



## Ecosystem Enhancement Program will change how highway impacts to wetlands and streams will be mitigated in North Carolina

At least 75% of all the activities undertaken to compensate for impacts to wetlands and streams in North Carolina are undertaken by the N.C. Department of Transportation. NCDOT spends more than \$80 million each year on projects meant to mitigate the effects of bridges and road crossings on wetlands and regulated riparian areas. However, in spite of all the money devoted to it, NCDOT's compensatory mitigation program has not satisfied DOT or the regulatory agencies. Road and bridge projects still face considerable delays because of permitting problems and insufficient wetland and stream compensatory mitigation (See "Recommendations made for improvement of NCDOT mitigation program, Jan/Feb 2003, WRRI News).

However, over the next two years, NCDOT, the N.C. Department of Environment and Natural Resources (DENR), and the U.S. Army Corps of Engineers (USACE) plan to change this picture. At the N.C. Environmental Management Commission meeting in December 2002, DOT, USACE and DENR officials announced the imminent creation—by a memorandum of understanding among the three agencies—of the Ecosystem Enhancement Program (EEP). The new program will absorb the N.C. Wetlands Restoration Program and certain mitigation-related operations within the DOT. Under this new

program, mitigation staff between the two agencies will be merged under DENR. Except for some on-site mitigation, NCDOT itself, will phase out of the mitigation business.

According to Bill Gilmore, who serves as EEP Transition Manager for NCDOT and NCDENR, mitigation under

EEP will be pro-active and not re-active. The EEP will construct mitigation projects before highway right of ways are acquired, thereby reducing or eliminating mitigation-related permitting delays. The new process will select and design mitigation projects by conducting watershed assessments and developing

*continued page 3*

In this issue	March/April 2003	Page
Director's Forum: <i>WRRI Research Priorities</i>		2
February/March action of the N.C. Environmental Management Commission		4
February action of the EMC's Water Quality Committee		5
In Memoriam: Joseph A. Phillips		5
Water quality trading: Not ready for prime time?		6
House Science Subcommittee approves Aquatic Invasive Species Research Act		8
Research finds concentrations of atrazine lower than drinking water standard cause sex changes in male Leopard Frogs		9
Federal legislation addresses inland flooding and dam safety		9
Multi-funded project gave big boost to implementation of Neuse agricultural nitrogen reduction rule		10
Environmental legislation introduced in the N.C. General Assembly		10
WRRI report available: <i>Using Natural and Landscaped Buffers to Reduce Pollutant Loading from Agricultural Runoff</i>		11
STUDIES: <i>Study documents export of nitrogen from various land uses in Upper Neuse Basin higher than literature values</i>		12
Seven appointed to WRRI Advisory Committee		14
Plus...water resources conditions... people... conferences... calls... and more		

## Director's Forum

# WRR I Research Priorities

*Kenneth H. Reckhow, Director, Water Resources Research Institute*

Later this spring, the WRR I Advisory Committee meets to begin the annual cycle for the WRR I competitive grants program. As this meeting sets the stage for the Institute's research program for next year, I think that it is worthwhile to examine possible research needs.

However, before suggesting potential research needs, I should briefly describe the annual WRR I research program. At its spring meeting, the WRR I Advisory Committee establishes the annual research priorities for the Institute. The Advisory Committee is composed of individuals from a broad range of positions in the public and private sectors, all with extensive experience and knowledge of water management. Through their professional activities, these people are aware of water management and water-related decisions that are science-limited. This awareness, combined with the varied perspectives within the Advisory Committee, helps ensure that the Institute identifies appropriate water research needs to aid decision making. These research priorities then become the basis of a request for proposals (RFP) to the university research community in North Carolina. In response to the RFP, research proposals are developed, submitted, and undergo scientific peer review. The final step, aided by the WRR I Technical Committee, is selection of the best proposals for funding. With the active involvement of the WRR I Advisory Committee and the WRR I Technical Committee, the Institute has the basis for a strong annual research program.

The rationale for separate groups of experts advising WRR I on research needs and on research proposal selection is probably obvious. Those who use water science to guide water management presumably become aware of situations in which decisions are hampered by inadequate scientific knowledge.

Correspondingly, those who conduct water research should be the best judges of the quality of proposed research.

Yet, this separation of tasks is not without shortcomings; perhaps the most glaring potential shortcoming is that scientists may have failed to convey the uncertainties in the science, leading to a false sense of scientific knowledge. So, partly with those concerns and partly to

stimulate others to advise WRR I on water research priorities, I offer the following suggestions on research topics:

■ *Watershed-scale impacts of CAFOs and other nonpoint nitrogen sources* – Various human activities, notably agriculture, introduce large quantities of fixed and reduced nitrogen into coastal plain watersheds. On a small scale, we understand the processes that affect nitrogen transformation and transport, and on a farm scale scientists are examining alternative waste technologies for confined animal feedlot operations. However, on a river



## Water Resources Research Institute News of The University of North Carolina

ISSN 0549-799X  
Number 340  
March/April 2003  
Published bimonthly



*This newsletter is financed in part by the Department of the Interior, U.S. Geological Survey, as authorized by the Water Resources Research Act of 1984. Forty-three hundred copies of this newsletter were printed at a cost of \$1,624 or 38 cents per copy.*

### WRR I NEWS AVAILABLE ON WRR I WORLD WIDE WEB SITE

*The WRR I News plus summaries of more than 100 WRR I technical reports and other information are available on the World Wide Web at: <http://www2.ncsu.edu/ncsu/CIL/WRR I>*

### SUBSCRIPTIONS TO WRR I-NEWS LISTSERVE

*Anyone with an Email account can subscribe to the WRR I-News list serve. This service is used to announce posting of the WRR I News to the website and to disseminate information about WRR I seminars, workshops, conferences, NCWRA forums, and other pertinent information. To subscribe, send an Email message to: [mj2@lists.ncsu.edu](mailto:mj2@lists.ncsu.edu). Put nothing in the subject line. In the message say only: subscribe WRR I-News. Please send any Email correspondence regarding the WRR I News or the WRR I-News Listserve to [jeri\\_gray@ncsu.edu](mailto:jeri_gray@ncsu.edu).*

*WRR I offices are located at 1131 Jordan Hall  
on the North Carolina State University campus  
Mailing address: Box 7912, NCSU, Raleigh, NC 27695-7912  
Telephone: (919) 515-2815 General Email: [water\\_resources@ncsu.edu](mailto:water_resources@ncsu.edu)*

### WRR I Staff

*Director/Kenneth H. Reckhow ([Ken\\_Reckhow@ncsu.edu](mailto:Ken_Reckhow@ncsu.edu))  
Associate Director/Gregory D. Jennings ([Greg\\_Jennings@ncsu.edu](mailto:Greg_Jennings@ncsu.edu))  
Asst. Dir. for Information and Communications/ Jeri Gray ([Jeri\\_Gray@ncsu.edu](mailto:Jeri_Gray@ncsu.edu))  
Business and Administrative Officer/ Lynne Bridger ([Lynne\\_Bridger@ncsu.edu](mailto:Lynne_Bridger@ncsu.edu))  
Program Coordinator/ Julie Mason ([Julie\\_Mason@ncsu.edu](mailto:Julie_Mason@ncsu.edu))  
Accounting Technician/Gerry Cheney ([Gerry\\_Cheney@ncsu.edu](mailto:Gerry_Cheney@ncsu.edu))  
Office Assistant/Diane Fudge ([Diane\\_Fudge@ncsu.edu](mailto:Diane_Fudge@ncsu.edu))*

basin scale, what factors determine how much of this nitrogen reaches surface waters and exacerbates eutrophication?

■ *Water supply* – During the past year, the drought exposed a variety of water supply problems. Issues include local water supply versus demand, ground-water depletion, saltwater intrusion, contamination of private wells, and water use allocation. Development of new sources, water conservation, and water reuse are among the solutions. Where is the science lacking or insufficient?

■ *Water quality standards and compliance assessment* – Over the next several years, we will spend millions of dollars on TMDL planning and implementation. The foundation of a TMDL is the water quality standard, and the determination of the need for a TMDL is a function of ambient water quality monitoring. Clearly, we would like to spend the planning and implementation money in only those areas where standards appropriately indicate impairment and sampling correctly indicates noncompliance. Unfortunately, several recent nationwide studies have identified serious inadequacies in state water quality standards and ambient monitoring programs. Are North Carolina's water quality standards and monitoring program suitable for these tasks?

■ *Sediments in surface waters* – During and following most rainstorms in urban areas, we see streams of sediment-laden waters pouring into urban storm drains from land disturbing activities. Certainly, development has its costs, and some environmental effects, while undesirable, are also unavoidable. Yet several studies have identified sediment as one of the major water pollutants in North Carolina. Is this a problem of inadequate enforcement of existing rules due to too-few inspectors during tight budget times? Is this caused by failure to require known technologies that would do a better job of sediment and erosion control? Or, do we need additional research to develop improved, cost-effective technologies? ●

## Ecosystem Enhancement Program *continued*

mitigation plans based on the needs of the watershed.

Gilmore explained that under the current system, DOT is often late in its effort to address mitigation due to staffing shortages, process and regulatory coordination requirements. Typically the entire sequence of locating, acquiring, and designing requires more time than is available to meet letting schedules. This results in mitigation planning often occurring after the roadway right of way is acquired, leaving insufficient time to acquire and design a mitigation site in advance of the roadway letting. Under the current system, the mitigation process is driven by the need to obtain Corps and DENR permits and results in discrete

projects that may or may not provide optimal mitigation return of functional loss to the watershed ecosystem.

Under the EEP, impacts to wetlands and streams will be identified very early in the roadway planning process. Wetlands and stream impacts to each of 51 watersheds (based on USGS 8-digit cataloging units) over the current seven-year transportation plan will be compiled. This information will be used to target watersheds for assessment and mitigation planning based on the timing and the extent of impacts. In the watersheds, sources of water quality and habitat degradation will be identified and used to target mitigation. Watershed planning will be coordinated with other programs such as the Division of Water Quality's Basinwide Water Quality planning and Coastal Habitat Protection Plans. Once in place, mitigation projects



## Important announcement for all those who receive WRR I mailings!!

In an effort to make more efficient use of our shrinking funds, WRR I has begun phasing out hard copy mailings of seminar, workshop, and conference brochures.

If you want to receive information on workshops, conferences, and seminars, and other water-related announcements, **you must subscribe to the WRR I-News listserve.**

To subscribe to the WRR I-News listserve: send an email message to [mj2@lists.ncsu.edu](mailto:mj2@lists.ncsu.edu).

Put nothing in the subject line.

In the body of the message say exactly and only:  
subscribe WRR I-News

The WRR I newsletter will continue to be mailed in hard copy format for the foreseeable future. However, the newsletter is also accessible on line, and an email announcement is sent on the WRR I-News listserve each time a new issue goes online. The newsletter and all workshop, seminar, and conference information are on our website:

<http://www2.ncsu.edu/ncsu/CIL/WRR I>

## Ecosystem Enhancement Program *continued*

will be monitored to determine their effectiveness.

Mitigation planning and construction will occur concurrently with or ahead of road planning and engineering. The evaluation of the mitigation sites is planned to take place when or before the roadway right of way is acquired. So, by the time a road project is ready to let, wetlands and stream mitigation will be in place and providing functional replacement value to the ecosystem before there is impact.

### Transition

EEP will become effective on or before 2005. In the meantime, a core transitional staff headed by Gilmore is developing the organizational structure and processes that will make the program work. During the transitional phase, DOT will continue to provide restoration and enhancement to meet regulatory requirements but will rely on a higher percentage of high quality preservation. The Natural Heritage Program will assist in identifying preservation sites.

Gilmore emphasizes that the entire program is designed around ensuring that any project impacts are avoided and minimized to the maximum extent practicable and that a minimum of 1:1 restoration will be provided.

During the transitional phase, DOT will ramp up spending from its present \$80-\$100 million each year by adding as much as \$120 million for studies and projects.

The Ecosystem Enhancement Program will be overseen by a Policy and Oversight Committee composed of the heads of the three agencies. A Liaison Council composed of a diverse group of stakeholders will provide advice to the Policy and Oversight Committee.

Gilmore said that it is the hope of the three participating agencies that EEP will become a national model for compensatory mitigation. ●

## February, March action of the N.C. Environmental Management Commission

At its regular meetings on February 13 and March 13, 2003, the N.C. Environmental Management Commission took the following action:

- Approved holding public hearings on rules for air quality special orders. Special orders are directives issued by the Commission to an entity found to be out of compliance with air quality rules. Special orders are sometimes used in place of enforcement action to bring entities into compliance. The proposed rules describe procedures that the Division of Air Quality (DAQ) will use to issue special orders. For information contact Thom Allen with DAQ at (919) 733-1489.
- Approved a temporary rule amendment changing the date by which municipal waste combustors must comply with air quality rules and approved holding public hearings on the permanent rule amendment. Contact Thom Allen.
- Adopted a rule amendment providing for website public notice on draft permits that allow entities to limit operating hours or control air pollutants to avoid being designated as a "synthetic minor" source of air pollution. Notice will be posted on the Division of Air Quality's web site providing an opportunity to request a public hearing on the draft permit. Contact Thom Allen.
- After discussion about the fiscal effect on small counties and the lack of clarification of the NCDOT role in phase II, approved holding public hearings on proposed permanent rules to implement the NPDES Phase II Stormwater rules in North Carolina. See page 13 for hearing dates and locations and other information.

- Approved holding public hearings on permanent rules establishing riparian buffer protection in certain areas of the Catawba River Basin. See page 16 for hearing dates and locations and other information.
- In March, delayed for the second time a request to hold public hearings on reclassifying two sections of the Rocky River in Chatham County as Water Supply III Critical Area. The Town of Siler City intends to replace an existing dam with a larger one to create a water supply reservoir on the Rocky River. This will convert their water supply source from "run-of-river" to reservoir which will require expansion of the Critical Area under the Water Supply Watershed Protection rules. Commissioners requested additional information, including the draft Environmental Impact Statement, before approving the request. The Commission's Water Quality Committee is to review the EIS in May and perhaps send the item to the full EMC for action that month.
- Approved the final Broad River Basinwide Water Quality plan. Basinwide plans are available on the Basinwide Planning Program website at: <http://h2o.enr.state.nc.us/basinwide/index.htm>.
- Approved the Tar-Pamlico Model Local Stormwater Program. The Tar-Pamlico stormwater rule requires six municipalities and five counties in the Tar-Pamlico basin to develop and implement stormwater programs within one and one-half years of approval of a model local program by the EMC. The affected local governments must submit a local stormwater program by Feb 13, 2004, and must begin implementing the programs by August 13, 2004. The Tar-Pam Model Local Stormwater Program can be downloaded as a Microsoft Word file at <http://h2o.enr.state.nc.us/>

nps/tarpam.htm. Look under "stormwater rule."

- Approved a full accounting method for the agricultural rule under the Tar-Pamlico Nutrient Sensitive Waters Strategy. At direction of the N.C. General Assembly, a method for accounting for nitrogen reduction from pasture lands had to be developed separately from the method for cropland. The full accounting method combines both accounting methods.
- Approved an amendment to the Commission's by-laws setting up a new procedure for handling requests for remission of civil penalties. The new procedure provides for preliminary review of requests for remission of civil penalties by at least three members of the EMC designated by the chairman. The review group will make a recommendation for action by the EMC's Committee on Civil Penalty Remissions.
- Approved the final Yadkin-Pee Dee River Basinwide Water Quality Plan. During the monitoring period leading up to revision of the plan, DWQ determined that High Rock Lake is impaired by nutrients, and a management strategy for the lake is recommended in the plan. The plan also recommends a nutrient reduction strategy for Badin Lake.
- Approved holding public hearings on amendments to the rules establishing procedures for declaratory rulings (15A NCAC 2I .0600). Anyone affected by a rule of the EMC can request that the EMC issue a "declaratory ruling" as to the validity of a rule or as to the applicability of a rule to a given state of facts of a statute administered by the EMC or of a rule or order of the EMC except when the EMC, for good cause, finds issuance of a ruling undesirable. The EMC must prescribe in its rules the circumstances in which rulings shall or shall not be issued. For information on the rule amendment and public hear-

ings, contact EMC Counsel Frank Crawley at (919) 716-6600.

## February action of the EMC's Water Quality Committee

The Water Quality Committee of the N.C. Environmental Management Commission did not meet in March. In February, 2003, the Water Quality Committee took the following action:

- Approved Lincoln County's revised Water Supply Watershed Protection Ordinance.
- Approved a major variance from the Neuse River Riparian Area Protection Rule for HWB, Inc.'s Rosewood Industrial Park on the Little River in Goldsboro.
- Approved conditions under which staff of the Division of Water Quality (DWQ) may approve modifications of previously approved major variances
- Heard from DWQ staff on the status of wetlands rules. John Dorney, Head of the 401/Wetlands Unit, told commissioners that staff has discussed with the U.S. Army Corps of Engineers and U.S. EPA how they will treat isolated wetlands following the U.S. Supreme Court's decision in the case *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*. Dorney said discussions established that as long as the EMC's rules covering isolated wetlands and isolated waters (15A NCAC 2H .1300) are in effect, implementation of the Supreme Court decision by EPA and the Corps will have no effect in North Carolina. Dorney also reported that in December, 2002, the N.C. Court of Appeals acting on a challenge to EMC wetlands rules, ruled unanimously that the EMC has statutory authority to regulate wetlands because wetlands are included in existing definition of "waters of the state." The Court of Appeals also ruled

that the 401 Water Quality Certification rules (15A NCAC 2H .0500) were properly adopted.

## In Memoriam: Joseph A. Phillips

Dr. Joseph A. Phillips, one of the founders of North Carolina's erosion and sedimentation control program and its most persistent supporter, died March 10.

A member of the NCSU Soil Science Department for 21 years, Dr. Phillips also served as assistant director of the N.C. Cooperative Extension Service, retiring in 1989. His work focused on developing North Carolina agriculture and improving the quality of the state's natural resources. He oversaw programs that cleaned waterways, provided clean water for municipalities, and improved lives and livelihood for citizens of rural North Carolina. During his academic career, he received many honors, including the USDA Superior Service Award, the Extension Leadership Award, and the Outstanding Teacher Award. He was elected a Fellow of the Soil Conservation Society and a Public Service Fellow by the Board of Governors of The University of North Carolina.

Dr. Phillips had a leading role in drafting and passage of the Sedimentation Pollution Control Act of 1973, and he served on the committee that wrote the rules for the N.C. Erosion and Sedimentation Control Program.

Dr. Phillips served a total of 27 years on the N.C. Sedimentation Control Commission, 17 years as chairman. In recognition of his dedicated public service, former Governor James B. Hunt, Jr. awarded Dr. Phillips the Order of the Long Leaf Pine, one of the state's highest civilian awards.

# Water quality trading: Not ready for prime time?

On January 13, 2003, the U.S. EPA released the final version of its Water Quality Trading Policy, which provides guidelines to states for establishing programs that allow one source of water pollutants to meet its regulatory obligations by using pollutant reductions created by another source. The policy was immediately welcomed by the Water Environment Federation, a nonprofit organization representing mainly wastewater treatment professionals, and the World Resources Institute, a nonprofit environmental think-tank. It was immediately condemned as illegal by the Natural Resources Defense Council. Environmental Defense and other environmental organizations said that while they support trading, EPA's new policy has serious flaws.

Across the country, agency officials, dischargers, analysts, and environmental groups are debating the use of water quality trading. Some tout it as the tool that can bring unregulated nonpoint sources into effective cooperative efforts to clean up polluted streams. A visit to the Environmental Trading Network website (<http://www.envtn.org/index.htm>) reveals the widespread interest and momentum that water quality trading apparently enjoys. However, environmental proponents point out that while the concept holds promise, trading could lead to weaker water quality protections if it is not implemented with safeguards.

## The textbook model and necessary conditions for trading

In the textbook model, regulators establish a total cap on a pollutant and allocate rights and responsibilities to various sources of that pollutant. If one source can decrease its contribution of that pollutant at a low cost, it may sell pollutant credits to other sources for which the cost of reduction is high. The purpose of trading is to reduce the pollutant at the lowest cost.

According to economists who have studied trading, for a trading program to be possible, there must be recognition among all sources of a pollutant that an enforceable limit will be set and that noncompliance is not an option. The pollutant (such as nitrogen and phosphorus) that is causing water quality impairment must be common to all (or most) dischargers, whether point sources or nonpoint sources. Further, a credible assessment of the pollutant's impact and the positive consequences of its reduction must be made (through modeling, for instance) to set a realistic cap. For trading to be feasible, at least one source of the pollutant must be able to reduce its contribution at a significantly lower cost than others.

Trading of sulfur dioxide (SO<sub>2</sub>) and oxides of nitrogen (NO<sub>x</sub>) is an established and successful practice under the Clean Air Act, which addresses the cumulative effect of multiple sources on ambient air quality. Water quality regulations, on the other hand, have traditionally applied to individual dischargers, requiring either technology-based controls or compliance by individual dischargers with effluent limits in NPDES permits. The emphasis on individual limits written into individual permits has made effluent trading infeasible. However, a number of developments over the last 10-12 years seems to have set the stage for increased trading:

- Success of trading programs under the Clean Air Act has demonstrated that trading can work.
- With aggressive implementation of the total maximum daily load (TMDL) program, regulators are beginning to address cumulative impacts to stream segments and to set caps on pollutants, creating the possibility for trading among pollutant sources.
- In many cases, point sources have already implemented the easiest and cheapest methods of reducing pollution, making further point source reductions more expensive than reductions of

nonpoint source pollution, which is responsible for a large share of the nation's remaining water quality problems.

- Experimental programs and pilot projects across the country are demonstrating the promise of water quality trading programs. EPA and organizations like the Water Environment Federation and the American Water Works Association, which have the biggest incentive to engage in trading, have cooperated to fund and carry out many of the pilot programs. (See for instance, [http://www.werf.org/Press/release\\_011303.cfm](http://www.werf.org/Press/release_011303.cfm)) In "A Summary of U.S. Effluent Trading and Offset Projects," EPA describes 37 trading projects in various stages of implementation.

## Components of a sound water quality trading program

In spite of the apparent momentum of the water quality trading movement, legal and environmental analysts warn that a number of conditions must be met to assure that water quality improvement takes place under trading programs. Rena Steinzor, J.D. of the Maryland School of Law and the Center for Progressive Regulation, testified before the U.S. House Subcommittee on Water Resources and the Environment regarding EPA's draft water quality trading policy. According to Dr. Steinzor, an environmentally sound water quality trading program will be built on the existing legal and regulatory structure and six core principles:

- Trading should not result in an increase in actual—as opposed to permitted—levels of pollution.
- Trading should take place under a firm cap on total emissions or discharges based on reliable data about the level of actual releases at the time that trading starts. Caps should be set low enough

to compel innovation in pollution control by creating adequate scarcity of marketable allowances to ensure that trading remains economically attractive. Caps must decline steadily over time to achieve improvement.

- Once a cap is set, individual sources should be allocated allowances on the basis of typical production levels. Such “baselines” for allowance allocation should be based on concrete and reliable information about actual emissions, either from monitoring or other similarly accurate technical methodologies.
- Trading regimes must prohibit and prevent the creation of “hot spots” that harm human health and the environment, especially in already overburdened communities. The most reliable way to accomplish this is to prohibit trading of toxic emissions or discharges.
- Dischargers that will reap the benefits of trading programs in the form of reduced compliance costs should bear the expense of implementing such programs.
- Trading programs should include a mandatory re-evaluation of their performance at set intervals so that problems with design and implementation can be addressed.

In its analysis of trading, the National Wildlife Federation adds that:

- Any trading should be on a watershed basis.
- A TMDL should be in place as a prerequisite for trading.
- Point sources should be required to meet technology-based controls at a minimum, and dischargers should have good compliance records.
- There must be accurate ways of measuring contributions of the pollutant by various sources; monitoring must be performed to verify effectiveness of pollution controls; and controls must be enforced.
- In trades involving nonpoint sources, a trading ratio must be established that accounts for the uncertainty related to

nonpoint source contributions and reductions.

- Trading among different pollutants and of toxic pollutants should not be allowed.
- The public should be involved in the design of any trading arrangement.

Most environmental organizations endorse these views.

## EPA's new water quality trading policy

Given the requirements put forth by environmental proponents for a sound trading program, how does the new EPA water quality trading policy measure up? Although EPA made significant changes in its original draft policy in response to input from numerous groups, the final policy is judged by analysts to fall short of safeguarding water quality and avoiding potential legal challenges by disappointed interest groups.

In her assessment of the new EPA water quality trading policy at a recent meeting of the American Bar Association, Dr. Steinzor said that crucial trading issues “remain either unaddressed or ambiguous and these characteristics could easily lead to poorly designed and functioning trading program that will threaten rather than improve water quality.”

Specifically, Dr. Steinzor says:

- The policy allows pre-TMDL trading, effectively circumventing the TMDL process in order to implement trading without a baseline or cap.
- While the new policy restricts trading to a watershed or TMDL-defined segment, there are no stated limitations on the size of the watershed.
- The policy states that anti-degradation review is not required as part of trading programs because EPA believes trading programs will result in no net increase pollutants. However, trading within a large watershed could result in localized impact even with no net increase.
- The new trading policy attempts to create an inter-source trading program

to achieve environmental gains by significantly changing the NPDES permitting system. However, the Clean Water Act does not provide any statutory language to authorize trading, so changes to the permitting system must occur at the legislative level, not via guidance. At the very least, such changes require a formal rulemaking.

- Although the policy states that trading cannot be used by an NPDES permittee to achieve primary technology-based effluent limits, it also states EPA will consider revising certain effluent limitations to allow such technology-based trading. This would undermine the basic structure of the Clean Water Act, upon which point-source effluent controls are based.
- The policy states that water quality trading may occur to offset an increased discharge. This sort of trade would allow higher pollution at the point of discharge in exchange for reduced pollution elsewhere. Thus, even under a TMDL that caps pollution for a segment of a water body, significant violations of water quality standards could easily occur. Legally, a point source cannot violate water quality standards or its effluent limitations because, if it did, it would violate the anti-backsliding provision of the Clean Water Act.
- The policy allows trading of different types of discharges (nutrients and sediments, including cross-pollutant trading for oxygen-related pollutants; other pollutants on a case-by-case basis; and persistent bioaccumulative toxics, including mercury, as part of a pilot project).
- There are no requirements for monitoring and enforcement, only advice, and there are no requirements for public participation. The policy offers some sound ideas for trading but these must be transformed from notions into requirements.
- The policy does not call for trading ratios that would compensate for uncertainties in measuring nonpoint source pollution.

## Water quality trading *continued*

■ EPA oversight of trading arrangements is not required.

Environmental proponents say that water quality trading may be most useful for reducing nutrients in impaired waters because nutrient loads are largely attributable to nonpoint sources of pollution, which are inadequately controlled. However, nutrient trading should occur only under a TMDL. Trading may also be useful for accomplishing further pollutant reduction in waters currently meeting water quality standards or for accommodating new dischargers in the future. Any trading program, however, must not undermine the existing legal structure—both because it would threaten gains in water quality made over the last three decades and because it would expose dischargers to liability.

### Resources

Association of State Drinking Water Administrators. 2002. Comments on EPA's proposed Policy on Water Quality Trading. Water Docket MC4101, U.S. EPA.

Environmental Defense. "New Water Pollution Trading Lacks Cap to Ensure Effectiveness, Plan Also Undermined by Possible Cut in Protection for Many Wetlands and Streams." (<http://www.environmentaldefense.org/article.cfm?contentid=2603>)

National Wildlife Federation. "A New Tool for Water Quality: Making Watershed-Based Trading Work for You." ([http://www.nwf.org/watersheds/pdf\\_documents/newtool.pdf](http://www.nwf.org/watersheds/pdf_documents/newtool.pdf))

Natural Resources Defense Council. "New Administration Water Pollution Trading Policy is Illegal, Says NRDC." (<http://www.nrdc.org/media/pressreleases/030113.asp>)



## House Science Subcommittee approves Aquatic Invasive Species Research Act and turns to harmful algae

In a move aimed at preventing and controlling aquatic invasive species, the House Science Subcommittee on Environment, Technology, and Standards (ETS) has unanimously approved legislation to boost research on ways to prevent the introduction of the troublesome and costly species. The legislation, H.R. 1081, authorizes \$180 million to combat this problem.

Invasive species cause an estimated \$137 billion in loss and damages in the United States each year. H.R. 1081 would fund research on the pathways through which the species enter U.S. waters and help the Coast Guard reduce the threat of species introduction from ships. It would also establish an EPA program to develop environmentally sound technologies to control and eradicate invasive species and it would provide a grant for the National Science Foundation to support academic research in systematics and taxonomy to extend expertise in these areas and enhance ability to identify invading species.

This legislation is part of a bicameral, comprehensive package of legisla-

tion to tackle aquatic invasive species. H.R. 1080, which deals with broader management issues has also been introduced in the House, and companion legislation has been introduced in the Senate.

The Subcommittee also heard testimony on another environmental problem—harmful algal blooms (HAB)—that costs the U.S. economy tens of millions of dollars per year due to closure of fisheries and beaches and the treatment of illnesses. Some witnesses warned that federal programs are underfunded and suffer from a lack of coordination among participating agencies.

The Committee is drafting legislation to reauthorize specific research programs at NOAA to deal with HAB. The legislation will also make funding available to conduct research on fresh water algal blooms that occur in the Great Lakes.

*News Release*

*U.S. House Committee on Science*

Riggs, David W. ND. "Market Incentives for Water Quality: A Case Study of the Tar-Pamlico River Basin, NC." (<http://business.clemson.edu/cpls/Riggstar.PDF>)

Steinzor, Rena I. 2002. Testimony before the Subcommittee on Water Resources and the Environment of the U.S. House of Representatives regarding Water Quality Trading: An Innovative Approach to Achieving Water Quality Goals on a Watershed Basis, June 10, 2002. (<http://www.house.gov/transportation/water/06-13-02/steinzor.html>)

Steinzor, Rena I. 2003. "Toward Better Bubbles: What Does EPA's Water Quality Trading Policy Have to Do

with Fish Sticks and Thermometers?" presented to the American Bar Association Section of Environment, Energy and Resources, 32<sup>nd</sup> Annual Conference on Environmental Law, Keystone, CO, March 13-16, 2003.

U.S. Environmental Protection Agency, Office of Water, Water Quality Trading Policy, January 13, 2003. (<http://www.epa.gov/owow/watershed/trading/tradingpolicy.html>)

Woodward, Richard T., Ronald A. Kaiser, and Aaron-Marie Wicks. ND. *The Structure and Practice of Water-Quality Trading Markets.* (<http://ageco.tamu.edu/faculty/woodward/paps/Structures.pdf>) ●



## Research finds concentrations of atrazine lower than drinking water standard cause sex changes in male Leopard Frogs

In an article published in the April 2003 issue of *Environmental Health Perspectives*, researchers at the University of California-Berkeley report laboratory and field studies that show exposure to the pesticide atrazine at concentrations as low as 0.1 part per billion (ppb) induces hermaphroditism in male American leopard frogs (*Rana pipiens*). EPA's current drinking water standard for

atrazine in drinking water is 3 parts per billion.

In the laboratory, the researchers immersed frog larvae in concentrations of 0, 0.1 or 25 ppb atrazine from 2 days post-hatching to complete tail reabsorption. Each treatment was replicated three times, and all dosing and analysis was conducted blindly with color-coded tanks and treatments. At metamorphosis, each

animal was euthanized and examined for evidence of gonadal dysgenesis. Thirty-six percent of the males treated with 0.1 ppb atrazine and 12% of those treated with 25 ppb atrazine suffered from underdeveloped testes and low to absent germ cells. Further, 29% of the 0.1 ppb-treated animals and 8% of those treated with 25 ppb displayed varying degrees of sex reversal.

Once effects were identified in the laboratory-reared animals, the investigators conducted a study of gonadal morphology in field-collected *R. pipiens* to determine if animals exposed in the wild displayed similar abnormalities. They collected animals from 4 control sites expected to be uncontaminated based on sales of atrazine and four sites expected to be contaminated based on sales of atrazine. They collected water samples from all sites and analyzed for atrazine.

All sites associated with atrazine sales that exceeded 0.4 kg/km<sup>2</sup> and atrazine contaminant levels that exceeded 0.2 ppb had males that displayed sex reversal similar to that observed in laboratory animals. In a high use site in Nebraska, 28% of the males had gonadal dysgenesis. A wildlife habitat site on the North Platte River in Wyoming not expected to be contaminated based on sales of atrazine nevertheless had 0.2 ppb atrazine in water samples and the highest incidence and most advanced cases of hermaphroditism.

The authors say that most water sources in the United States, including rainwater, can exceed the concentrations of atrazine in their laboratory studies. They say that results of their study combined with results of earlier similar studies raise serious concerns about the potential role of atrazine and other endocrine-disrupting pesticides in amphibian declines.

The article can be accessed online at: <http://ehpnet1.niehs.nih.gov/members/2003/5932/5932.pdf>

## Federal legislation addresses inland flooding and dam safety

Among legislation passed by the 107th Congress were bills aimed at better preparing and warning the public about flooding in inland areas and at improving dam safety.

The **Inland Flood Forecasting and Warning Systems Act of 2002** (PL 107-253) provides for research, training, and outreach activities to improve inland flood forecasting and awareness. Under the legislation, the National Oceanic and Atmospheric Administration, through the United States Weather Research Program will:

- conduct research and modelling to improve forecasting of inland flooding, including flooding caused by coastal and ocean storms;
- develop, test and deploy a new flood warning index to give the public and emergency management officials more detailed, understandable, and accurate information about the risks and dangers posed by expected floods;
- train emergency management officials, National Weather Service personnel, meteorologists and others in improved flood forecasting methods, risk management techniques, and use of the inland flood warning index; and
- conduct outreach and education activities for local meteorologists and the public regarding the dangers of inland flooding as well as the use of the warning index; and

■ assess the long-term trends in frequency and severity of inland flooding along with how shifts in climate, development, and erosion patterns might make certain regions vulnerable to more continual or escalating flood damage in the future.

Congress appropriated \$1.25 million per year for 2003 - 2005 to carry out the act. One hundred thousand dollars per year are available for competitive grants to institutions of higher education to develop models to improve forecasts of coastal and estuary inland flooding that are influenced by tropical cyclones.

The **Dam Safety and Security Act of 2002** (PL 107-310) requires the Federal Emergency Management Agency (FEMA) to prepare a strategic plan to establish goals, priorities, and target dates to improve dam safety as well as provide cooperation with and assistance to interested state governmental entities. The act also requires FEMA to establish the National Dam Safety Review Board to monitor state implementation of dam safety programs, monitor the safety of dams in the United States, and advise the FEMA director on national dam safety policy. FEMA must provide, at the request of any state that has or intends to develop a dam safety program, training for dam safety staff and inspectors.

## Multi-funded project gave big boost to implementation of Neuse agricultural nitrogen reduction rule

A recently released report shows that about one-third of the nearly \$7 million spent to achieve the 30% nitrogen reduction required of agricultural producers in the Neuse Basin came through the multi-funded Neuse Crop Management Project organized and carried out by faculty in the departments of soil science, crop science and biological and agricultural engineering at NC State University in cooperation with the N.C. Cooperative Extension Service.

The project was initiated under an \$867,000 grant from the Pew Charitable Trust and U.S. Environmental Protection Agency through the Center for Agricultural Partnerships. About \$1.4 million was added through grants and in-kind contributions from the N.C. Clean Water Management Trust Fund, the UNC Water Resources Research Institute, the N.C. Cooperative Extension Service, and a U.S. EPA 319 grant from the N.C. Department of Environment and Natural Resources.

The Neuse Crop Management Project operated from Sept 1998 to Sept 2002 and was designed to supplement agency and private\* efforts to reduce farmers' nitrogen use and/or export in the Neuse Basin. The project had research, demonstration, education and technical assistance components. Project personnel

- surveyed farmers to determine fertilization practices,
- established demonstration projects on farms to illustrate that crop yields can be sustained with less nitrogen use and to demonstrate and evaluate best management practices for nitrogen control,
- performed detailed water quality monitoring at one of the demonstration farms to evaluate the performance of shrub buffers,
- conducted training on off-site nitrogen movement and nutrient management for agribusiness audiences, including crop consultants, to get them ahead of the training that would be done for farmers,
- developed nutrient management training materials for distribution to Extension agents who then educated farmers,
- worked directly with farmers to write and implement nutrient management plans for more than 105,000 acres of cropland,
- conducted two cost-benefit analyses of BMPs and nutrient management, and

- computerized the BMP accounting and tracking tool (Nitrogen Loss Estimation Worksheet or NLEW) and the Phosphorus Loss Assessment Tool or PLAT.

According to the project evaluation performed by an independent consultant, one the important lessons learned from the project is that effective work with growers on nutrient management is an intensive, one-on-one activity that requires full-time technicians.

The full project report, *Final Report: Neuse Crop Management Project*, is available from the principal investigator, Dr. Deanna Osmond, in the NCSU Soil Science Department ([Deanna\\_Osmond@ncsu.edu](mailto:Deanna_Osmond@ncsu.edu)).

*\* The Neuse Crop Management Project was one part of a much greater effort in the Neuse River Basin that included the Neuse River Basin Oversight Committee and Local Advisory Committees, the N.C. Divisions of Water Quality and Soil and Water Conservation, the N.C. Farm Bureau Federation, the Neuse River Foundation, Soil and Water Conservation Districts, the Neuse technicians funded through the Division of Soil and Water Conservation, county Cooperative Extension agents in the basin, the USDA-Natural Resources Conservation Service, and most importantly growers in the basin.*

## Environmental legislation introduced in the N.C. General Assembly

The following bills have been introduced in the 2003 session of the N.C. General Assembly. They can be tracked using the "bill look-up" feature on the General Assembly website at <http://www.ncga.state.nc.us/homePage.pl>

H 47 AN ACT ADOPTING THE CAROLINA LILY AS THE OFFICIAL WILDFLOWER OF NORTH CAROLINA.

H 477 AN ACT TO AUTHORIZE THE DIVISION OF MOTOR VEHICLES TO ISSUE SPECIAL NORTH CAROLINA COASTAL FEDERATION REGISTRATION PLATES.

H 429 AN ACT TO REQUIRE LOCAL GOVERNMENTS TO PAY JUST COMPENSATION FOR REMOVAL OF LAWFULLY ERECTED BUILDINGS, STRUCTURES, OUTDOOR ADVERTISING, OR PERSONAL PROPERTY AND TO AUTHORIZE LOCAL GOVERNMENTS TO ENTER INTO RELOCATION AND RECONSTRUCTION AGREEMENTS WITH OWNERS OF NONCONFORMING PROPERTIES.

S 118 AN ACT TO AUTHORIZE THE DIVISION OF MOTOR VEHICLES TO ISSUE A BLUE RIDGE PARKWAY FOUNDATION SPECIAL REGISTRATION PLATE.

## WRR I report available

WRR I has recently published a peer-reviewed technical completion report on research projects for which it provided funding. Single copies of WRR I reports are available free to federal/state water resource agencies, state water resources research institutes, and other water research institutions with which exchange agreements have been made. Single copies of publications are available to North Carolina residents at a cost of \$4 per copy prepaid (\$6 per copy if billed) and to nonresidents at a cost of \$8 per copy prepaid (\$10 per copy if billed). Send requests to WRR I, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 or call (919) 515-2815 or email: [water\\_resources@ncsu.edu](mailto:water_resources@ncsu.edu).

### **Using Natural and Landscaped Buffers to Reduce Pollutant Loading from Agricultural Runoff**

Report No. 340 December 2002

*Richard A. McLaughlin and J. Wendell Gilliam*  
Department of Soil Science  
NC State University

The effectiveness of vegetative buffer zones in reducing the impact of agricultural runoff on surface water is a function of several factors, including width of the zone and the type and condition of vegetation in the zone. This study was designed to determine how various buffers, especially a "landscaped" buffer composed of juniper and pine bark mulch, affected water quality under a variety of runoff conditions. The landscaped buffer was examined as a possible alternative to forested buffers in situations where trees are not desirable, such as areas adjacent to crops to avoid shading and in urban environments such as golf courses or parks. The investigators tested grassed and landscaped buffers in a Coastal Plain location and typical grassed and wooded buffers in a Piedmont location for pollutant removal.

At the Coastal Plain site, runoff from fields growing a variety of crops was directed to four 10-meter-long by 5-meter-wide grass buffer strips, two of which had the lower 5 meters planted in juniper with pine bark mulch. Water was collected above and below each plot and analyzed for soluble nutrients, total suspended solids (TSS), and 11 pesti-

cides and metabolites. The Piedmont site had grassed or wooded buffers of 4 meters or 8 meters width and received water from a 0.3 hectare field planted in corn. Water samples were taken after 4 natural events and 4 artificial events and analyzed for soluble nutrients, total suspended solids, and the three pesticides applied (Chlorpyrifos, atrazine and acetochlor).

Reductions of TSS ranging from 40% to 60% for the natural events were recorded for the 4-meter grass and both forested buffers. The 8-meter grass buffer averaged 90% reduction in TSS. There were no differences in TSS reduction between the 10-meter grass and a 5-meter grass plus 5-meter landscaped buffer, both reducing TSS loads by about 60%. The investigators found no evidence that any of the buffers had any effect on reducing concentrations of dissolved nutrients or pesticides. In fact, the grass buffers at the Piedmont site were often sources of nutrients. There were reductions in the total amounts of nutrients and pesticides leaving the wooded buffers because water infiltrated and runoff volume was reduced.

The landscaped (juniper and pine bark mulch) buffers were as effective in reducing TSS loads as the grass buffer; however, many of the runoff events that occurred at the landscaped buffer site clearly exceeded the ability of the mulch to maintain sheet flow. Moreover, the landscaped buffers did not reduce pesticide concentrations as the investigators had hypothesized. The investigators say that further work on design specifications for mulched buffers is needed

before they could be recommended for buffering runoff.

The authors point out that while reductions in pollutant loading can be achieved strictly through infiltration in buffer zones, many buffers are poorly maintained and flow occurs largely in channels, resulting in little runoff reduction. They recommend minimizing occurrence of nutrients and pesticides in runoff through field practices.

They also recommend additional research focusing on buffer performance over a period of many years to determine the average and range of pollutant attenuation that can be expected. Flow measuring systems should be able to handle the largest runoff events, even if it means sacrificing measurements from the smallest events.

In presenting their results, the investigators emphasize that there were several limitations to the study. The Piedmont study had only one year of data, and half of the eight events were artificially induced runoff with relatively low volumes. Because of dry conditions following planting of the buffer, the zone may have had an unusually high infiltration rate. The Coastal Plain study excluded the four largest events due to overtopping of the plot flumes.

The investigators emphasize that their focus was on runoff water quality and not on processes occurring within the soil profile or within shallow groundwater.

The Conservation Trust for North Carolina reports that N.C. land trusts have saved over 85,000 acres of open space in 500 locations over the past ten years. But, CTNC says, this does not come close to keeping pace with the nearly 160,000 acres of farms, forests and rural lands lost to urban development each year.

June 7 is Land Trust Day  
at Great Outdoor  
Provision Company.

# Studies

## Study documents export of nitrogen from various land uses in Upper Neuse Basin higher than literature values

A project that measured nitrogen, phosphorus and sediment exports from six different land uses in Wake County in the Upper Neuse River Basin, found that nitrogen exports were typically greater than those in previously published reports. Researchers also found that rainfall in the drainage basins contained significant concentrations of nitrogen that often accounted for a considerable portion of the total nitrogen export from all land uses.

“Pollutant Export from Various Land Uses in the Upper Neuse River Basin” by Daniel E. Line and other researchers at NC State University was published in the Jan/Feb 2002 issue of *Water Environment Research*. In the article, the investigators document monitoring of runoff in six small basins that drained generally homogeneous single-family residential, golf course, industrial, dairy cow pasture, construction, and wooded land uses. Lagoon effluent from the dairy was irrigated onto the pasture where cows were grazed on a rotational basis. The “construction” land use was monitored in two phases: the clearing, grubbing, and grading phase (construction I) and the installation of roads, infrastructure and house construction (construction II). The wooded site contained a small area of cropland and a number of uprooted trees.

Because variability of pollutant export from urban land uses is high, investigators monitored at least 20 storms in which runoff occurred over at least one year at each site to adequately characterize export from these sites. During the monitoring period, the area

experienced a month of unusually heavy rain associated with three hurricanes. In addition to recording the ratio of runoff to rainfall (an estimate of infiltration), the investigators computed the average and median concentration for each storm event and the total annual load of nitrate-nitrogen, total Kjeldahl nitrogen (organic nitrogen plus ammonia), ammonia, total phosphorus and sediment from each land use except the “industrial” site. Problems with measuring discharge at the industrial site prevented total load calculation, so only average and median concentrations were computed for this land use.

The construction II site (which could be described as a new residential development) had the highest runoff-to-rainfall ratio of the six computed, indicating the lowest infiltration rates. While this site did not have the most impervious surface, it likely suffered from soil compaction from construction equipment and did not yet have well established vegetation. This site also had the highest export level of nitrate-nitrogen, total Kjeldahl nitrogen, and ammonia. This nitrogen export probably resulted from efforts to establish lawns and new vegetation (enriched topsoil, mulch, and fertilizer) as well as pet wastes. The construction II site had the second lowest (next to wooded) export of phosphorus, which was unexpected, but probably was related to the fact that soils had been somewhat stabilized.

The established residential site had the second highest runoff-to-rainfall ratio and the third highest total nitrogen export (behind the golf course). Phosphorus export from this site was the third lowest (behind wooded and construction II). The highest nitrogen and phosphorus concentrations in runoff from the residential site occurred in early and late spring when yard maintenance was greatest. The nitrogen and phosphorus export from the residential site is nearly two times greater than any reported in the literature for residential land uses. A door-to-door fertilizer use survey conducted in Cary, where the research took place, found that homeowners there apply nitrogen to the fescue lawns at an

annual rate almost twice the annual average rate of application determined by a survey of farmers in the Neuse River Basin (168 kilograms per hectare per year as compared to 86.2 kilograms per hectare per year).

If the wooded site is taken to represent pre-construction conditions, nitrate-nitrogen, total Kjeldahl nitrogen and total nitrogen annual exports for the “new residential” (construction II) and residential sites more than tripled after development.

Runoff from the residential site was also sampled in a riparian area downslope from a level spreader. The 5 to 10 meter (16 to 33 feet) wide riparian area and level spreader reduced total Kjeldahl nitrogen by 38%, nitrate-nitrogen by 42%, phosphorus by 18%, and total suspended solids by 60%. These data show that relatively simple measures with no maintenance can reduce pollutant levels from urban areas.

The golf course, pasture, and construction I sites had the highest phosphorus export rates. The relatively high phosphorus export from the pasture resulted from lagoon waste disposal in addition to waste from pastured cows.

As expected, sediment or total suspended solids export was highest from the construction I and construction II sites. Sediment export from the wooded area was third highest because of the small area of cropland and several trees uprooted by hurricanes. Still, export of sediment from the “new residential” site was six times that of the wooded area, and export from the construction I site was 22 times that of the wooded area. Sediment export from the construction I phase averaged more than 10 times more than any of the other sites.

Nitrogen exports for the land uses in this study were typically greater than those reported in the literature. Total Kjeldahl (organic nitrogen plus ammonia) nitrogen (TKN) accounted for 68% to 85% of the nitrogen load for each site. The authors say that at least some of the TKN may have been pollen because TKN seemed to increase during periods

of pollen deposition during the fall. However, they also say that rainfall in the area contained significant concentrations of nitrogen. Average concentrations of nitrate-nitrogen and ammonia in rainfall sampled over a 2-month period during the fall of 1997 were 26% and 72% higher respectively than that measured in rainfall in Charlotte. All drainage areas received more ammonia in rainfall than was exported in runoff because ammonia is readily used by plants or converted to other forms of nitrogen. Overall, the study indicates that a considerable portion of the nitrogen export from these small drainage areas likely comes from nitrogen in rainfall.

Results from this study help establish the high end of the range of nitrogen and phosphorus export coefficients for these land uses. The higher export was a result of the high standard of lawn and turf maintenance on some sites and, possibly, a month of heavy rain associated with three hurricanes. The authors say that the export rates illustrate the increase in pollutant export associated with development and emphasize the need for implementing best management practices in developed and developing areas.

Line, Daniel E., Nancy M. White, Deanna L. Osmond, Gregory D. Jennings, and Carolyn B. Mojonier. 2002. "Pollutant Export from Various Land Uses in the Upper Neuse River Basin." *Water Environment Research* 74(1) 100-108.

Corresponding author Daniel E. Line  
([Dan\\_Line@ncsu.edu](mailto:Dan_Line@ncsu.edu))

*Water Environment Research* is a peer-reviewed journal published by the Water Environment Federation. ●

## Publications

N.C. Sea Grant offers *Invasive Aquatic and Wetland Plants Field Guide* by Barbara Doll and Stratford Kay. The guide targets natural resources field personnel and home water gardeners alike. The waterproof fieldguide identifies 21 species of greatest concern. Entries feature color photographs, line drawings and descriptions of growing conditions and range. Send request and check for \$15 to North Carolina Sea Grant, Box 8605, NC State University, Raleigh, NC 27695-8605.

The Center for Watershed Protection has made available its report *Impacts of Impervious Cover on Aquatic Systems*. This report is a comprehensive examination of more than 225 multi-disciplinary research studies documenting the impact of urbanization and the associated impervious cover on aquatic systems. The research distilled in this report was conducted in many different eco-regions, climatic zones, and stream types. Weighing in at about 150 pages, the

report includes more than 100 graphics and tables. The cost is \$25. The report can be ordered online at <http://www.cwp.org>.

The **National Environmental Training Center for Small Communities** offers a host of materials to help educate small communities in environmental management, solid waste, wastewater, and drinking water. Training packages typically contain material developed for both the learner and the instructor. For a listing of some materials go to website: [http://www.nesc.wvu.edu/netcsc/netcsc\\_resources.htm](http://www.nesc.wvu.edu/netcsc/netcsc_resources.htm). For the most complete catalog Call NETCSC at (800) 624-8301. The center is currently putting finishing touches on a training module: *Preparing for the Unexpected: Security for Small Water Systems*. This course will help local officials prepare their drinking water system for potential security breaches, natural disasters, and emergencies. If you are interested in bringing this training to your area, contact Sandra Fallon, NETCSC training specialist at (800) 624-8301 ext. 5582 or e-mail her at [sfallon@mail.wvu.edu](mailto:sfallon@mail.wvu.edu).

## Public Hearings on N. C.'s NPDES Phase II Stormwater draft permanent rule

In February the N.C. Environmental Management Commission gave their approval for the N.C. Division of Water Quality to move forward to public notice and public hearings with draft permanent rule language for implementing the NPDES Phase II Stormwater program in North Carolina. Public hearings will be held as listed below. The public comment period is scheduled to close on May 16, 2003. Comments may be submitted by e-mail to [stormwater@ncmail.net](mailto:stormwater@ncmail.net) or by regular mail. The address is Stormwater and General Permits Unit, Division of Water Quality, 1617 Mail Service Center, Raleigh, North Carolina, 27699-1617.

**7:00 PM, TUESDAY, APRIL 1**  
**JOHNSTON COUNTY COMMUNITY COLLEGE SMITHFIELD**

**7:00 PM, THURSDAY, APRIL 17**  
**ASHEVILLE-BUNCOMBE TECHNICAL COMMUNITY COLLEGE ASHEVILLE**

**7:00 PM, MONDAY, APRIL 7**  
**NEW HANOVER COUNTY NORTH-EAST REGIONAL LIBRARY WILMINGTON**

**7:00 PM, TUESDAY, APRIL 22**  
**MUNICIPAL BUILDING KERNERSVILLE**

**MONDAY, APRIL 28**  
**WASHINGTON CIVIC CENTER WASHINGTON**

The draft rules and directions to hearing locations are available at website: [http://h2o.enr.state.nc.us/su/NPDES\\_Phase\\_II\\_Stormwater\\_Program\\_Perm\\_Rules.htm](http://h2o.enr.state.nc.us/su/NPDES_Phase_II_Stormwater_Program_Perm_Rules.htm)

## Seven appointed to WRRRI Advisory Committee

University of North Carolina President Molly Broad has appointed seven people with water resources interests to serve on the Water Resources Research Institute Advisory Committee. The Advisory Committee is composed of representatives from state and federal programs, local government, industry, environmental organizations, private consultants, water and wastewater treatment plants, the university research community and others. The committee advises the Institute on the need for water-related research in North Carolina, the region, and the nation. The newly appointed members join 17 continuing members on the committee. The new members are:

- Sydney Miller, Water Resources Program Manager, Triangle J Council of Governments
- W. Coleman Long, Chief, Planning and Environmental Branch, Technical Services Division, U.S. Army Corps of Engineers, Wilmington District
- Alan W. Klimek, Director of the Division of Water Quality, N. C. Department of Environment and Natural Resources (DENR)
- John Spurrell, Senior Environmental Policy Analyst, North Carolina League of Municipalities
- James D. Simons, Director of the Division of Land Resources and State Geologist, DENR
- William T. "Buzz" Bryson, Trout Unlimited
- Rick Durbrow, Program Analyst, U.S. Environmental Protection Agency, Region 4
- Benson Kirkman, Raleigh City Councilman

## People

**Shelia Thomas-Ambat** has left her position with the N.C. Division of Water Resources to take a position in interactive programming and multimedia with the N.C. Department of Cultural Resources.

**Anita S. Watkins** has joined the N.C. League of Municipalities replacing Paula Thomas as environmental policy manager. Watkins was formerly a senior policy analyst for the N.C. Department of Environment and Natural Resources working in the office of Secretary Bill Ross.

**Janet Paith** has joined the Land Quality Section of the N.C. Division of Land Resources as sediment education specialist. She was formerly an environmental technician with the Land Quality Wilmington Region.

**Brock Nicholson** has been appointed deputy director of the Division of Air Quality.

**Coleen Sullins**, chief of the Water Quality Section of the N.C. Division of Water Quality, has been named deputy director of the division.

### North Carolina Precipitation/Water Resources

	Jan	Feb
<b>Rainfall (+/- average)</b>		
Asheville	1.19" (-2.87")	4.47" (+0.64")
Charlotte	1.96" (-2.04")	3.61" (+0.06")
Elizabeth City	2.84" (-1.74")	5.96" (+2.86")
Greensboro	2.35" (-1.19")	4.91" (+1.81")
Raleigh	1.82" (-2.20")	4.64" (+1.17")
Wilmington	1.69" (-2.83")	4.03" (+0.37")

<b>Streamflow Index Station</b> (County, Basin)	<b>Jan mean flow (CFS)</b> (% of long-term median)	<b>Feb mean flow (CFS)</b> (% of long-term median)
Valley River at Tomotla (Cherokee, Hiwassee)	308 (69%)	565 (137%)
Oconaluftee River at Birdtown (Swain, Tenn)	448 (60%)	1,040 (131%)
French Broad River at Asheville (Buncombe, FB)	1,630 (68%)	2,434 (93%)
South Fork New near Jefferson (Ashe, New)	400 (84%)	546 (104%)
Elk Creek at Elkville (Wilkes, Yadkin/Pee-Dee)	71.5 (76%)	132 (115%)
Fisher River near Copeland (Surry, Yadkin/Pee-Dee)	146 (76%)	286 (138%)
South Yadkin River near Mocksville (Rowan, Yadkin/PD)	198 (45%)	498 (100%)
Rocky River near Norwood (Stanly, Yadkin/Pee-Dee)	772 (27%)	3,390 (115%)
Deep River near Moncure (Lee, Cape Fear)	968 (36%)	3,539 (122%)
Black River near Tomahawk (Sampson, Cape Fear)	555 (49%)	875 (71%)
Trent River near Trenton (Jones, Neuse)	62 (19%)	236 (79%)
Lumber River near Boardman (Robeson, Lumber)	1,080 (53%)	1,243 (55%)
Little Fishing Creek near White Oak (Halifax, Pamlico)	154 (58%)	443 (143%)
Potocasi Creek near Union (Hertford, Chowan)	168 (41%)	780 (152%)

### Groundwater

<b>Index well (Province)</b>	<b>Jan depth below surface (ft)</b> (departure from average for month)	<b>Feb depth below surface (ft)</b> (departure from average for month)
Blantyre (Blue Ridge)	33.19 (-0.35)	31.94 (-0.08)
Mocksville (Piedmont)	19.54 (-2.75)	18.45 (-2.13)
Simpson (Coastal Plain)	3.80 (-0.70)	2.68 (+0.36)

Source: U.S. Geological Survey's *Water Resources Conditions in North Carolina* <http://nc.water.usgs.gov/monthly/>

## Conferences and workshops

**Using Science to Assess Environmental Vulnerabilities (ReVA-MAIA)** conference, May 13-15. This conference is sponsored by the U.S EPA. Its purpose is to bring environmental decision makers and researchers together to illustrate practical uses of recently developed approaches, tools, and decision support systems that can be used to assess current and future environmental vulnerabilities. The conference will highlight research approaches and models developed by ORD's Regional Environmental Vulnerability Assessment (ReVA) program; however, all researchers interested in the assessment of environmental vulnerability and environmental forecasting are invited to participate. Agenda and registration information available at <http://www.reva-maia.org>.

**National Groundwater Association Focus Conference on MTBE Assessment, Remediation, and Public Policy.** June 5-6, 2003 (June 4 Workshops) Holiday Inn Inner Harbor, Baltimore, MD. For a pdf brochure with registration form go to web address: <http://www.ngwa.net/pdf/mtbebrochure.pdf>.

The International Erosion Control Association will present **Ten Tools to Beat the Muddy Water Blues** May 8 & 9, 2003, at the Shelby Oaks Corporate Park in Memphis, TN. For information and registration go to web address: <http://www.ieca.org/public/articles/details.cfm?id=875>.

The University of Wisconsin-Madison will present the short course **Understanding and Using Geophysical Methods for Characterizing Engineering and Environmental Sites** May 1-2, 2003, on the University of Wisconsin campus in Madison. This is an entry-level course describing and analyzing many of the cost-effective methods used in practice, including seismic reflection

## 2002 - 2003 Water Resources Research Seminar Series

Following are the currently scheduled research seminars for 2002-2003. Presentations take place at 3 pm in the Ground Floor Hearing Room of the Archdale Building in downtown Raleigh or in Room 1132 of Jordan Hall on the NC State University campus. Licensed Professional Engineers and Surveyors can receive one Professional Development Hour for attending these seminars. There is no attendance fee, and registration is not required. For additional information email [Jeri\\_Gray@ncsu.edu](mailto:Jeri_Gray@ncsu.edu).

April 22, 2003, Archdale  
**"Using Natural and Landscaped Buffers to Reduce Pollution Loading from Agricultural Runoff"**  
*Dr. Richard A. McLaughlin*  
 NC State University

May 20, 2003, Jordan  
**"From Pfiesteria to Micro Arrays: New Tools for Water Quality Assessment"**  
*Dr. Parke A. Rublee*  
 UNC-Greensboro

and refraction, magnetic fields, electrical resistivity, ground penetrating radar and more. It is designed to give non-geologists a working knowledge of these methods, how they work, when they should be used, their precision and accuracy, relative costs, etc. It will give participants knowledge of how to plan and design geophysical surveys that determine physical properties of subsurface materials to detect and explore bedrock, aquifers, structures, river scour, brownfields, contaminants, voids and other underground features. Course participants can earn 13 Professional Development Hours. For information and registration go to website: <http://epdweb.engr.wisc.edu/brochures/F040.html>.

### Call for papers/presentations

National Ground Water Association has issued a call for papers for **Remediation Conference: Site Closure and the Total Cost of Cleanup**. November 13-14, 2003, at the Convention Center Hampton Inn in New Orleans, LA. For call go to web address: <http://www.ngwa.net/pdf/evcfp0311135082.pdf>.

CSREES Pacific Northwest Regional Water Quality Program has issued a call for presentations and posters for **Getting It Done: The Role of TMDL Implementation in Watershed Restoration** October 29-30, 2004, in Stevenson, WA. Abstract deadline is May 1, 2003. Download the call in pdf format at: [http://www.swwrc.wsu.edu/conference2003/PNRWQP\\_flyer03.PDF](http://www.swwrc.wsu.edu/conference2003/PNRWQP_flyer03.PDF).

The Water Environment Federation has issued a call for abstracts for **Watershed 2004** to be held July 11-14, 2003, in Dearborn, MI. Deadline is August 1, 2003. For a pdf version of the call go to web address: <http://www.wef.org/pdffiles/Watershed04Call.pdf>.

The International Erosion Control Association has issued a call for presentations for its 2004 annual conference, **EC 04** to be held February 16-20, 2004, in Philadelphia, PA. Abstracts are due April 4, 2003. For details on the call go to website: <http://www.ieca.org/public/articles/details.cfm?id=465>.

**Announcement of Public Hearings and  
Comment Period for Proposed Riparian  
Buffer Protection rules from Lake James to  
Lake Wylie along the Catawba River**

Three hearings (shown below) have been scheduled on proposed buffer rules that would protect a 50-foot wide riparian shoreline bufffer along the Catawba River mainstem below Lake James and along the mainstem lakes from, and including, Lake James to the NC/SC border in Lake Wylie. It does not include the Catawba River mainstem above Lake James nor any other streams in the Catawba Basin. Public hearings are listed below. Comment period ends May 9, 2003.

For additional details and copies of the rules contact Robin Markham at (919) 733-5083 Ext. 558 or go to website: <http://h2o.enr.state.nc.us/nps/catawba.htm>. Send comments to Alan Clark, NC Division of Water Quality, 1617 Mail Service Center, Raleigh, NC 27699-1617.

**7:00 pm, Monday, April 14  
Catawba Valley Community College  
Hickory**

**7:00 pm, Monday, April 21  
Belmont Abbey College  
Belmont**

**7:00 pm, Tuesday, April 22  
Mooreville Citizens Center  
Mooreville**



**2002 - 2003 Luncheon and Forum  
Schedule**

**September 8, 2003**

**Land Use & Water Quality Interactions Using GIS**

**December 1, 2003**

**Water Reuse**

***Please note new meeting location.***

All luncheon/forums take place at 11:30 am  
at the College of Textiles Building on Centennial Campus  
N.C. State University.

For directions, go to website:

<http://centennial.ncsu.edu/howtogether/htgh.htm>

For registration information call WRRRI (919/515-2815)

For information about NCWRA visit the website:  
<http://www.ncsu.edu/waterquality/ncwra/home.htm>

**WATER RESOURCES RESEARCH INSTITUTE  
OF THE UNIVERSITY OF NORTH CAROLINA**  
BOX 7912  
NORTH CAROLINA STATE UNIVERSITY  
RALEIGH NC 27695-7912

**NONPROFIT ORG  
U S POSTAGE  
PAID  
RALEIGH NC  
PERMIT NO. 549**

ADDRESS SERVICE REQUESTED