

## DENR says recommendation of LUST Funds Council runs counter to its responsibilities

At meetings of the N.C. Environmental Management Commission's (EMC) Groundwater Committee in March and again in April, Groundwater Section Chief Arthur Mouberry said that the Department of Environment and Natural Resources (DENR) strongly opposes a recommendation by a group called the Leaking Underground Storage Tank (LUST) Funds Council that the department should require cleanup of groundwater contamination from leaking tanks only if it can obligate funds to reimburse tank owners for the cleanup.

"This recommendation is incompatible with our responsibility to protect the environment and public health," said Mouberry.

Mouberry said that the department's position is that contamination from leaking tanks must be cleaned up according to the state's "corrective action" rules regardless of whether there is money in the fund to reimburse tank owners.

The LUST Funds Council was appointed by the General Assembly to provide advice on management of the LUST Trust Funds. Recommendations from the council for changes in managing the fund, first presented to the Legislative Environmental Review Commission (ERC) in March, is the latest in a series of efforts to prevent insolvency of the commercial LUST fund.

N.C.'s commercial LUST Fund has proved inadequate to meet the needs of

cleaning up contamination from thousands of leaking tanks, in spite of a temporary suspension of cleanup activity at low-risk sites by the General Assembly and adoption by the EMC of risk-based corrective action (often called "Rebecca" rules) allowing lower levels of cleanup and allowing some sites to be left to "natural remediation."

The N.C. General Assembly in 1988 established the Leaking Underground Storage Tank Trust Funds—one for

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## Director's Forum

Kenneth H. Reckhow, Director, Water Resources Research Institute

# Neuse River Estuary Water Quality and Fish Kills Advisory for Summer/Fall 1998

*A statement from the  
N.C. Department of Environment  
and Natural Resources  
Science Advisory Council  
on Water Resources and  
Coastal Fisheries Management*

The rivers and estuaries of coastal North Carolina have experienced unprecedented increases in nutrient loading over the last 50 years. Changes in watershed land use, increased human population and exponential growth of intensive animal operations have all contributed to nutrient over-enrichment. A proliferation of water quality problems has resulted in our rivers and estuaries, including increases in nuisance algal blooms, anoxic water and fish kills.

While there are currently only limited data on which to make conclusions, it appears that severe water quality problems in the Neuse River Estuary originate with excessive winter and spring rains and are exacerbated by above average rains during the summer and early fall (Paerl et al., 1998). The rains deliver large pulses of nutrient-rich discharge to the estuary and algae "bloom" rapidly in response to these nutrients.

One mechanism for fish kills occurs when the algal blooms die and sink to the bottom where degradation and decomposition consume oxygen at a high rate. Fresh water runoff coupled with hot and calm weather encourages stagnation and stratification (fresh water floating downstream over the top of saltier water). The stratification slows the rate of oxygen replenishment from the atmosphere. If these conditions persist for long periods of time (days to weeks), the water column, particularly the bottom waters, become oxygen depleted. Waters with low or no dissolved oxygen

are known as "dead waters" because they are usually devoid of fin fish and shellfish.

Large dead water zones can overlap directly with critical fin fish and shellfish feeding and nursery areas, resulting in a reduction of suitable habitats. When fin fish and shellfish are exposed to these

stressful conditions, they become more susceptible to parasites, disease and infections and they also die directly from a lack of oxygen (Winn and Knott, 1992; Lenihan and Peterson, 1998). Although fish will avoid dead water, strong winds can quickly push this water into creeks and shallow areas near shore. Fish that

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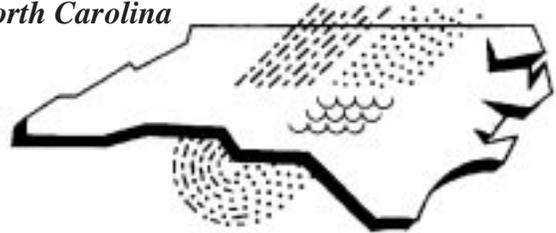
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are fleeing the dead water may become trapped along the shoreline or in the creeks with no way to escape.

Sudden kills of certain fish species (primarily menhaden) have also been correlated with the presence of the dinoflagellate *Pfiesteria piscicida* and similar *Pfiesteria*-like organisms. While a wide variety of fish have been shown to be susceptible to *Pfiesteria piscicida* when they are cultured together in the laboratory, little is definitively known about the interplay between fish species and *Pfiesteria* in the wild (The Raleigh Report 1998). It is known, however, that these organisms graze on other algae and therefore that their growth can be stimulated by nutrient induced algal blooms. It is also quite possible that stress caused by low oxygen conditions makes fish more susceptible to attacks from organisms such as *Pfiesteria* (Burkholder et al., 1995).

We believe that the summer and fall of 1998 may be shaping up as one of significant water quality problems since the record El Niño rainfalls of this winter and spring have provided a strong nutrient pulse to the Neuse River Estuary.

We strongly recommend continuation of an intensive long-term monitoring and modeling program for the Neuse. Only with a well-coordinated and thorough data collection effort spanning a number of different runoff/loading seasons coupled with the quantitative analysis that rigorous modeling can provide can we hope to sort out the mechanisms and chain of events that lead to fish kills, be able to predict with some degree of confidence how, why and where these events will occur, and be able to separate the effects of natural weather variations from nutrient management actions in stimulating or controlling these events.

#### References:

Burkholder, J., H.B. Glasgow and C.W. Hobb. 1995. Fish kills linked to a toxic ambush-predator dinoflagellate: distribution and environmental conditions.

*Marine Ecology Progress Series* 124:43-61.

Lenihan, H.S. and C.H. Peterson. 1998. How habitat degradation through fishery disturbance enhances impacts of hypoxia on oyster reefs. *Ecological Applications*, 8(1):128-140.

Paerl, H., J. Pinckney, J. Fear and B. Peierls. 1998. Ecosystem responses to internal and watershed organic matter loading: consequences for hypoxia in the eutrophying Neuse River Estuary, North Carolina, USA. *Marine Ecology Progress Series*, in press.

The Raleigh Report 1998: *Pfiesteria* research needs and management actions—Recommendations of an expert panel convened December 4-5, 1997, Research Triangle Park, NC, Special Report Series No. 19, The Water Resources Research Institute, Raleigh, NC.

Winn, R. and D. Knott. 1992. An evaluation of the survival of experimental populations exposed to hypoxia in the Savannah River Estuary. *Marine Ecology Progress Series*. 88:161-179.

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## Long-time WRRRI Business and Administrative Officer retires

WRRRI's Business and Administrative Officer Linda Lambert retired at the end of April after nearly 30 years of service to the Institute and more than 40 years' service to the State of North Carolina. She joined the Institute in 1969 after working in the NCSU business office and for the N.C. Departments of Transportation and Public Instruction.

During Linda's tenure with WRRRI, four directors and one interim director relied on her for day-to-day administrative support, and numerous now-distinguished university researchers began their careers with her budgeting and proposal advice and funding from WRRRI.

Renowned for attention to detail and her "Eagle Eye," Linda has also provided "quality control" (proofreading) for the *WRRRI News* and numerous other Institute publications and projects.

In April, N.C. State University's Office of Research, Outreach and Extension recognized Linda's outstanding service with the Award for Excellence. She received a similar honor for the NCSU "Chancellor's Unit" in 1989.

Linda will remain on staff part time for several months to provide a smooth transition for the new Business and Administrative Officer, Mary Sanford.

Mary, who worked with WRRRI briefly in the early 1980s, comes to us from the NCSU Industrial Extension Service.

# State sends message to municipalities to give attention to wastewater collection systems

At the April meeting of the Environmental Management Commission (EMC), N.C. Division of Water Quality (DWQ) Director Preston Howard announced new enforcement initiatives aimed primarily at preventing spills and overflows from municipal wastewater collection systems—the network of pipes, mains, and pumps that convey wastewater from individual homes, businesses and industries to wastewater treatment plants. Discharges of raw sewage from broken sewer lines and malfunctioning pump stations have been reported across the state recently, with the most visible occurring in highly populated areas in the Research Triangle and Coastal Plain communities.

“The heart of the problem,” said Howard, “is that wastewater collection systems have been ignored across the state for a long time. We need to provide impetus for change.”

To encourage municipalities to provide better maintenance and operation of their wastewater collection systems, the Department of Environment and Natural Resources has adopted the following policies, effective July 1:

- Municipalities and other wastewater treatment operators will be fined a minimum of \$4,000 if they do not comply with the requirement to report within 24 hours all spills that reach surface waters and those to ground surface exceeding 1,000 gallons, regardless of whether they are contained or reach waters. A point system will be used to determine whether to assess fines for reported spills.

- Between now and July 1, 1999, wastewater collection system operators must evaluate their systems and develop a plan and a schedule to deal with maintenance and operational deficiencies uncovered. If a system

has a spill after July 1, 1999, and the spill is related to a maintenance or operational problem that the system's plan was supposed to have addressed when the spill occurs, the penalty will be increased.

- When serious spills occur, wastewater collection system operators could face not only higher fines but requirements to publish public notices in local media, undergo training, injunctive action and/or a moratorium on new connections to the system.

## Other enforcement initiatives

In addition to new policies on wastewater collection systems, DWQ will delegate to its seven regional water quality supervisors the authority to assess civil penalties for wastewater discharge permit violations. Effective July 1, regional supervisors may assess penalties for single violations of daily, weekly or monthly effluent parameters, will assess for toxic pollutant limit violations which exceed standards by 20 percent, and will assess penalties when conventional pollutant parameters exceed permit limits by at least 40 percent.

According to Howard, delegation to regional supervisors will provide for quicker response to violations, and, he said:

“We'll be looking at a lot more assessments. We will have to shift [DWQ] staff to deal with this increased work load.”

Howard also announced that DWQ has begun encouraging the use of “supplemental environmental projects” as a means to resolve certain enforcement cases. Supplemental environmental projects are activities that a wastewater permit violator agrees to perform in place of full assessment of a monetary penalty. For instance, the City of Kinston was assessed \$39,650 in penalties for

various violations since 1994 but also agreed to provide more than \$50,000 to help establish a water management training program at Lenoir County Community College. Under state law, fines collected for permit violations go back to the county where the violation occurred for use in funding schools. Supplemental environmental projects are mechanisms for seeing that violators provide funding for environmental or public health programs.

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## Informational Sessions on Permit Enforcement Policy

The Division of Water Quality and the N.C. League of Municipalities are presenting a series of informational sessions on the new permit enforcement policy. Below are locations and dates. Meetings begin at 8:00 am and conclude at 4:30 pm. There is no charge.

Information is also available on the Division's web site at: <http://h2o.ehnr.state.nc.us/enfcomm/index.html>

May 21, 1998 - Greenville  
City Council Chambers, City Hall  
201 West 5th St.

May 27, 1998 - Asheville  
Wm F. Wolcott Jr. Bldg.  
161 South Charlotte St.

June 4, 1998 - Fayetteville  
City Hall Council Chambers  
433 Hay St.

June 9, 1998 - Winston-Salem  
Board of Aldermen Chambers, 2nd floor,  
City Hall, 101 North Main St., Room 215

June 11, 1998 - Wilmington  
City Council Chambers, City Hall  
102 North 3rd St., 2nd Floor

## April/May action of the North Carolina Environmental Management Commission

The N.C. Environmental Management Commission (EMC) took the following action at its April and May meetings:

- Upheld an administrative law judge's decision to assess civil penalties against Rayco Utilities for wastewater permit violations at its Greystone Forrest wastewater treatment plant in Cabarrus County. Discussion of the case revealed a history of permit violations and contested penalties by the private utility and ended with the Commission directing Division of Water Quality Director Preston Howard to write a letter to the Public Utilities Commission expressing concern about Rayco's operations.
- Approved holding public hearings on amendments to air quality permitting rules and indirect heat exchanger rules and adoption of a new exclusionary rule for peak shaver electric generators. For information, contact Tom Allen with the Division of Air Quality (919/733-1489) or visit the Air Quality web site at <http://www.ehnr.state.nc.us/EHNR/AQ/>.
- Approved the final Yadkin-Pee Dee River Basinwide Water Quality Management Plan. The plan includes development of a nutrient management strategy for High Rock Lake, with consideration of Nutrient Sensitive Waters (NSW) designation. In relation to a possible NSW designation for High Rock Lake, commissioners expressed concern about requirements in the Clean Water Responsibility Act that when a water body is designated NSW and phosphorous is the nutrient of concern, wastewater treatment plants are required to meet both phosphorous and nitrogen limits. They gave Director Preston Howard permission to convey to legislative committees considering the issue their opinion

that where phosphorous is the nutrient of concern, only that nutrient should be targeted for removal by wastewater treatment plants.

- Approved initiating the process to reclassify the proposed Randleman Reservoir for water supply. The first step in the process is publication in the *N.C. Register* of a "subject matter notice." This notice will be published in the June 1, 1998, *N.C. Register* and will indicate the Commission's intent to consider reclassifying segments of the Deep River from class C to class WS-IV. The notice will also indicate that because of the potential for eutrophication to occur in the proposed lake, there is a possibility the lake will be classified Nutrient Sensitive Waters. DWQ staff told the Commission that because of the potential for eutrophication, the Piedmont Triad Regional Water Authority has been required to develop a nutrient management strategy in order to receive "401 water quality certification," which they must have to proceed with the project. Staff will bring the EMC recommendations on what that strategy should include at its July meeting. Also at the July meeting, the EMC will be asked to take the next step in reclassifying the Deep River, which will be to publish the proposed reclassification and hold a public hearing on the proposal. If the EMC approves, the public hearing will be held in September, and the EMC will consider final action on the reclassification in November.

Director Howard announced that a public meeting to discuss issues related to the Randleman reclassification will be held June 4 at 6 pm at Guilford Technical Community College.

## April/May action of the EMC's Water Quality Committee

The Water Quality Committee of the N.C. Environmental Management Commission took the following action at its April and May meetings:

- Approved Water Supply Watershed Protection Ordinances for Orange and Moore counties and the Town of North Wilkesboro.
- Approved initiation of a temporary rule to define "innovative" swine waste management systems. The Clean Water Responsibility Act provides that during the two-year moratorium on waste permits for new or expanding swine operations, permits may be granted for operations that employ an "innovative" waste management system that does not employ an anaerobic lagoon. The Legislature's Administrative Procedures Oversight Committee had directed the EMC to develop rules to establish what the Department of Environment and Natural Resources would accept as an "innovative" system. A subcommittee composed of Commissioners Robert Cook and Robert Epting worked out wording for a definition, and the committee approved sending it to the full commission for action in July.

■ Heard a report from Mike Marshall with the N.C. Division of Marine Fisheries on the Fisheries Reform Act of 1997 and requirements for development of Coastal Habitat Protection Plans. The EMC, Marine Fisheries Commission and Coastal Resources Commission are required to collaborate to develop and approve Coastal Habitat Protection Plans for wetlands, spawning areas, threatened/endangered species habitat, primary and secondary nursery areas, shellfish beds, submerged aquatic vegetation, and outstanding resource waters. A "Habitat Summit" for the three commissions is scheduled for June 1 at the Legislative Office Building in Raleigh. It is an open meeting.

## DENR says recommendation of LUST Funds Council runs counter to its responsibilities

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commercial operations and another for noncommercial tank owners such as homeowners and farmers. There is no solvency problem with the noncommercial fund.

The commercial fund serves two purposes: (1) After a deductible, it provides reimbursement to tank owners for costs of cleaning up contamination from a LUST. (2) It provides financial assurance required of commercial tank owners by EPA that they can clean up contamination if their tanks leak. Without the fund or if EPA withdraws approval of the fund as a financial assurance mechanism, tank owners

would have to find insurance for \$1 million or more or provide proof they could provide at least \$1 million to clean up contamination if it occurred.

Revenue to the commercial fund comes from two sources: (1) taxes—motor fuel and kerosene inspection tax and excise taxes on kerosene and motor fuel sales, and (2) annual payment of tank operating fees.

Revenue to the commercial fund has been running about \$28 - \$30 million a year. However, in about 1995, reimbursements began outpacing revenue, drawing down the fund balance. A report delivered to the ERC in March showed a fund balance (less a \$1 million reserve) of \$3.9 million and claims pending of \$8.7 million. It is only the department's policy of paying reimbursement requests only as funds become available and

retaining a reserve that allows the fund to continue operating as a financial assurance mechanism for tank owners.

Not only are reimbursement requests backing up, but state regulators expect an increase in cleanups needed as some tank owners remove and replace old tanks to meet a December 22, 1998 deadline for tank upgrades and discover that their old tanks have leaked. Projections are that the fund faces a total shortfall of \$15.3 million in 1998, and a major question is how to address this shortfall.

The dilemma facing the Underground Storage Tank program will fall on new shoulders July 1, when the program, administered by the Pollution Control Branch, is moved from the Division of Water Quality's Groundwater Section to the Division of Waste Management.

### Petroleum Underground Storage Tank Funds Council - Recommendations to the Environmental Review Commission

(Revised version presented to EMC Groundwater Committee May 13, 1998)

1. Rank all sites with reported releases
  - A. Hierarchical order using site rankings to existing high, medium and low risk categories.
  - B. Highest risk to health, human safety and the environment to the lowest risk (Risk to be determined using the data supplied in preliminary assessment completed during Phase I and Phase II limited site assessments.)
- II. Require pre-approval of all technical work plans and associated cost proposals. (Pre-approval may be for specific work plans and cost proposals submitted on behalf of responsible party or may be for fixed task/rate scope of work.)
- III. Obligation of funds
  - A. Projects will be approved for funding based on the Department's determination of need, which will be based on risk to health, human safety and the environment. Department will utilize available funds in the most prudent manner to best protect health, safety and the environment.
  - B. Work may proceed at all sites upon approval of workplans and cost proposals. Funding obligations will only be made when the project's priority ranking is the next to be approved. Department will mandate work for sites where deductibles have been met only when funds are available to be reserved.
  - C. Department will enter into a funding commitment agreement with the responsible party. A deadline will be established for completion of work.
  - D. Funds are "de-obligated" if deadline not met or extension granted in writing by department.
  - E. Deadline of 60 days for report review, cost review and payment of reserved funds since approval is done at the front end.
- IV. Contingency fund.
 

Reserve (amount not agreed upon) in account for emergency response needs at all times.
- V. Transition Options
  - A. Fund backlog projected by department at \$15 million for 1998 from current revenues. Will take approximately seven months. Then proceed with new work, or
  - B. Fund projected \$15 million backlog with one-time appropriation to avoid suspension of work in entire program.
- VI. Future
  - A. Actuarial study to be completed by August 1998.
  - B. Long-term funding needs to be determined based on actuarial and full ranking of sites in state.
  - C. Funding options to be explored by year end.

## Division of Environmental Health remains in DENR pending decision on commissions

In 1977 legislation, the N.C. General Assembly transferred most agencies dealing with health services to a new Department of Health and Human Services (DHHS) and transferred all agencies dealing with environment and natural resources to a new Department of Environment and Natural Resources (DENR), eliminating the former Department of Environment, Health and Natural Resources. However, while the Division of Environmental Health (DEH), which includes the public water supply and on-site wastewater programs, was placed in the new DENR, its placement was deemed temporary. The Legislative Environmental Review Commission (ERC) was to study responsibilities relating to water programs and decide whether DEH should remain in DENR or be placed in DHHS.

The ERC held hearings this winter and spring, and DENR/DHHS held stakeholders meetings in an effort to sort out the various issues that arise at the nexus of public health and environmental programs.

In March, the two departments advised the ERC that it was the "consensus opinion of stakeholders that issues relating to commission jurisdiction are a primary concern and have not over the years been adequately addressed by any reorganization action to date."

In general, N.C. environmental programs, located in DENR, are implemented (through rulemaking and oversight) by the Environmental Management Commission, and public health programs, most located in DHHS, are implemented by the Health Services Commission. Locating programs, such as public water supply and on-site wastewater, which are implemented by the Health Services Commission in a department that is in general responsible to the Environmental Management Commission would create confusion and

jurisdictional difficulties, according to many employees of DEH.

DENR and DHHS have recommended to the ERC that it study "in detail the responsibilities and jurisdiction of several commissions having rulemaking authority over public health and environmental protection policy issues" and report to the next long session of the General Assembly. The departments also recommended that until the study is complete, DEH remain in DENR under a Memorandum of Agreement.

Re-aligning responsibilities of the state's various public health, environmental, and natural resources commissions; merging some commissions; and merging all environment-related commissions into one "mega-commission" have all been suggested and considered briefly in the past.

## Conservation Reserve Enhancement proposal could bring \$200 million to state for riparian buffers

In March, the N.C. Soil and Water Conservation Commission (SWCC) approved initiating a rule change that would facilitate cost sharing arrangements that could help bring more than \$200 million in funding from the U.S. Department of Agriculture (USDA) to purchase easements on 100,000 acres of stream buffers in the Chowan, Tar-Pamlico, and Neuse river basins and the Jordan Lake watershed.

Donna Moffit, Nonpoint Source Chief in the N.C. Division of Soil and

Water Conservation, told the SWCC that the Division and the Natural Resources Conservation Service were developing a proposal to USDA for \$221 million in Conservation Reserve Enhancement Program funding. The Conservation Reserve Enhancement Program (CREP) is a joint State-Federal effort to retire land targeted to address State and nationally significant agriculture-related environmental effects. This voluntary program uses financial incentives to encourage farmers and ranchers to enroll in the Conservation Reserve Program (CRP) in contracts of 10- to 15-years' duration to remove lands from agricultural production.

Under the North Carolina proposal, federal funding from USDA would be combined with \$8.8 million in funding provided through regular commitments of the Ag Cost Share Program, \$39.3 million from the N.C. Clean Water Management Trust Fund and \$1.5 million from the N.C. Wetlands Restoration Fund to provide financial incentives to farmers to keep lands along stream corridors out of production beyond the usual 15-year Conservation Reserve contract and to pay for installation of buffer BMPs to reduce nutrient runoff. The total funding package proposed would amount to \$274.6 million over a six-year period.

Moffit asked the SWCC to initiate a change in Ag Cost Share rules that limit farmers to 75% of the average cost of a BMP so that Ag Cost Share funding can be used to help in this state-federal partnership that will pay 100% of the cost of buffer BMPs. The Commission agreed, and rulemaking will be initiated.

North Carolina's CREP proposal was inspired by the State of Maryland's CREP program announced in 1997. Maryland received \$200 million for its efforts to control nutrient inputs from agricultural lands to the Chesapeake Bay.

### Drought in Indonesia

A majority of El Niño events cause below-normal rainfall over Indonesia, and much of that country is now suffering its worst drought in 50 years.

# Future of stream gaging network in question

When storms drive North Carolina streams out of their banks, the National Weather Service issues flood warnings to allow people to move to higher ground or otherwise prepare for flooding. Information on stream stage and flow that the National Weather Service uses to forecast flooding comes from a network of stream-gaging stations operated by the U.S. Geological Survey (USGS).

When Carolina Power & Light and other power-generating companies are licensed by the Federal Energy Regulatory Commission, they make a commitment to maintain minimum flows from their dams. Information that power companies use to monitor flows below dams comes from the USGS stream-gaging stations.

When the N.C. Division of Water Quality issues discharge permits to wastewater-treatment plants, they base waste-load allocations on flows in receiving streams. Information on flows in receiving streams comes from the USGS stream-gaging stations.

When highway engineers with the N.C. Department of Transportation design bridges, they use historical stream discharge information to determine the size of culverts and bridge design parameters. The stream discharge information comes from the USGS stream-gaging stations.

When paddlers plan outings, they often must check stream levels to see if the water levels are sufficient to float their canoes or if the levels are dangerously high. Water levels in many streams can be checked by logging onto the Internet and selecting the relevant USGS stream-gaging stations for near real-time information.

Stage and flow data from USGS stream-gaging stations support dozens of critical water quality, water supply, power generation, and navigational programs, as well as a range of recreational activities. However, most of the general public is probably not aware of

the existence of the stream-gaging network, even if they have seen the conical steel gaging stations on local streams. And many professionals who use the data may assume that stream data will always be there, provided by the Federal Government through USGS funding.

The low public profile of the stream-gaging station network and complacency among data users may be the undoing of a valuable and reliable tradition.

Nationwide, the number of stream gages has been decreasing since 1989, and some states have lost a significant number of gages. Between 1985 and 1996, the State of Maryland lost 20 percent of its gaging stations, and the Director of the Maryland Geological Survey recently called the stream gage an endangered species.

Gerald Ryan, Chief of the North Carolina District of the USGS, doesn't use alarmist terms, but he is concerned that, at a time when the state needs more and better data to predict flooding in urbanizing areas and to support the state's water-quality initiatives and the operation of its water-supply reservoirs, funding for the state's stream-gaging network has, at best, remained flat.

"You can't continue to maintain the same number of gages if funding simply remains level," said Ryan.

Funding problems for the stream-gaging network arise because, while many agencies, companies, and individuals use these data, there is no single high-profile office or agency within the Federal or State Governments to trumpet its cause. Of all USGS stream-gaging stations in the Country, only 6 percent are funded entirely by the USGS. About 64 percent of the stations are funded through the Cooperative Program in which the USGS provides as much as half of the funds and cooperating state and local agencies provide the other half. About 30 percent of the stations are funded by other Federal agencies, such

as the U.S. Army Corps of Engineers (COE) and the Tennessee Valley Authority (TVA).

Because of shifting funding priorities and other budget considerations, funding support for the stream-gaging network has become increasingly vulnerable to reduction or elimination by traditional long-term cooperators, such as the COE and TVA. While support from Federal cooperators in North Carolina is currently holding steady, the very real possibility exists that it could slip.

Moreover, private and state and local government cooperators may want to provide funding for a stream-gaging station only for a specific time-limited project. While there are currently about 180 gages in the North Carolina network, a number are temporary. When cooperative funding disappears, the gage must be closed. This funding arrangement does not provide for a broad, dense, and stable network that can generate the kind of long-term data so critical for scientific research and water-quality modeling to support local and watershed water-quality management.

Among the most stable and useful stream gages in the N.C. network are the 77 continuous-record stream gages in the Federal/State Program. Forty-two of these gages currently have real-time data-collection platforms that, by satellite transmission, make streamflow and river stage near real-time data available on the Internet. The N.C. Division of Water Resources (DWR) has requested and the Governor has included in his change budget \$180,000 to add real-time data-collection platforms to the remaining 34 gages in the Federal/State Program.

According to Tom Fransen of the DWR, making this real-time data available will increase the State's ability to respond to floods and will provide information to help better manage

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reservoirs and water-supply systems during droughts.

Gerald Ryan would certainly like to see the kind of upgrading in the stream-gaging network that the DWR's request would provide. However, his immediate concern is not only to maintain the network at its present level but to seek additional funding to offset increasing maintenance costs.

Currently, the USGS is developing a priority rating system to use when decisions must be made to close gages.

The importance of the USGS stream-gaging network to public health and safety and to the environment, and the funding dilemma for supporting it will be the subject of a workshop being planned by the WRRI and the USGS for November or December 1998.

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### Impacts of Diminished Water Quality on Municipal Water Treatment Costs

Results of a recent study in Texas revealed that when regional raw water contamination is present, the chemical cost of water treatment increases from a base of \$75 per million gallons (mg) to \$95 per mg. A one percent increase in turbidity was shown to raise chemical treatment costs by 0.25%.

Researchers in Nebraska, Texas, and Oregon collaborated on the study to provide information on how the volume of pollutants affect the marginal costs of treating municipal water supplies. They used three years' worth of data on 12 Texas water treatment plants that treat surface water to estimate the cost of municipal water treatment as a function of raw surface water quality. Sediment was utilized as a primary indicator of water quality. Fertilizers and pesticide levels were also measured because they attach to sediments.

For information on the study and publications resulting from it contact Dr. Bruce A. McCarl, Department of Agricultural Economics, Texas A&M University (409) 845-1706 or [mccarl@scout.tamu.edu](mailto:mccarl@scout.tamu.edu).

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## Task force developing tools for designing stream restoration projects in N. C.

Thanks to funding from the Clean Water Act 319 program, the N.C. Clean Water Management Trust Fund, new programs under the recent farm bill, and other programs, projects are being launched across North Carolina to restore degraded streams.

When personnel of natural resource agencies or environmental consultants design plans for restoring streams to a more stable and more natural condition, they need several pieces of information. Two critical pieces of information they need are what the naturally stable stream form in the watershed looks like—a *reference reach*, and the flow that, under natural conditions, fills the stream channel to the top of its banks and just begins to overflow onto a floodplain—*bankfull discharge*. (Because of incision, bankfull is not always the top of the bank. Many times it is a bench or scour line below the top of the bank.)

To provide tools for performing good stream restoration in North Carolina, a task force is now at work compiling an N.C. reference reach database and developing regional curves of watershed size vs. bankfull width, depth, and cross section area that can be used in identifying bankfull discharge in ungaged watersheds.

The task force is an informal group of hydrologists, engineers, biologists, and administrators from many different agencies including but not limited to: the Natural Resources Conservation Service (NRCS), N. C. State University, U.S. Geological Survey, N. C. Wildlife Resource Commission, U. S. Fish and Wildlife Service, City of Charlotte, UNC-Charlotte, and Duke Energy. The task force chair is Greg Jennings from the NCSU Department of Biological and Agricultural Engineering.

According to Will Harman, a task force member with the NCSU Water Quality Group, the task force has been focusing on developing a curve for the rural Piedmont.

The basic procedure is to find stream gaging stations with at least 10 years of record in a watershed that is not rapidly changing. So far, seven gage stations have been surveyed by NRCS and NCSU. At the gage, bankfull stage is identified using field indicators. Then the bankfull stage is carried through the gage plate to get a bankfull discharge. A flood frequency analysis is completed to determine the return interval of the bankfull discharge. If the return interval is between 1 and 2 years, then the identified feature is confirmed to be bankfull.

Bankfull width, depth and area are measured near the gage station and plotted on a graph for that watershed size. This procedure is repeated at several gage stations in different size watersheds to develop the regional curve.

Harman said that at a minimum, there will be two curves for North Carolina, a rural curve and an urban curve. More than likely, there will be more curves for unique hydrophysiographic regions like the southwestern mountains of North Carolina that receive more than 100 inches per year of rainfall. UNC-Charlotte and the City of Charlotte are exploring methods for creating an urban curve.

According to Harman, the regional curves and reference reach database will be published in a Technical Field Guide for Stream Restoration in North Carolina. The guidebook will not be printed for at least two years; however, draft copies of the curves will be made available by the task force as they become available.

For additional information, contact Harman at (919) 515-8245 or [will\\_harman@ncsu.edu](mailto:will_harman@ncsu.edu).

## Capacity Use regulation possible for Central Coastal Plain

N.C. Division of Water Resources (DWR) Hydrogeologist Nat Wilson told the Environmental Management Commission's Groundwater Committee in April that it is possible the Division will recommend designating a Capacity Use Area in the Central Coastal Plain.

The Water Use Act of 1967 provides for designation, after study, of Capacity Use Areas, within which permits are required for surface or groundwater withdrawals of 100,000 gallons or more per day. To date, only one Capacity Use Area has been designated—a multi-county area centered around Beaufort County.

However, DWR has been tracking water levels and potentiometric surfaces within the Central Coastal Plain for more than ten years, and in that time, water levels in the two most important aqui-

fers—the Black Creek and Upper Cape Fear—have continued to decline. These aquifers lie just west of Capacity Use Area #1 and provide drinking water for the population centers of New Bern, Kinston, and Jacksonville. Most towns and cities that get their drinking water from the Central Coastal Plain aquifers have encountered problems with dropping water levels, and some have encountered higher chlorides and other groundwater quality problems.

DWR held a Central Coastal Plain Aquifer Conference at East Carolina University in March to discuss with cities and towns and other users of groundwater in the area an action plan for dealing with the emerging water management problem.

Along with providing technical assistance to cities and towns to help them use water more efficiently and minimize aquifer dewatering, DWR is working to develop policy for aquifer storage and recovery. For additional information on the proposed Central Coastal Plain Action Plan visit the DWR web site at <http://www.dwr.ehnr.state.nc.us/hms/gwbranch/ccpact.htm>

## Fifty-nine communities receive grants for water and sewer

The N. C. Rural Economic Development Center has awarded \$3.8 million worth of grants for the planning or construction of 59 community development projects throughout the state. Nearly all of the grants involve water or sewer infrastructure. The majority of the grants, in amounts of up to \$125,000, will help local governments and non-profit organizations meet matching requirements for economic development construction grants from federal or state agencies. Smaller grants were awarded to assist localities with planning or grantwriting for economic development projects. All together, these grants will leverage an additional \$62 million in

public funds for water and sewer construction and provide water or sewer service to 20,760 customers. The infrastructure projects are expected to result in \$414 million in private investments, the creation of 5,018 jobs and the retention of an additional 4,779 jobs. The N. C. General Assembly funds the Supplemental Grants Program and targets its use to economically distressed areas. A survey conducted by the Rural Center identified \$11.34 billion in needed water and sewer construction statewide. In poor rural communities, low and nonexistent bond ratings block access to private capital for infrastructure. Meanwhile, federal support for local water and sewer projects is at its lowest level in two decades, and matching requirements put many of the available federal programs out of reach for rural communities. The Supplemental Grants Program helps them overcome such obstacles.—*Rural Routes* Vol 9 No 4

## Tar-Pamlico nutrient reduction goals not being met

At its May meeting the N.C. Environmental Management Commission received the second annual status report on the Tar-Pamlico River Nutrient Management Plan for Nonpoint Sources. The plan adopted by the EMC calls for a 30 percent reduction in nonpoint nitrogen loading to the estuary at Washington from 1991 levels and sets a five-year timeframe, to the end of 2000, for attaining the goal.

Ninety-five percent of the nonpoint source reduction is to come from reductions in agricultural loadings through voluntary implementation of best management practices (BMPs). Estimates are that to achieve the 30 percent reduction, BMPs will be needed on 100 percent of the cropland in the basin. However, the report shows that at the present rate of BMP adoption, only 20 percent of the basin's cropland will be treated by the end of 2000.

To increase adoption of agricultural BMPs, the Division of Soil and Water Conservation has requested an increase in the Agriculture Cost-Share Program.

Some commissioners have suggested that the voluntary approach will not achieve the needed nutrient reductions in the Tar-Pamlico and that a mandatory approach like the one taken in the Neuse River Basin will be needed. In July, the Division of Water Quality is to present the EMC's Water Quality Committee a strategy and schedule for meeting reduction goals through the voluntary program.

The Tar-Pamlico nonpoint source plan allocates 4 percent of the reduction goal to urban land uses and one percent to atmospheric deposition. However, allocations among the sources could change as research is completed on volatilization and deposition of ammonia from animal waste lagoons and spray fields and contributions from groundwater under lagoons and sprayfields.

## N.C. Coastal Resources Commission will propose changes to estuarine waters protection rules

The N.C. Coastal Resources Commission has announced that it will consider expanding its permit jurisdiction along estuarine and public trust shorelines in the 20 coastal counties.

Currently the CRC's estuarine shoreline jurisdiction ends at the inland waters boundary (as defined by N.C. General Statute 113-A-113(b)(2)), and extends 75 feet landward from the water's edge or 575 feet landward from waters classified as Outstanding Resource Waters.

The commission has established standards for development along the Estuarine Shoreline Area of Environmental Concern (AEC). These are found in the N.C. Administrative Code at Title 15A Subchapter 7H .0209.

The CRC supports expanding the estuarine shoreline AEC landward and including shorelines farther upstream that are adjacent to public trust waters, where the CRC has jurisdiction.

The CRC has asked the Division of Coastal Management to begin drafting proposed rules to address problems in estuarine waters that have been documented scientifically. The rules will address the need for vegetated buffers, the long-term negative effects of bulkheads, impervious surfaces along the shoreline, and increased protection for primary nursery areas and other sensitive waters.

The proposed rules will include new standards to strengthen resource protection in the coastal area.

For information contact Charles Jones, Assistant Director for Permits and Enforcement, with the N.C. Division of Coastal Management. at (919) 733-2293.

## Digest

**Governor's \$101 million environmental budget.** Governor James B. Hunt Jr.'s recommendations for changes to the 1998-99 budget (change budget) includes \$101 million in recommended spending on environmental programs. According to Hunt, his number one environmental priority is restoring and protecting North Carolinas' water quality, and his budget includes \$34.9 million to support cleanup efforts, reduce nonpoint source pollution, and protect fisheries. His Clean Water budget includes \$3.1 million for basinwide water quality planning; \$8 million for monitoring, research and fish kill response; \$8.3 million to increase funding to the Agricultural Cost Share Program and hire more erosion and sedimentation control inspectors; \$11.5 million to support the state's efforts to enforce wastewater treatment plant regulations and ensure safe drinking water; and \$4.1 million to help implement fisheries reform measures, including development of coastal fisheries habitat protection plans. In presenting the Governor's budget recommendations to the N.C. Environmental Management Commission in May, Secretary of Environment and Natural Resources Wayne McDevitt noted that spending on environmental programs across all state agencies currently accounts for only about 2 percent of the state budget, and that the DENR budget accounts for only one percent. He said that a recent Mason-Dixon Poll showed that 69 percent of North Carolinians rated the state's effort to protect the environment fair or poor.

**Craven County Livestock Study.** In February 1997, the Craven County Board of Commissioners passed a resolution declaring a moratorium on new intensive livestock operations and expansions of existing operations and calling for formation of a study committee to conduct research to describe problems associated with intensive

livestock operations and recommend solutions to the problems. In December 1997, the study committee presented its report and recommendations. Among the group's findings was that "Economic factors such as cheaper land and less restrictive environmental regulations have brought a large number of intensive livestock operations into North Carolina since 1990. Craven County in particular has experienced a doubling in the number of intensive livestock operations located here since 1990." Among the group's 15 recommendations were that the county should establish size limitation on all new and expanding intensive livestock operations, log all complaints of odors from livestock operations and require that they be investigated by the soil and water conservation district, pursue a Clean Water Management Trust Fund grant to conduct a groundwater study to determine if groundwater monitoring of intensive livestock operations should be made mandatory, require the adoption of aerobic waste management systems when economically and technologically available for new operations and when lagoons must be replaced, and request that the N.C. General Assembly address the issue of closure of abandoned lagoons.

**Restoring N.C. coastal streams.** Small, low-gradient streams and their associated floodplains are common wetland features throughout the inner Coastal Plain of North Carolina. Many of these streams and floodplains have been altered by activities such as stream channelization, road building, intensive agriculture, and commercial logging. The effects of these activities include reduced or more stable water tables, deposition of excessive amounts of sediment onto the floodplain, changes in forest composition, and invasion of exotic species. As a result, many floodplains no longer effectively intercept runoff, thus inhibiting their potential to enhance water quality. With funding from the Center for Transportation and the Environment (CTE), Drs. Richard Rheinhardt and Mark Brinson at East Carolina Univer-

sity hope to provide guidance for restoration opportunities by establishing the attributes of relatively unaltered riverine wetlands, which can serve as design templates for restoration. Degraded stream floodplain systems can then be identified and actions taken to compensate for functions lost elsewhere by unavoidable negative effects of highways. By recognizing the close relationship between upstream and downstream portions of riverine wetlands, larger-scale mitigation banks could be established to more holistically restore functions in comparison with projects targeted for smaller, individual sites. After sampling 41 sites in 38 stream floodplains, the researchers have described characteristics for floodplain forests of low-order streams in eastern North Carolina that can be useful in restoring former riverine wetlands. The final project documentation is in preparation. For project-related inquiries, please contact Brinson or Rheinhardt at [brinsonm@mail.ecu.edu](mailto:brinsonm@mail.ecu.edu) or 919-328-6307.—*Excerpted from a CTE Research Project Profile. CTE is affiliated with the Institute for Transportation Research and Education headquartered at N.C. State.*

**Nitrate in drinking water.** A 1990 survey conducted by the U.S. Environmental Protection Agency showed that about 1,130 public and 250,000 private domestic water supply wells exceeded the Safe Drinking Water maximum contaminant level (MCL) of 10 milligrams per liter (mg/l) for nitrate. In addition, a survey by the American Water Works Association indicated that excessive nitrate concentrations accounted for 23 percent of the violations of drinking water standards by water systems. Nitrate in natural groundwater is generally less than 2 mg/l. Concentrations of nitrate greater than 10 mg/l can be fatal for infants under six months of age. Other than effects on infants, little is known about the effects of nitrate on human health, although there are studies indicating a link between nitrate rich well water and an increase in congenital malformations and increased risk of

lymphoma. The major sources of nitrogen are agricultural chemicals, such as inorganic fertilizers and animal manure. Minor sources of nitrate are septic tanks and leaking sewers. Nitrate is persistent in groundwater and accumulates to high concentrations as more nitrogen is applied to land surface. Nitrate is a highly soluble and stable ion that doesn't drop out of water or adsorb to other materials easily, making it difficult to remove from drinking water. The most effective ways of removing nitrate from drinking water are ion exchange and reverse osmosis.—National Drinking Water Clearinghouse's *On Tap*, Spring 1998

**Drugs in drinking water.** According to a copyrighted article on ScienceNews Online ([http://www.sciencenews.org/sn\\_arc98/3\\_21\\_98/bob1.htm](http://www.sciencenews.org/sn_arc98/3_21_98/bob1.htm)), scientists are finding trace amounts of a range of pharmaceuticals in wastewater effluent and in water supplies. Scientists in Switzerland, Germany and the United States have recently reported in scientific journals that they have found cholesterol-lowering drugs, analgesics (including ibuprofen), chemotherapy drugs, antibiotics, hormones and other drugs in streams, lakes and even ground waters. German and Swiss studies have revealed drug contamination of water supplies to be widespread, and an EPA official is quoted as saying there's no reason to think the situation is any different in the United States. Drugs are not completely broken down in the human body, and in some cases, 50 to 90 percent of a drug may be excreted in its original or biologically active form. Since wastewater treatment plants are not designed to remove pharmaceuticals from wastewater, trace amounts of drugs are released to waterways, and in a few cases have been found in tap water. Whether the presence of drugs in water supplies is a threat to humans or the environment is a question yet to be answered. There is speculation that hormones in sufficient concentrations could affect fish reproduction and that antibiotics could give rise to resistant strains of bacteria.

**Bacteria monitor.** Researchers at Cornell University have produced a biosensor that can detect minute quantities of *E. coli* and other bacteria in contaminated water or food. A biosensor is a silicon-coated chip coded with antibodies or proteins that bind with specific bacteria, capturing them in a regular pattern, like a UPC bar code, that can be read by a laser-beam. The researchers say the chips could be placed in a well or water monitoring station and tied to a central computer to monitor contamination. Their research was reported in the March 15 issue of *Analytical Chemistry* and on the Cornell web site at <http://www.news.cornell.edu/releases/April98/E-coli.bpf.html>.

**Year of the Ocean.** Commerce Secretary William M. Daley launched the International Year of the Ocean in January. "The goal of the Year of the Ocean is to highlight the important role the ocean plays in the daily lives of Americans," Daley said. "This is especially important when you consider that one of every six jobs in the United States is marine-related and one-third of the nation's gross national product is produced in coastal areas through fishing, transportation and recreation. All of these industries are dependent on healthy waters and marine habitats." The public awareness campaign includes a number of activities throughout the year, including a national conference, print and television public service announcements, and a web site <http://www.yoto.com>.—DOC/NOAA news release

## People

**Steve Coffey**, formerly an extension specialist with the N.C. State University Water Quality Group, has joined the N.C. Division of Soil and Water Conservation as Tar-Pamlico Coordinator. He replaces **Noah Ranells**, who has joined the Department of Soil Science at NCSU.

# UNC-Wilmington scientists make recommendations on coastal stormwater ponds

In a report published by the UNC-Wilmington Center for Marine Science research\*, coastal researchers say they have also found that stormwater detention ponds can discharge water higher in nutrients than the incoming water. The same finding was reported by other researchers in recent WRRI reports.

UNC-W researchers Michael A. Mallin, Lawrence B. Cahoon, John J. Manock, James F. Merritt, Martin H. Posey, Ronald K. Sizemore, W. David Webster, and Troy D. Alphin report that, in the course of conducting an environmental analysis of New Hanover County tidal creeks, they surveyed a number of stormwater detention ponds in the Wilmington area for water quality and pollutant removal efficiency. Some of the ponds contained excessive concentrations of fecal coliform bacteria, nutrients, and chlorophyll *a*. The ponds generally functioned quite well in terms of removal of sediments from stormwater. However, some of the ponds discharged water higher in nutrients and chlorophyll *a* than the incoming water. Many of the ponds had low nitrogen:phosphorus ratios, along with mats of blue-green algae, which, they say, indicates that nitrogen fixation may be occurring in some of the systems.

The scientists recommend that stormwater detention ponds should be built with a shallow "shelf" surrounding the pond to encourage growth of native rooted aquatic vegetation. Such vegetation will filter pollutants and take up nutrients that might otherwise flow out of the ponds and into downstream tidal creeks. They say mid-pond areas should be deep enough (more than 6 feet) to discourage growth of nuisance aquatic weeds.

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The Mitchell River Watershed Coalition,  
N.C. Cooperative Extension Service and others  
will present

## NC STREAM RESTORATION AND PROTECTION WORKSHOP

Holiday Inn, Jonesville, NC  
June 23-24, 1998

Workshop Fee \$30 (\$40 after June 1)  
Optional Tour Fee \$10

The purpose of this workshop is to provide an overview of stream restoration and protection in North Carolina and promote networking among professionals in this area.

For program and registration information contact Greg Jennings at N.C. State University (919) 515-6795; Email [greg\\_jennings@ncsu.edu](mailto:greg_jennings@ncsu.edu) or check website: <http://www2.ncsu.edu/ncsu/CIL/WRRI/streamrest.html>

Since nutrients and other pollutants settle in pond sediments, they recommend periodic pond maintenance (sediment removal).

The researchers also make other recommendations for handling urban stormwater to reduce fecal coliform and nutrient pollution of tidal creeks and protect such waters for shellfishing.

\* *A Four Year Environmental Analysis of New Hanover County Tidal Creeks 1993-1997*. Center for Marine Science Research Report No. 98-01. University of North Carolina at Wilmington. For information contact Michael Mallin 910-256-3721 Ext 275 or [mallinm@uncwil.edu](mailto:mallinm@uncwil.edu)

## Publications

Proceedings of WRRI's annual water resources research conference, **WATER RESOURCES PROTECTION: Understanding and Management** held April 1, 1998, in Raleigh is 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 WRRI, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 or call (919) 515-2815. The proceedings contains abstracts of all presentations made at the conference.

**Green Development: Integrating Ecology and Real Estate**, a 525-page hardback book with 150 photos and an extensive appendix of resources is available from the Rocky Mountain Institute for \$54.95 plus \$7.00 for shipping and handling. Written primarily for real-estate professionals, the book describes a new field "where environmental considerations are viewed as opportunities to create fundamentally better buildings and communities—more efficient, more comfortable, more appealing, and ultimately more profitable." Order it from RMI, 1739 Snowmass Creek Road, Snowmass, CO 81654-9199. Find out more about the book on the RMI website: <http://www.rmi.org/gds/pubs.htm>

"*Our Changing Climate*" is the fourth in the series of **Reports to the Nation on Our Changing Planet** produced by the University Corporation for Atmospheric Research and the National Oceanic and Atmospheric Administration. Intended for general public education and classroom use, this nicely illustrated 24-page report examines the causes and effects of changes in the earth's climate. Teachers packets are also available. For a single copy of the report, call (303) 497-8666 or email [rtn@joss.ucar.edu](mailto:rtn@joss.ucar.edu).

The U.S. Environmental Protection Agency has produced a fact sheet "*Linear Regression for Nonpoint Source Pollution Analyses*" to

*continued next page*

demonstrate an approach for describing the relationship between variables using regression. It is targeted to agency personnel responsible for nonpoint source assessments and implementation of watershed management. Request publication number EPA-841-B-97-007 from U.S. Environmental Protection Agency, Office of Water Resource Center, RC-4100, 401 M Street, SW, Washington, DC 20460, or call the Resource Center publications request line at (202) 260-7786.

The U.S. EPA has announced availability of a Report to Congress, *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States*. Required by the Water Resources Development Act of 1992, the report describes the accumulation of chemical contaminants in river, lake, ocean and estuary bottoms and includes a screening assessment of the potential for adverse effects to human and environmental health. The report is in three volumes: EPA 823-R-97-006; EPA 823-R-97-007; EPA 823-R-97-008. Request copies from the National Center for Environmental Publications and Information (513) 891-6561.

The N.C. Rural Center has published *Funding Resource Guide: Quick Reference to Sources of Water & Sewer Funding in N.C.* 23 pages. \$3.00. For ordering information call Linda Schepers at (919) 250-4314.

The Center for Conservation Biology at Stanford University has launched *Ecofables/ Ecoscience*, an occasional publication dealing with issues relating to the distortion of environmental science. Initially, the publication is free. Write Center For Conservation Biology, Attn: Ecofables/ Ecoscience, Dept Biological Sciences, Stanford University, Stanford, CA 94305-5020. Email: Ecofable@bing.stanford.edu.

*Tidal Flats* is a newsletter about the N.C. National Estuarine Research Reserve. Request it from NCNERR, Center for Marine Science Research, 7205 Wrightsville Ave, Wilmington, NC 28403.

*Legal Tides* is a newsletter about current events in N.C. coastal law. The latest issue focuses on the N.C. Fisheries Reform Act of 1997. Request this free newsletter from Editor Walter Clark, N.C. Sea Grant , Box

8605, N.C. State University, Raleigh, NC 27695-8605.

*WaterWise* is a newsletter of the N.C. Sea Grant program examining water quality issues of the N.C. Coast. The latest issue focuses on "The Next Generation of Animal Waste Technologies." Request it from UNC Sea Grant, Box 8605, N.C. State University, Raleigh, NC 27695-8605.

The U.S. Geological Survey has recently published *Water Quality in the Albemarle-Pamlico Drainage Basin, North Carolina and Virginia, 1992-95* summarizing results

of 5 years of study and 3 years of data collection as part of the USGS's National Water-Quality Assessment Program. Request copies of USGS Circular 1157 from the USGS, 3916 Sunset Ridge Rd., Raleigh, NC 27607 or access it on the web at <http://water.usgs.gov/lookup/get?circ1157/>

The Raftelis Environmental Consulting Group has published its *1998 Water and Wastewater Rate Survey*. For ordering information write the group at 6100 Fairview Tower, Ste 615, Charlotte, NC 28210 or call (704) 556-1936.

### North Carolina Precipitation/Water Resources

|                               | March          | April          |
|-------------------------------|----------------|----------------|
| <b>Rainfall (+/- average)</b> |                |                |
| Asheville                     | 3.71" (-0.92") | 8.70" (+5.34") |
| Charlotte                     | 3.01" (-1.42") | 6.19" (+3.51") |
| Greensboro                    | 3.62" (-0.10") | 5.52" (+2.68") |
| Raleigh                       | 7.31" (+3.54") | 3.12" (+0.53") |
| Wilmington                    | 2.06" (-1.82") | 2.80" (-0.07") |

### Streamflow

| Index Station<br>(County, Basin)                       | Mar mean flow (CFS)<br>(% of long-term median) | April mean flow (CFS)<br>(% of long-term median) |
|--|--|--|
| Valley River at Tomotla (Cherokee, Hiwassee)           | 365 (86%)                                      | 548 (162%)                                       |
| Oconaluftee River at Birdtown (Swain, Tenn)            | 860 (108%)                                     | 1,230 (167%)                                     |
| French Broad River at Asheville (Buncombe, FB)         | 4,290 (148%)                                   | 4,380 (171%)                                     |
| South Fork New near Jefferson (Ashe, New)              | 922 (161%)                                     | 912 (168%)                                       |
| Elk Creek at Elkville (Wilkes, Yadkin/Pee-Dee)         | 177 (151%)                                     | 225 (209%)                                       |
| Fisher River near Copeland (Surry, Yadkin/Pee-Dee)     | 261 (114%)                                     | 311 (145%)                                       |
| South Yadkin River near Mocksville (Rowan, Yadkin/PD)  | 676 (135%)                                     | 770 (192%)                                       |
| Rocky River near Norwood (Stanly, Yadkin/Pee-Dee)      | 4,030 (135%)                                   | 2,920 (208%)                                     |
| Deep River near Moncure (Lee, Cape Fear)               | 7,480 (252%)                                   | 2,570 (144%)                                     |
| Black River near Tomahawk (Sampson, Cape Fear)         | 2,820 (199%)                                   | 1,830 (181%)                                     |
| Trent River near Trenton (Jones, Neuse)                | 279 (97%)                                      | 141 (83%)  |
| Lumber River near Boardman (Robeson, Lumber)           | 5,440 (210%)                                   | 3,330 (184%)                                     |
| Little Fishing Creek near White Oak (Halifax, Pamlico) | 883 (295%)                                     | 219 (126%)                                       |
| Potecasi Creek near Union (Hertford, Chowan)           | 676 (146%)                                     | 225 (94%)  |

### Groundwater

| Index well<br>(Province) | Mar depth<br>below surface (ft)<br>(departure from<br>average for month) | April depth<br>below surface (ft)<br>(departure from<br>average for month) |
|--------------------------|--|--|
| Blantyre (Blue Ridge)    | 23.77 (+6.99)  | 23.61 (+6.35)  |
| Mocksville (Piedmont)    | 13.43 (+1.98)  | 13.12 (+2.45)  |
| Simpson (Coastal Plain)  | 3.40 (-0.27)   | 3.96 (-0.03)   |

Source: U.S. Geological Survey's *Water Resources Conditions in North Carolina*

## Workshops and Conferences

The Delaware Department of Natural Resources and Environmental Control will host *Minimizing Erosion, Sediment and Stormwater Impacts: Protection and Enhancement of Aquatic Resources in the 21st Century* Sept 15, 16, 17, and 18, 1998, at the University of Delaware in Newark. This event is a week of workshops, technical sessions, field trips and general discussion relating to erosion, sediment and stormwater impacts to aquatic resources. Cost is \$175. For information fax a request to 302-739-6724 or email rbaldwin@DNREC.state.de.us.

The National Association of State Land Reclamationists will hold its annual conference, *Reclamation in the Next Millennium*, Oct 11-14, 1998, in Jacksonville, Florida. For information call Jim Price at (850) 488-8217 or email price\_jc@dep.state.fl.us.

The Universities Council on Water Resources will host *Cross Currents in Water Policy* Aug 4-7, 1998, at Hood River, OR. The conference will explore inherent conflicts between old water policies and new concep-

tions of sustainable development. For information call (618) 536-7571; email ucowr@uwin.siu.edu, or visit web site <http://www.uwin.siu.edu/ucowr>.

The Association of State Dam Safety Officials will hold its 1998 annual conference, *Dam Safety '98*, Oct 11-14, 1998, at the Riviera Hotel in Las Vegas, NV. Conference will focus on the new National Dam Safety Program, the effects of recent disasters on dam safety, and technical case studies in dam rehabilitation. For information call ASDSO at (606) 257-5146.

The Association of State Dam Safety Officials will hold its *Southeastern Regional Conference* June 7-10, 1998, at the Hot Springs Park Hilton in Hot Springs, AR. For information call ASDSO at (606) 257-5140 or visit web site <http://members.aol.com/damsafety/homepage.htm>

The Center for Environmental Studies at Virginia Commonwealth University is offering the following *1998 Environmental Technology Training Workshops* on the campus in Richmond, VA. \*\*\* Ecology and Identification of Wetland Environments, June 3-5, 1998 \*\*\* Wetlands Mitigation, June 11-12 \*\*\* Identification of Wetland Plants, June

17-19 \*\*\* Winter Wetlands Plant Identification, Dec 10 \*\*\* Hydrological Principles, June 9-10 \*\*\* Advanced Fish Identification July 16-17 \*\*\* Rapid Bioassessment Protocols, July 22-24 \*\*\* Water Quality Assessment, July 29-31 \*\*\* Ecological Risk Assessment, Aug 3-4 \*\*\* Environmental Decision and Risk Analysis, Aug 5-7 \*\*\* Indoor Air Quality, Aug 13-14. Contact the Center for Environmental Studies for more information: Phone: (804) 828-7202; E-mail: ces-vcu@vcu.edu; Web site: [HTTP://www.vcu.edu/cesweb/](http://www.vcu.edu/cesweb/)

The UNC Water Resources Research Institute, the N.C. Division of Land Resources, Land Quality Section, and the N.C. Sedimentation Control Commission will present *Advanced Erosion and Sedimentation Control Design Workshops* Sept 15-16 in Raleigh (location to be determined) and Oct 27-28 at the Holiday Inn Select in Hickory. A brochure with registration form will be available in July. If you receive the *Sediments* newsletter, you will be sent a brochure. If you do not receive the newsletter but wish to receive a brochure, call WRRRI at (919) 515-2815.

### Cut here

## WRRRI NEWS SUBSCRIPTION UPDATE (ADD? DELETE? ADDRESS CHANGE?)

Please review your address as it appears on this newsletter. If you wish to have your name removed from our mailing list, or if your address needs to be corrected, please indicate the action we should take directly on the reverse side of this page adjacent to your address label and return the lower portion of the page to us for correction.

It will help tremendously if you will return changes promptly so that they can be made prior to our next mailing. If we do not hear from you, we will assume your address is correct as shown on the label.

If you know others who would benefit from receiving the WRRRI News, please ask them to send name, affiliation, address, and phone number to the address below with a request to be added to the mailing list.

Return to:

**Water Resources Research Institute  
of The University of North Carolina  
Box 7912, North Carolina State University  
Raleigh, NC 27695-7912**

# Websites

The **UNC Water Resources Research Institute website** now offers web access to the *WRRRI News* in both HTML and PDF format. In addition, the website provides:

- HTML summaries of about 90 WRRRI technical reports searchable by keyword (Additional report summaries are added periodically.)
  - *The Raleigh Report 1998: Pfiesteria Research Needs and Management Actions*—*Recommendations of an expert panel* in both HTML and PDF formats.
  - A directory of university water resources experts in North Carolina searchable by keyword
  - A frequently updated listing of water-related conferences and workshops
  - A frequently updated listing of public hearings, public meetings, meetings of environmental policy making bodies, regulatory documents available for public comment and other opportunities for public input
  - Links to other water-related websites
- Visit us at <http://www2.ncsu.edu/ncsu/CIL/WRRRI>

The **Neuse River ModMon website** provides information about a project being conducted by an interinstitutional team of North Carolina scientists to support decisionmaking for the Neuse River Basin. The project involves monitoring, short-term modeling and long-term modeling. The ModMon website provides up-to-date information on the monitoring and modeling phases as well as information about the scientists participating in the project. Learn about ModMon at <http://www.marine.unc.edu/neuse/modmon/homepage.html>

The *4th International Conference on Toxic Cyanobacteria* will be held Sept 27 - Oct 1, 1998, at the Duke University Marine Laboratory, Beaufort, NC

For information call Jean Stack at 252/726-6841 or email [cstack@email.unc.edu](mailto:cstack@email.unc.edu). Or, visit website <http://www2.ncsu.edu/ncsu/CIL/WRRRI/cyanosymp.html>.

North Carolina Water Resources Association

## NCWRA

North Carolina Section of the American Water Resources Association

### Luncheon and Forum Schedule

|               |   |
|---------------|---|
| Sept 14, 1998 | Water Quality Issues in North Carolina: Gauging the Environment |
| Nov 9, 1998   | Nutrient Management in the Neuse River Basin                    |
| Jan/Feb 1999  | New Developments in Erosion and Sediment Control                |
| April 1999    | Wetlands Restoration and Related programs                       |
| Sept 1999     | Stormwater: NPDES Phase II and Neuse River Rules                |
| Nov 1999      | Jordan Lake Allocation Issues                                   |

All luncheon/forums take place at 11:30 am at the Jane S. McKimmon Center on the N.C. State University campus. For additional information call Robert Holman at WRRRI (919/515-2815).

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

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