters. The other piece is helping to increase the connections felt between citizens, local government officials, business and community leaders, and their water resources to increase the likelihood that they will take action to protect what they care about. Some other key findings include:

- Many opportunities exist for partnering and cross training among watershed professionals;
- Volunteer respondents would likely participate in one-day workshops within an hour drive;
- The majority of professional and volunteer respondents welcome the idea of online interactive networking tools; and
- Volunteers need help reaching out to some audiences, including businesses, underserved communities, and civic groups like Rotary and Kiwanis Clubs.

In May 2013, fifty people representing a broad array of watershed professionals and volunteers from across the state gathered at the NC Botanical Garden in Chapel Hill to review the needs-assessment results and provide suggestions for moving forward, including discussing ways to create and sustain a network. Their recommendations and interests formalized the formation of the NCWSN, and created a steering committee to guide NCWSN growth and development.

Recommendations from the gathering call on the NCWSN to focus on positive results, build on existing resources, hire a coordinator and engage a broad array of partners. A NCWSN steering committee is intended to represent a suite of water-

shed interests, diverse by geography, size, and organizational type such as community, non-profit, local and state government and corporate. In the year since the NCWSN was formed, the steering committee has accomplished an impressive list of achievements, highlighting the power of a motivated collaborative team.

UNC-IE and WRR I addressed the recommendation of funding a coordinator by hiring two part-time coordinators, Michele Drostin and Christy Perrin. The coordinators' roles are to advance the development and growth of the NCWSN by coordinating the activities of members and subcommittees in alignment with the NCWSN mission to "empower more effective watershed stewardship because water is critical to economic, environmental and community health."

NCWSN will identify, include, link and serve watershed stakeholders across the state by focusing on three strategic areas taken from a draft of the strategic plan currently in process:

1. **Building a network.** NCWSN will create a networking infrastructure and hub for members to connect and share resources, recruit members, and help members approach and work with others.

2. **Building skills and inspiring engagement.** NCWSN will provide training and other educational offerings to increase ability and confidence of members. It will also conduct activities and campaigns to spark connections between potential watershed stewards and natural resources.

3. **Building financial support for the NCWSN and local stewardship efforts.** NCWSN will acquire funding to support network development and assist local stewardship efforts with their funding efforts.

The NCWSN hosted its first



Brainstorming session at a recent NCWSN meeting.

networking and educational event at the September 2014 Water Education Summit in Asheville with a special interactive session, "Successfully recruiting public and private partners in watershed improvement projects: A roundtable symposium." Thirty participants from North Carolina, Alabama, South Carolina, Vermont, the District of Columbia, Georgia and Texas shared success stories about sparking connections between people and their resources, engaging landowners in projects and engaging underserved communities. The results will be summarized and published as a guidance document to serve as a resource for North Carolina watershed stewards.

As the NCWSN moves into its second year, it will introduce a suite of online interactive tools, engage non-traditional watershed audiences such as businesses, finalize a strategic plan and coordinate regional workshops with partner organizations.

Announcements of opportunities to participate and product roll-outs, such as maps and other informational materials, can be viewed on the NCWSN listserv, website and social media sites.

To subscribe to the members listserv, contact christy_perrin@ncsu.edu. For more information, visit ncwatershednetwork.org.

Follow NCWSN on Twitter @NCWSN.

Christy Perrin *continued from page 1*

coordinating the new and expanding N.C. Watershed Stewardship Network in partnership with University of North Carolina at Chapel Hill's Institute for the Environment, N.C. Division of Water Resources, Triangle J Council of Governments and multiple other organizations. The network, which she describes in an article on page 2, assists watershed groups across the state with protecting and improving local water resources.

Trained in community mediation, group facilitation, and public participation, Perrin also continues to lead long-term collaborative urban water restoration projects in Cary and Wilmington. In north Cary, she leads an effort to engage business and institutional landowners in improving the Black Creek watershed, home to the popular Black Creek Greenway. In Wilmington, Perrin works with environmental educators, youth and teaching artists to design and implement urban stormwater retrofits and accompanying educational curricula at an after-school arts facility for underserved youth.

"I'm excited to join an esteemed water resources organization with 50 years of history in sponsoring and sharing science-based information in North Carolina," Perrin says. "WRRI continues to serve on the forefront of watershed protection and improvement. And Susan and John [WRRI's executive and deputy directors] recognize the value of fostering partnerships, a key strategy for successful organizations in today's world."

Prior to joining WRRI, Perrin led the Watershed Education for Communities and Officials, or WECO, program for North Carolina

State University Extension from 2001 to 2014. The program served communities working to identify and collaboratively address natural resource management issues. From 1998 to 2001 Perrin worked with the NC Natural Resources Leadership Institute, where she engaged citizens in discussing high-conflict policy issues such as endangered piping plover management at the beach, stormwater rule making, and wood-chip mills.

Perrin holds a master's degree in public administration with an environmental policy focus from North Carolina State University. She has a Bachelor of Science in animal science with a wildlife-biology minor from the University of Vermont. Perrin also holds certificates in Appreciative Inquiry facilitation and corporate sustainability.

In 2011, Perrin won the Outstanding Statewide Extension Program Award from the Southern Region Water Program, USDA-NIFA. In 2010, she received the Marvin Collins Outstanding Planning Award for Sustainability from the North Carolina Chapter of the American Planning Association.

Contact Perrin at christy_perrin@ncsu.edu or 919-513-1152. Follow the N.C. Watershed Stewardship Network on Twitter @NCWSN.

Annual Conference will look back on 50 years of WRRI

The federal Water Resources Research Act of 1964 authorized funding for a network of institutes to assure the nation has "a supply of water sufficient in quantity and quality to meet the requirements of its expanding population."

The following year, the North Carolina Water Resources Research Institute was formed. Since 1965, WRRI has supported statewide research and outreach efforts to advance knowledge and protection of water resources.

The upcoming WRRI Annual Conference — March 18 and 19 at the Jane S. McKimmon Center in Raleigh — will include a look back at WRRI's 50 years. In addition to hosting sessions and speakers that highlight contemporary water research and policy in North Carolina, conference sessions will also examine water challenges the state has faced in the last half-century and look ahead to what the next 50 years may bring.

Researchers, managers, water professionals and state and local leaders are encouraged to take part in the conference and festivities. For more information, visit the WRRI website at www.ncsu.edu/wrri/.

Environment-related legislation passed by the N.C. General Assembly

The following is a summary of some of the environment-related legislation passed during the “short-session” of the 2013-2014 General Assembly.

By Samantha Walker and Rory Fleming, research law fellows, N.C. Coastal Resources Law, Planning, and Policy Center

Session Laws

Coal Ash Management Act of 2014 (S 729/S.L. 2014-122)

This Act, resulting from the mismanagement of the Dan River coal ash spill, requires that coal combustion residuals (CCRs), removed from wet impoundments, be regulated under N.C. solid waste disposal laws, closes 33 impoundments under environmental standards, establishes timelines for groundwater assessment and remediation, requires utilities to identify drinking water wells and provide alternative water sources when necessary, and establishes stronger construction standards and Emergency Action Plan standards.

Regulatory Reform Act of 2014 (S 734/S.L. 2014-120)

This Act reforms aspects of the environmental and administrative laws of the state. These reforms include changes to air-quality regulation (fewer instances where open burning of leaves and trees requires state permits and no private fireplace regulation beyond federal level); coastal development (removes some shorelines from inlet hazard area designation, adds procedural hurdles to those appealing CAMA permits); onsite wastewater systems (creates streamlined permitting process); water quality (raises permitting threshold for disturbance of isolated wetlands); and water supply (extends expedited interbasin transfer approval process).

Energy Modernization Act (S 786/S.L. 2014-4)

This Act allows DENR to begin issuing permits for hydraulic fracturing (“fracking”) on July 1, 2015. It also requires oil and gas companies to disclose all chemicals used in fracking to the State Geologist, but prevents such “trade secrets” from public disclosure except during emergency situations.

Groundwater Contamination/Modify Response (S 574/S.L. 2014-17)

This Act, in response to the United States Supreme Court ruling in *CTS Corp. v. Waldburger*, clarifies that the 10-year statutory period for bringing a personal injury or property damage claim does not bar tort action for damages caused by exposure or use of contaminated groundwater.

Reclaimed Water as Source Water (S 163/S.L. 2014-113)

This Act permits approved wastewater to supplement drinking water supply. The bill also requires communities utilizing reclaimed wastewater as drinking water engage in other water-conservation acts.

2014 State Budget

The 2014 State Budget (Session Law 2014-100), entitled Current Operations and Capital Improvement Appropriations Act of 2014, has many items which implicate environmental law and policy. These are included in a variety of different sections of the overall bill and are broken down here according to general category.

Department of Environment and Natural Resources

The budget required the Department of Environment and Natural Resources, the Wildlife Resources Commission, the Department of Agriculture and Consumer Services, the Department of Labor, and the Department of Commerce to review every active federal grant received by the respective departments and report to the House Appropriations Subcommittee on Natural and Economic Resources, Chairs of the Senate Appropriations Subcommittee on Natural and Economic Resources, regarding grant resources and maintenance. Pursuant to G.S. 143C-1-1, all departments which have undergone reorganization or modification are required to submit a report detailing:

- (1) Positions eliminated,
- (2) Positions transferred among divisions, sections or programs,

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Environment-related *continued from page 5*

- (3) New divisions, sections, and programs established,
- (4) A comparison of the organizational charts before and after the reorganizations or other administrative modifications with each structural change clearly identified,
- (5) A list of divisions, sections, and programs that were unaffected by the reorganizations or other administrative modifications,
- (6) Resulting cost-savings, itemized by funding source,
- (7) An explanation of improvements in the administrative capability of the department to manage its programs and carry out its mission, and
- (8) An identification of any obsolete or overlapping activities.

Water Quality Remediation Funds

Five hundred thousand dollars (\$500,000) from the Clean Water Management Trust Fund will be used for remediation and mitigation of stormwater impacts to lakes subject to a Nutrient Management Strategy approved by the Environment Management Commission. This allocation will fund efforts to control stormwater upstream from lakes with nutrient management plans, such as Jordan and Falls Lakes.

Natural and Economic Resources

The Wildlife Resources Commission General Fund budget was reduced by \$3,313,319. This brings the Wildlife Resources Commission 2014-2015 budget to \$11.1 million and represents a \$1 million decrease in last year's allocation. The Department of Environment and Natural Resources (DENR) received an additional \$1,534,820 from the NC General Fund, bringing their fiscal year 2014-2015 funding to \$159.3 million.

General Provisions

Adjustments in the budget include \$5 million from DENR Special Funds. Diversions include: transfer of interest from DENR Special Funds (\$793,095); diversion of funds from DENR Inspection and Maintenance Control Special Fund (\$3,300,000); and diversion of funds from DENR Water and Air Account Special Fund (\$1,000,000). The funds from these accounts were predominately transferred to cover additional Medicaid expenses. In addition to the decrease in DENR funding, the interest from the following funds are redirected to the general fund:

- Marine Conservation Fund
- Clean Water Management Trust Fund
- Dry Cleaning Solvent Cleanup Fund
- Parks and Recreation Trust Fund
- Bernard Allen Drinking Water Fund
- Water Pollution Control System Account
- Commercial Leaking Petroleum Storage Tanks Fund
- Noncommercial Leaking Petroleum Storage Tanks Fund
- Inactive Hazardous Sites Fund
- Emergency Response Fund
- Superfund Cost Share Fund
- Brownfield Superfund Fund
- Inactive Hazardous Sites Fund-S1492

Pilot Program

The Office of State Budget and Management and the Office of the State Controller were authorized to establish a pilot program to test measures for improving the extent to which funds spent are properly budgeted. Included in the pilot program are grant programs and special funds within DENR and unexpended appropriations carried forward by UNC pursuant to N.C.G.S. 116-30.3. The provision allows for other programs to be part of the pilot as necessary.

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Environment-related *continued from page 6*Department of Health and Human Services*Increased Fee for Private Well-Water Testing*

Although the fee for analyzing private well-water samples increased from \$44 to \$74, the Department of Health and Human Services, in consultation with DENR, will analyze options for reducing or waiving the fee for low-income households. These households are at or below three hundred percent of the current federal poverty level.

TVA Settlement Funds

In 2011, the Tennessee Valley Authority entered into a settlement agreement pursuant to a dispute over TVA's compliance with the EPA's Clean Air Act. The budget allocates \$2,240,000 per year for two years (2013-2015) from the settlement to the Department of Agriculture and Consumer Services. The Department will divest the \$1,000,000 from the award to the North Carolina Agricultural Development and Farmland Preservation Fund, which will further grant funds to Avery, Buncombe, Burke, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Swain, Transylvania, Watauga, and Yancey counties. \$500,000 from the total award is allocated to "Environmental Mitigation Projects" in the above stated counties. Another \$500,000 from the award is allocated through the North Carolina Agricultural Water Resources Assistance Program in the above-stated counties. The remaining \$240,000 is allocated to the Appalachian Energy Center at Appalachian State University.

Aquatic Weed Control

A maximum of \$500,000 is allocated for aquatic weed-control projects. These projects are designed to assist North Carolina citizens and local governments burdened with aquatic weed infestations.

Capital Appropriations*Department of Environment and Natural Resources*

DENR's capital improvements allocation was cut nearly in half from last year's \$11,522,000 to \$5,810,000 for fiscal year 2014-2015.

Water Resources Development Projects

DENR will allocate funds for water resources development projects including:

- (1) B. Everett Jordan Lake Water Supply Storage (\$200,000)
- (2) Wilmington Harbor Maintenance – Disposal Area 8 & 10 (\$4,000,000)
- (3) Morehead City Harbor Maintenance (\$0)
- (4) Wilmington Harbor Deepening (\$600,000)
- (5) Wilmington Harbor Improvements Feasibility Study (\$200,000)
- (6) Natural Resources Conservation Service (NRCS) Equipment Projects (\$2,000,000)
- (7) Planning Assistance to Communities (\$25,000)
- (8) Hookerton, NC – Stream Bank Erosion Repair of Sec 14 (\$410,000)
- (9) State/Local Water Resource Development Grants (\$1,000,000)

These projects are funded from \$2,625,000 carried forward from previous fiscal years. In sum, this serves as a state match for approximately \$9.65 million in federal funds.

For more information, including to subscribe to the Center's newsletter *Legal Tides*, contact the N.C. Coastal Resources Law, Planning, and Policy Center at lcschiav@ncsu.edu or 919-515-1895. Follow them on Twitter [@oceancoastallaw](https://twitter.com/oceancoastallaw).

A new approach to assessing the risk of graywater

Graywater reuse — the recycling of water from laundry, sinks and showers for such uses as irrigation, toilet flushing, and vehicle or home washing — has major potential for reducing the amount of treated water a household uses.

Graywater differs from reclaimed water in that it does not include water from toilets or from food preparation. Recent state legislation authorizes limited mixing by local water supply systems of reclaimed water with raw water prior to treatment to augment water supplies.

Reuse of graywater, on the other hand, is typically on-site and employs varying levels of treatment. The 2012 North Carolina plumbing code allows for limited use of graywater in approved recycling systems. For use in toilets, the graywater must be filtered, disinfected — using chlorine, iodine or ozone — and dyed. For use in subsurface landscape irrigation, only filtration is required.

In research funded by WRRRI, North Carolina State University researchers Francis de los Reyes III, Christopher Frey and Jory Whalen employ advanced molecular techniques to examine the microbial communities in untreated graywater. The researchers then use the information to evaluate the potential for infection associated with graywater use.

Traditional methods of testing graywater involve culturing graywater samples and looking for bacteria that are associated with the presence of feces. That method, says de los Reyes, may not be an accurate representation of what is actually in the sample.

The researchers, all from NC State University's Department of Civil, Construction and Environmental Engineering, used two techniques to gain a better understanding of the microbial communities found in graywater. Quantitative Polymerase

Chain Reaction, or qPCR, allows them to directly identify targeted pathogens, or microbes that can cause disease. Next-generation sequencing provides an overview of the entire microbial community within a sample.

The researchers took 80 graywater samples from 30 homes in the Triangle. Using qPCR, they hunted for four pathogens that had previously been shown to live in graywater:

- None of the samples tested positive for *Campylobacter jejuni*, a bacterium associated with gastroenteritis;
- One tested positive for *Legionella pneumophila*, a bacterium associated with pneumonia;
- Two tested positive for *Aeromonas hydrophila*, a bacterium associated with gastroenteritis and septicemia; and
- Five samples contained *Bacteroides*, a genus of bacteria associated with numerous infections and includes several species that are resistant to antibiotics.

Next-generation sequencing of the samples shows that bacterial communities in graywater vary by source, such as shower/bath, laundry and bathroom sink with different classes of bacteria living in each.

Assessing Risk

Once the researchers quantified the targeted pathogens in graywater, they entered the new data into a set of equations called a quantitative risk assessment. The assessment determines the risk of infection based on different exposure scenarios.

The exposure scenarios the researchers used include varying ways of ingesting graywater. These are direct ingestion, indirectly ingesting it from touching plants and lawns irrigated with graywater, and ingesting it by eating crops irrigated with graywater.

The results show that pathogen

contamination occurs less frequently (i.e., in very few households) than estimated by models using fecal indicators to estimate pathogen concentration.

However, when pathogens are detected, the risk of infection, as determined by a quantitative microbial risk assessment, exceeds the risk estimated by models that used fecal indicators.

The researchers also examined the effects that storage has on graywater that had been mixed from multiple homes. They found that levels of microorganisms increased with storage time until they stabilized at around five days — likely the time when the finite amount of organic matter in the samples had been consumed.

Conclusions and next steps

North Americans use approximately 69 gallons of water a day, with between 50 and 75 percent — or between 34.5 and 51.8 gallons — becoming graywater, notes the research report. It calls graywater “a valuable resource that can be utilized to reduce the amount of potable water needed in the home.” But it cautions that graywater reuse can present human health risks that need to be managed.

To reduce the risk of bacterial infection potentially associated with ingesting graywater, the report suggests graywater be used at the household level, rather than mixing the graywater of multiple homes. It also cautions against storing graywater for more than 24 hours.

The researchers will continue to employ next-generation sequencing techniques to gain a better understanding of the entire microbial community found in the samples. They also may conduct additional qPCR analyses to clarify the condition — rather than just the presence or absence — of the microbes they found.

To access the report, visit go.ncsu.edu/11-04-U.

Save-the-Date

WRRRI 17th Annual Conference & NCWRA Symposium

March 18-19, 2014
McKimmon Center
Raleigh, NC

The premier conference highlighting diverse topics in water research, management and policy in North Carolina.

Join us as we celebrate NC WRRRI's 50th anniversary.

Registration opens
Winter 2015

For more information visit:
go. ncsu.edu/wrriac.

Recently published reports from WRRRI

The following WRRRI research reports have recently been published and are available for download from the NC State library repository. Reports can be accessed through the links below.

- Hans Paerl, UNC-CH.
“Bioavailability and fate of organic nitrogen loading to Neuse River Estuary phytoplankton” at *go.ncsu.edu/12-04-UW*.
- Regina Guyer, UNC-Charlotte.
“Tailoring fats, oil, and grease communication platforms to fit the needs of NC utilities, while enhancing the message through statewide synergy” at *go.ncsu.edu/12-08-U*.
- Jennifer Dorton, UNCW.
“City of Durham water quality web portal” at *go.ncsu.edu/13-07-SE*.

Upcoming Events

EcoStream Stream Ecology and Restoration Conference

November 17 to 20, 2014
Sheraton Charlotte Hotel
Charlotte, NC

Check out the site below for additional information:
www.bae.ncsu.edu/programs/extension/wqg/srp/conference/.

Erosion & Sedimentation Control Planning & Design Workshop

December 2, 2014
The Crossing at Hollar Mill
Hickory, NC

This workshop will focus on considerations for protection of developing watersheds. Techniques will be discussed for establishing vegetation, dealing with extreme rain events, and converting E&SC measures to permanent stormwater controls. Updates on DEMLR activities, including a new system for electronic permitting, will also be discussed.

Agenda and registration information at:
ncsu.edu/wrri/code/events/upcomingevents2.htm.

NCWRA Forum, Luncheon and Webinar: Big Environmental Regulatory Changes Coming to North Carolina

December 8, 2014
NCSU Jane S. McKimmon Center
Raleigh, NC

Presentation by Benne Hutson, Partner,
McGuireWoods LLP, Charlotte and Raleigh Offices;
Chairman, NC Environmental Management Commission

Register online at:
www.ncwra.org/events.

A full list of upcoming WRRRI and other events can be found at: *www.ncsu.edu/wrri/code/events.htm.*