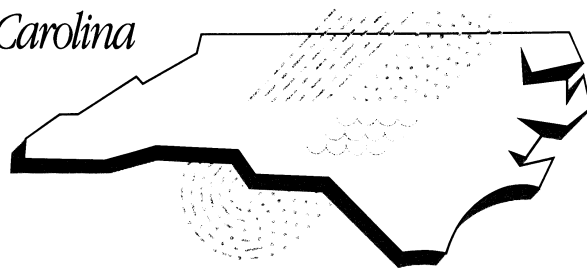


Water Resources Research Institute News

of The University of North Carolina



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Reckhow to lead National Academy of Sciences committee

TMDL rules delayed, study of scientific basis mandated

When Congress passed legislation appropriating 2001 funding for the U.S. Environmental Protection Agency, it put on hold proposed new rules for implementing the Total Maximum Daily Load (TMDL) requirements of Section 303 of the Clean Water Act and mandated a study of the scientific basis for the proposed rules. The study will be conducted by the Water Science and Technology Board of the National Academy of Sciences (NAS), and the committee that will complete the first phase of the study will be chaired by WRRRI Director Kenneth H. Reckhow.

Under section 303 (d) of the Clean Water Act, states and other entities are required to develop lists of waters that do not meet water quality standards set for them because of nonpoint source pollution. The law requires that jurisdictions establish priority rankings for waters on the list, specify the maximum amount (TMDL) of a pollutant that the waterbody can receive and still meet water quality standards, and allocate the pollutant loadings among point and nonpoint sources. The regulations that say how TMDLs are to be developed were issued in 1985 and amended in 1992. In August 1999, EPA issued draft proposed new regulations for development and implementation of TMDLs. While the original draft rules underwent significant changes, the current proposed rules have been widely criticized by many groups because data on which states are expected to make decisions is

said to be poor and because the rules are expected to be costly for states and regulated communities to implement.

Details of Congress' response to the proposed TMDL rules are found in reports accompanying H.R. 4635, which appropriates funds for the Department of

Veterans Affairs, and Housing and Urban Development and Independent Agencies.

House Report 106-675 explains the action to delay the rules:

The Committee has included bill language which prohibits the

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Director's Forum

How should WRI disseminate results of its sponsored research?

Kenneth H. Reckhow, Director, and Jeri Gray, Editor, Water Resources Research Institute

Given the significant changes in the methods of information exchange and research dissemination over the past few years, we at WRI wonder whether it is time to change the way we disseminate the results of our research projects. Two particular events are noteworthy in stimulating this examination.

First, we recently found it necessary, because of space limitations to largely eliminate our store of older WRI reports through sales, giveaways, and ultimately, recycling. In addition, we have observed a reduction in the demand for hardcopy reports and anticipate increased demand for downloadable reports and papers on the Internet.

Second, in a recent discussion with North Carolina water researchers, we have learned that one of the apparent reasons for a reduction in the number of research proposals submitted to WRI during the past few years is the burden of final report preparation. While this is interesting given that we have no length requirements (final reports can be short), it nonetheless is indicative of a need for us to consider flexible yet effective reporting alternatives.

Before making any changes in the way we disseminate research results, we would like to have input from the producers and users of our reports—university scientists, agency personnel, consultants, environmental organizations, and others. Before thinking about alternatives to our current peer-reviewed technical completion reports, we should first identify the goals for the dissemination of research results. Here is our list:

1. To make research results and data widely accessible to other scientists, to natural resource managers, and to the interested public.
2. To provide enough details of research so that it could be duplicated and so that the validity of the methods can be evaluated.
3. To assure some level of validation of research results.
4. To make results available as quickly as possible.

5. To encourage publication of results in peer-reviewed publications (to support faculty advancement and to facilitate citation and archiving of the results).

As a rule, researchers view refereed journals as the primary publication outlet and the logical culmination of a research project. "Gray literature" research reports such as ours are often cited in refereed journals, and they frequently

serve to provide the raw data and additional details from the research, but they reach a limited readership.

If we modify our research publication policy, there are many alternatives that might be considered. Listed below are some that occur to us along with thoughts on their pros and cons:

1. Publish results of projects as articles in an institute peer-reviewed printed journal.
(Preparation of a peer-reviewed journal

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either quarterly or biannually would involve the same delays that publication of peer-reviewed reports does. Would important details and data be lost in moving from a full report to a shorter article? How would this affect subsequent refereed journal submittals? Printing and mailing costs need to be considered.)

2. Publish results of projects as articles in a printed, minimally refereed and minimally edited WRRI journal. (*The appropriate level of detail and of review and editing would have to be determined and communicated clearly to researchers and to users of the research. Printing and mailing costs would be a factor.*)
3. Publish results of projects as articles in an online minimally refereed, minimally edited WRRI journal. (*This would provide the most rapid dissemination of research results. The degree of peer review could vary among articles, but would have to be communicated clearly to readers. If we don't physically print something, how does it get to the libraries, technical information services, and others who index and archive?*)
4. Publish master's theses and doctoral dissertations resulting from the research (*What if there is no thesis or dissertation?*)
5. Give researchers a choice. (a) Submit a report that conforms to minimal requirements and undergoes minimal review and editing and is published on our website in pdf format as a "non-reviewed final report." (b) Submit an article that would conform to certain requirements, undergo peer-review and editing and be published in our on-line journal. (*Again, what about indexing and archiving?*)
6. Publish nothing, but require researchers to negotiate special privileges with journal publishers so that we can provide web links to online journals or provide reprints of articles published by our researchers. (*What about projects that are not published in journals?*)

Over the next few months we will be considering changes such as these in WRRI research publications. As researchers, professionals, and readers, you are WRRI clients and consumers whom we serve. We invite you to provide input on this important transition by completing a survey that will be posted on our website: <http://www2.ncsu.edu/ncsu/CIL/WRRI/reportsurvey.html>.

TMDL study continued

expenditure of funds by the Administrator to make a final determination on or to implement rules relative to the National Pollutant Discharge Elimination System Program and Federal Antidegradation Policy, and the Proposed Revisions to the Water Quality Planning and Management Regulations Concerning Maximum Daily Loads, published in the Federal Register on August 23, 2000. This action was taken as a result of a multitude of concerns with the timing, impact, and cost of the proposed TMDL rule registered by numerous States and businesses throughout the country. The Committee's action should be interpreted as nothing more than a brief holding action on this rule until many of these matters get sorted out and further addressed by the EPA, Congress, the States, [and] the business community.

Conference Report 106-988 contains the mandate for the NAS study and for economic assessments:

The conferees direct EPA to contract expeditiously with the National Academy of Sciences (NAS) for a review of the quality of science used to develop and implement TMDLs and direct that the final report be submitted to Congress by June 1, 2001. Further, EPA is directed to conduct a comprehensive assessment of the potential State resources which will be required for the development and implementation of TMDLs and present the results of the study to Congress within 120 days of enactment of this Act. In conducting this cost assessment, EPA must, in addition to direction included in Senate Report 106-410, provide an estimate of the annual costs to the regulated community in both the private and public sectors; address concerns regarding the economic analysis performed by the Administrator on regulatory changes to the

TMDL program that were identified by the Comptroller General in a June 21, 2000, report; and estimate the costs to small businesses that would result from regulatory changes to the TMDL program. In conducting these analyses, the Administrator shall solicit comment from the Comptroller General, each State, and the public regarding the Agency's assessment.

In addition, the conferees direct the Agency to prepare an analysis of the monitoring data needed for development and implementation of TMDLs and further direct . . . EPA Regions and EPA Headquarters not to impose or mandate new TMDL-related requirements or issue new guidance relative to new TMDL-related permits prior to the date the TMDL rule can be implemented under current law.

Senate Report 106-410 contains the same requirements, with additional detail:

The Committee is very troubled with EPA's TMDL water quality rules addressing impaired waters under section 303(d) of the Clean Water Act. The regulations are inconsistent with the Clean Water Act, inflexible and prescriptive, and have enormous cost implications for the States and the private sector. Moreover, there are serious gaps in data, research, and monitoring to meet the requirements EPA has set forth. Therefore, the Committee is very distressed with the administration's decision to thwart congressional intent in finalizing this flawed rule. The Committee expects the following TMDL studies to be initiated promptly.

NAS Study of TMDLs .--The Committee directs EPA to contract expeditiously with the National Academy of Sciences for a review of the quality of science used to

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develop and implement TMDLs. The study will evaluate the information required to identify sources of pollutant loadings and their respective contributions to water quality impairment; the information required to allocate reductions in pollutant loadings among sources; whether such information is available for use by States; whether such information, if available, is reliable; and if such information is not available or is not reliable, what methodologies should be used to obtain such information. The final report shall include recommendations for improving the methodologies evaluated under the study and shall be submitted to the Congress by June 1, 2001.

TMDLs Cost Assessment. --*To obtain better cost information, the Committee directs EPA to conduct a comprehensive assessment of the potential State resources which will be required for the development and implementation of TMDLs and present the results of this study to Congress within 120 days of enactment of this Act.*

TMDL Monitoring Data. --*In addition, the Committee directs EPA to prepare an analysis of the monitoring data needed for development and implementation of TMDLs. Such analysis shall include an estimate of the cost of collecting the monitoring data. In conducting the analysis, the Administrator shall solicit comments from each State regarding the Agency's analysis and estimate.*

NAS staff have already met with EPA and congressional staff to plan the TMDL study. It will be conducted in two phases. The first phase will assess data availability and quality and will be carried out by a small committee of experts drawn from the fields of statistics and water quality modeling and monitoring and who are familiar with TMDL programs at the state level in different geographic regions of the country.

Appointed to the committee are: Chris Yoder, Ohio EPA; Jan Mandrup-Poulsen, Florida DEP; Dick Smith, USGS; James Karr, University of Washington; Vladimir Novotny, Marquette University; and Tony Donigian, a consultant. This committee will be chaired by WRRI Director Kenneth H. Reckhow. Reckhow coordinates the Neuse River Modeling and Monitoring Program, which is supporting development of the nitrogen TMDL for the Neuse River Estuary.

During phase 1, the committee will host two information-gathering workshops. The first is scheduled for Jan 24-26 in Washington, DC. Two days will be devoted to presentations from TMDL program experts at the state and federal levels, the study sponsors, and other interested stakeholders. The third day will be closed. The second workshop is scheduled for March 8-10 and will probably also be held in Washington, DC. The report for this phase of the study is due to Congress by June 1, 2001.

Anticipating that nonpoint sources of pollution are the greatest obstacle to developing and implementing TMDLs, the second phase of the project will evaluate the scientific methodologies currently being used by states to identify impaired waters and develop and implement TMDLs. The second phase will be conducted by an expanded committee of approximately 15 members whose expertise will include hydrology, atmospheric science, ecology, botany, water quality, agricultural and environmental engineering, water and watershed management, resource economics, environmental law, and public participation. During the second phase, the committee will meet approximately six times. Meetings will include site visits to areas implementing BMPs for control of nonpoint sources of pollution. Phase two will be conducted from September 1, 2001, through September 30, 2002.

To provide public information about the project, NAS may post on its website (www.national-academies.org), notices of meetings open to the public, committee appointments, project description and report information.

Budget woes halt audit of state water programs

In November, State Auditor Ralph Campbell, Jr. described for the General Assembly's Environmental Review Commission a study that he had initiated of water resource issues and their impact on public health and the environment in North Carolina. A month later, Campbell had to halt the study because of state budget problems.

Campbell had announced the "Water Resources Study" in June at an ecology and public health conference in Chapel Hill. He said the audit was the result of growing concern across the state about population growth, aquifer decline in the Coastal Plain, stormwater issues, erosion and sediment control issues, demand for water and wastewater services, and the effects of large animal and agricultural operations. A primary objective of the audit, Campbell said, was to assess the State's efforts in planning for protection of its water resources and the effectiveness of its programs. Organization and management structure as well as funding sources and budget management would also be studied.

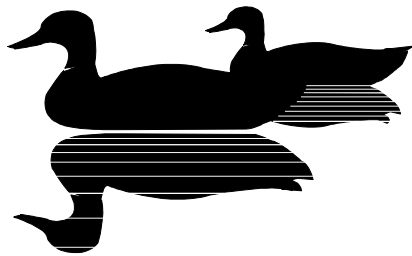
The broad-based study would be conducted in two phases over two years, and would initially receive \$650,000 in funding from the Office of State Auditor's (OSA) budget for consulting, Campbell said. He told the ERC that he hoped the General Assembly would provide input on water resource concerns for the study and, if needed, would provide additional funding for expanding the scope.

In December, however, Campbell notified the state departments involved in the study (Environment and Natural Resources and Health and Human Services) that the audit had been put on hold. According to OSA's Spencer Phillips, that office—like other state agencies—has been required to revert

continued next page

funds to help balance the state budget, and a large part of what OSA will revert is the consulting funds that would have gone for the water resources study.

Phillips said that OSA had finished a round of interviews with state officials designed to identify the initial scope of the study. But, he said, that is as far as the study will go for the time being. He said the study might be resumed in the future, but he could not say when.



The 8th International Waterfowl and Wetlands Symposium

The Waterfowl Legacy: Links to Watershed Health

July 20 through 22, 2001
Hyatt Regency Washington on
Capitol Hill
Washington D. C.

Experts from around the world will gather at the symposium to share their research findings and their opinions on a range of issues affecting waterfowl, wetlands, and their management. Session topics include Watershed Health and Waterfowl, North American Waterfowl Management Plan Checkup, The Future of Waterfowl, and Beyond North America. Join in the discussion of the important issues facing the management and protection of these valuable resources.

Sponsored by Ducks Unlimited.

For more information, contact Brenda Carlson, Ducks Unlimited, One Waterfowl Way, Memphis, Tennessee 38120, (901) 758-3707, bcarlson@ducks.org or visit http://www.ducks.org/conservation/symposium_2001.asp.

Important Correction Withdrawals in Central Coastal Plain aquifers exceed safe yield

In the article "Central Coastal Plain capacity use rules delayed" (*WRR I News* Nov/Dec 2000), the statement that "demand will soon begin to exceed the safe yield of the [Black Creek and Upper Cape Fear] aquifers, in some areas as early as 2005" is inaccurate.

Dr. Ralph Heath, former U.S. Geological Survey N.C. District Chief, called to point out "we began to exceed the safe yield of these aquifers probably shortly after World War II."

Nat Wilson with the N.C. Division of Water Resources agrees that withdrawals from the Black Creek and Upper Cape Fear are already exceeding recharge, or safe yield.

The inaccurate statement in our newsletter was based on a 1998 graph from the Division of Water Resources showing demand projected by local water supply plans for systems using the Central Coastal Plain aquifers exceeding the 1992 "12-hour yield" in 2005. The "12-hour yield" is a regulatory measure used by the Division of Environmental

Health, which requires water supply systems to be able to meet their demand with 12 hours of pumping capacity. The demand represented by the 1998 graph does not include agricultural or other uses of the aquifers.

Moreover, according to Nat Wilson, work done independently by the Division of Water Resources and Dr. Richard Spruill and Dr. Heath document a much lower recharge rate than the one used in computing the 1998 graph. In 1998, the recharge rate was thought to be about 90 million gallons per day. Later work showed that the recharge rate is about 25% of that.

"It is very important that we get the correct information in front of people," said Dr. Heath. "The situation in the Central Coastal Plain is critical."

Nat Wilson said that the new Central Coastal Plain Capacity Use rules (see article on EMC action) reflect the need to reduce the use of the Black Creek and Upper Cape Fear aquifers by 75% of over a 16-year period

Transitions

As new administrations settle into place in Washington and Raleigh, current officials move into new positions and new officials arrive. Following are some changes:

Raleigh:

Bill Holman, formerly Secretary of Environment and Natural Resources (DENR) in the Hunt Administration, has become Executive Director of the N.C. Clean Water Management Trust Fund (CWMTF). Established by the General Assembly, CWMTF allocates about \$30 million per year in grants to local government, state agencies and conservation nonprofits to help finance projects that address water pollution problems.

With Holman scheduled to take over CWMTF on Jan 8 and no new secretary named for DENR, Governor Mike Easley appointed Deputy Secretary **Sherri Evans Stanton** acting secretary. She is the first woman to lead the department. At press time, the new DENR secretary had still not been named.

Washington:

President George W. Bush has named **Christine Todd Whitman**, former governor of New Jersey, to be EPA Administrator and **Gale Norton**, former attorney general of Colorado, to be Secretary of the Interior. Both must be confirmed by the Senate.

2,000 underground storage tanks still not upgraded, still not permanently closed

by Kendall Jones, WRR I Intern

In 1984, in recognition of the threat of groundwater contamination by leaking Underground Storage Tanks (UST's), the United States Congress added Subtitle I to the Resource Conservation and Recovery Act (RCRA). The new subtitle ordered the Environmental Protection Agency (EPA) to develop a new program to regulate UST's storing hazardous chemical materials such as petroleum. This led to the EPA setting up regulations regarding, among other things, leak detection and spill and overfill protection.

UST's regulated by the EPA include all tanks that are greater than 110 gallons in capacity and have 10% or more of their volume including piping underground. Regulations, however, exclude all farm and residential tanks that hold 1,100 gallons or less of motor fuel that is used for noncommercial purposes.

The EPA set up a deadline (December 22, 1998) for all regulated UST's that were installed before December 1988 to either be upgraded to the new standards, temporarily closed until they can be upgraded, or permanently closed. In order to permanently close a UST it must be emptied and either removed or left in the ground and filled with a non-hazardous chemical. New tanks installed after December 1988 were to already meet the new regulations for leak detection and spill and overfill protection upon installation. The deadline set in 1988 gave the owners and operators of existing UST's until December 22, 1998, to upgrade or close their tanks. If owners or operators decided to temporarily close their USTs, then they had exactly 12 months to either upgrade or permanently close the tanks. This essentially set up another deadline of December 22, 1999, to have the tanks upgraded or permanently closed.

Since 1988, the EPA has been gathering information on UST's provided

by state and local UST programs. These reports are collectively referred to as Corrective Action Measures and were originally collected quarterly and have been collected semi-annually since 1996. The information collected includes the number of active tanks, total number of closed tanks, total number of confirmed releases, and total number of emergency releases. All of the numbers in the report are cumulative and each time a number is added to a category it remains there forever. This is true in all cases except for the number of active tanks, which includes only tanks active at the time of the report. The most recent report is from the mid-year report for the 2000 fiscal year and is current as of March 31, 2000. It reports that there are 32,382 active tanks and 58,530 closed tanks in North Carolina. There have been 21,848 total confirmed releases from regulated UST's in North Carolina making it the 4th highest in the country. Of the 20,398 total cleanups initiated in North Carolina, only 14,390 have been completed. The total number of emergency responses, sites where emergency action is taken to mitigate imminent threats to human health and the environment by an UST system was 349, making North Carolina 6th highest in emergency responses in the nation.

The EPA delegated authority to states requesting permission to oversee regulation of UST's and implement their own plans to ensure that all regulated UST's were taken care of by the December 22, 1998, deadline. In North Carolina, regulation and compliance of UST's is the responsibility of the Underground Storage Tanks Section of the North Carolina Division of Waste Management. The N.C. Division of Waste Management is governed by the North Carolina Department of Environmental and Natural Resources (NCDENR). The N.C. UST Section is responsible for a number

of various jobs. Not only do they issue permits, collect fees, and handle requests for information on regulated and commercial UST's, they also ensure compliance with all federal and state laws, rules, regulations, and policies. In addition to this, they oversee all permanent closures of UST's and cleanups of releases from UST's in North Carolina.

According to information provided by Ruth Strauss, Compliance Branch Head for the N.C. UST Section, and Janet Hardy, a hydrogeologist with the Compliance Branch, most UST owners and operators had upgraded or closed their tanks by the December 22, 1998, deadline. At this time, there are 32,218 active regulated UST's in North Carolina. Of these, 453 are owned by the State of North Carolina.

Although the N.C. UST Section didn't keep track of tanks that were permanently closed due to the 1998 deadline, there were a total of 2,494 tanks permanently closed in 1998 and a total of 1,218 tanks permanently closed in 1999. These UST's were most likely closed because the owners either couldn't afford or didn't want to upgrade their tanks to meet the new regulations. Since not all owners of UST's notified the N.C. UST Section of upgrades, the UST database did not reflect the number of UST's that were upgraded by the December 22, 1998, deadline.

Based on their most current databases, there are currently 30,218 regulated UST's that have been fully upgraded and 2,000 regulated UST's that are temporarily closed because they have not been fully upgraded to meet the regulations. All 2,000 substandard temporarily closed tanks are privately owned. Operating permits are not issued to owners and operators of non-upgraded UST systems.

According to Ruth Strauss, the reason that these tanks are still temporarily closed is because ownership of these tanks is uncertain. In trying to track down the responsible party, the N.C. UST Section has found that in most cases the owner is financially unable to

continued next page

proceed with cleanup or is deceased, or that ownership has changed hands and the new owners haven't been identified. Most of these temporarily closed tanks are gas stations and corner stores that have gone out of business. Some of the tanks that are currently temporarily closed have been that way since 1990.

The risk from having tanks temporarily closed for a long period of time is minimal. There have been few confirmed releases from any of the 2,000 tanks that are currently temporarily closed. Like any UST there is the risk of contamination to drinking water that is caused when a tank leaks. Since most of the temporarily closed UST's are empty and no products are being constantly added and removed, the risk of contamination is less than that posed by active operating UST's.

The main goal of the N.C. UST Section regarding temporarily closed tanks is to identify the responsible party and have that party permanently close or upgrade the tanks. Once they have been able to get these 2,000 temporarily closed tanks down to a smaller core number they will begin to use money from the state trust fund to permanently close the remaining tanks. These will be prioritized based on risk to human health and the environment.

The Field Operations of the N.C. UST Section is responsible for general compliance inspections and pursuing enforcement as necessary. An operating permit will not be issued to any UST that contains facilities with non-upgraded UST's. There have been a total of 17 penalties issued totaling \$64,711.85 in fines since the December 22, 1998, deadline. Fines are issued for failing to comply with the leak detection, corrosion protection, and spill and overfill regulations as well as for failing to assess and clean up environmental contamination. Fines, however, are not given to owners or operators for merely reporting a leak to the N.C. UST Section.

December action of the N.C. Environmental Management Commission

At its regular meeting on December 14, 2000, the North Carolina Environmental Management Commission (EMC) took the following action:

- Approved permanent rules to delineate and establish the Central Coastal Plain Capacity Use Area. The rules had been scheduled for presentation to the EMC in October but were delayed to allow time for additional "fine-tuning." The final rules dropped requirements that water use from Cretaceous aquifers in the western portions of Duplin, Wayne, Wilson and Edgecombe counties not be increased and dropped reduction requirements for wells exclusively screened or open to the Pee Dee Aquifer. In addition, provisions were added to exempt particular wells from reduction requirements provided that documentation shows groundwater levels in a well do not decline as regional groundwater levels decline, and to allow for direct submission of water use information by agricultural users to the N.C. Department of Agriculture and Consumer Services. Other changes were also made. The Hearing Officers Report on these rules, including the final rules, is available on the N.C. Division of Water Resources website at: <http://www.dwr.ehnr.state.nc.us/hms/gwbranch/HOR/HORwebpage.htm>

- Approved holding public hearings on the Interbasin Transfer (IBT) Certificate petition for RTP South and the Towns of Cary, Apex, and Morrisville and round two allocations from Jordan Lake. This item had also been deferred from October. Instead of making recommendations on conditions of the IBT Certificate (as reported in the Oct/Nov 2000 *WRRRI News*), the Water Allocation Committee recommended taking public comment on options for the IBT and conditions for the certifi-

cate. Public hearings have been scheduled as follows:

March 5

Groundfloor Hearing Room, Archdale Building, Raleigh

(A question and answer session is scheduled from 4-5 pm and the public hearing from 5-7 pm.)

March 6

Fayetteville State University Memorial Auditorium, Fayetteville, NC

(A question and answer session is scheduled from 4-5 pm and the public hearing from 5-7 pm.)

The public hearing announcement detailing the options and possible IBT certificate conditions can be found at the Division of Water Resources' website: <http://www.ncwater.org>. Look under Interbasin Transfer or Jordan Lake Allocation.

- Adopted amendments to air quality rules on excess emissions reporting and malfunctions and acid rain permitting applicability to satisfy objections of the Rules Review Commission.
- Approved award of State high-unit cost grants and revolving loans for wastewater treatment facilities.
- Approved the 2001 Federal/State Revolving Fund (for wastewater systems) priority list and intended use plan.
- Rejected a request to adopt a procedure for evaluating tax certification requests for animal waste management systems. State law exempts from local taxes real and personal property that is used exclusively for waste disposal or to abate, reduce, or prevent pollution of

the air or water. The Department of Environment and Natural Resources must furnish a certificate to the tax supervisor of the county in which the property is located in order for the property to qualify for the exclusion. The Division of Water Quality (DWQ) has received its first formal request for tax certification of waste management facilities at a swine facility. DWQ asked the EMC for permission to certify open air anaerobic lagoons or other systems for the tax exclusions once compliance with EMC requirements has been evaluated. The EMC declined to give DWQ the authority it sought and referred the issue to its Air Quality, Groundwater, and Water Quality Committees.

■ Approved a plan for rulemaking to establish riparian buffer requirements for the Catawba River Basin. The plan was arrived at through extensive stakeholder negotiations involving the Upper Catawba Advisory Committee and Lower Catawba Advisory Committee. Under the plan a draft temporary rule aimed at protecting buffers on lakes and the mainstem river will be introduced to the advisory committees in February, then brought to the EMC for approval of public hearings in March or April. After public hearings, the temporary rules will be presented to the EMC for adoption in May. Meanwhile, work will begin on permanent rules for perennial and intermittent streams, with the goal of having a draft permanent rule to the EMC in July. For additional information on the Catawba River Basin buffer rules, contact Alan Clark with the Division of Water Quality at (919) 733-5083, Ext 570.

■ Heard from Air Quality Committee chairman Marion Deerhake about a report on mercury delivered to the committee by the State Scientific Advisory Board on Toxic Air Pollutants. The report says that while most North Carolinians are not at risk for adverse effects of exposure to methylmercury (through fish consumption),

December action of the EMC Water Quality Committee

At its regular meeting on December 13, 2000, the EMC Water Quality Committee took the following action:

■ Gave staff of the Division of Water Quality permission to take the draft

EMC action *continued*

exposure data from southeastern North Carolina include some of the highest levels documented in the United States. The report says that "steps should be taken to reduce the impact of mercury emissions on North Carolina's waterways and to heighten awareness of safe fish consumption habits." [EPA announced in December that it will propose rules to reduce mercury emissions from coal-fired power plants. For information on mercury emissions and mercury exposure in North Carolina see the Division of Air Quality website: <http://daq.state.nc.us/News/mercury/>]

■ Heard from the Division of Water Quality that it has not filed with the Office of Administrative Hearings (OAH) the temporary rule reclassifying to HQW the headwaters of the Green River and its tributaries. Planning Branch Supervisor Boyd Devane told the EMC that OAH had advised that there was no basis for imposing a temporary rule, which meant that the rule would have been rejected by the Rules Review Commission. OAH suggested asking the Governor to issue an Executive Order to put the rule into place, but, Devane said, the golf course development that had been deemed a threat to water quality of the Green River was on hold because the developer is facing difficulties. Therefore, he said, it is questionable whether the Green River now faces a "serious and unforeseen threat," as required for a temporary rule.

Roanoke River Basinwide Water Quality Plan to public meeting. Public meetings are planned for February 21 in Roxboro, February 22 in Eden, and February 27 in Windsor and Weldon. For additional information visit the Basinwide Planning Program website: <http://h2o.enr.state.nc.us/basinwide/index.html> or contact Callie Dobson at (919) 733-5083 Ext 583.

■ Approved local stormwater plans under the Neuse River Nutrient Sensitive Waters rules for Wayne County, Johnston County, the Town of Goldsboro, and the Town of Garner. According to staff of DWQ, Wayne County will apply its stormwater program throughout the county even though part is in the Cape Fear River Basin, and the Town of Garner will offer land banking as a way of offsetting nitrogen loading.

■ Approved Water Supply Watershed Protection Ordinances for Hickory, High Point, Kernersville, Stem and Youngsville. Kernersville's revised ordinance complies with the Randleman Reservoir watershed protection rules. High Point submitted an alternative management plan as allowed under the Randleman Reservoir watershed protection rules. Hickory submitted an ordinance amendment for implementing density averaging.

■ Approved stormwater management plans for nine local governments affected by the Randleman Reservoir watershed protection rules: Archdale, Greensboro, High Point, Jamestown, Kernersville, Randleman, and Forsyth County, Guilford County, and Randolph County.

Turbidity standard still under a cloud, but narrowness of EMC decision should be noted

In December the N.C. Environmental Management Commission's Water Quality Committee discussed a request from the Department of Environment and Natural Resources (DENR) for clarification of the EMC's intent concerning enforcement of the turbidity standard. (The Water Quality Committee must first hear items for the EMC's consideration and make recommendations for action when the items are presented to the EMC.)

The DENR staff request was occasioned by the EMC's decision in October agreeing with an Administrative Law Judge who ruled that DENR had erroneously interpreted the state's turbidity rule in a manner that allows water quality standards to be violated so long as sedimentation control BMPs are being followed (see *WRR I News* Nov/Dec 2000).

The decision came in an administrative case in which sedimentation from a construction site caused damage to a downstream lake. The case was a challenge to issuance of a 401 Water Quality Certificate for the construction project, which is supposed to certify that the activity will not contravene state water quality standards.

When the EMC makes decisions on administrative challenges it is acting in its quasi-judicial capacity, and the implications of its decisions, like decisions by judges, may not be immediately clear and may therefore be open to interpretation.

Assistant Secretary for Environmental Protection Robin Smith told the committee that the department needs to understand the EMC's intent in making its decision on the case challenging application of the turbidity standard so that it can apply the standard consistently in similar cases. Smith said the staff needs to know how to write its water quality certifications and similar documents in such a way that they can

withstand legal challenges. She asked whether the department should request rulemaking to remove or refine some language in the current standard or to create some linkage between BMPs and the standard.

Boyd Devane, Supervisor of DWQ's Planning Branch, reviewed the history of the state's turbidity standard. He told the committee that linking the turbidity standard to the requirement for erosion and sediment control BMPs had been a strategy to encourage BMP implementation.

"Although recent legislation has brought some improvement by allowing a one-time fine, a major weakness of the Sedimentation Pollution Control Act is that time must be given to bring projects into compliance. In the meantime, sediment keeps going into streams and the damage is done."

The committee also heard presentations by various divisions within DENR which are responsible for implementing nonpoint source programs that would be affected by changes in application of the turbidity standard.

Mell Nevils, Chief of the Land Quality Section of the Division of Land Resources, told the committee that "ninety percent of construction sites cannot meet the [numerical] turbidity standard and it would be economically prohibitive for them to do so."

Moreland Gueth, staff forester for water quality and wetlands with the N.C. Division of Forest Resources, told the committee that if the numerical standard for turbidity were strictly enforced ninety percent of the forest owners in the state could not harvest their stands because they would have to construct stream crossings that would cause turbidity above the standard, even with BMPs.

Following Gueth's presentation, Commissioner Dan Besse attempted to soothe concerns by pointing out that state law provides that if forestry operations are in compliance with Forest Practices

Guidelines (FPG), sites are not inspected by either Land Quality (erosion and sedimentation control program) or the Division of Water Quality, and that enforcement action resulting from Division of Forest Resources referral to Land Quality for violation of FPG are extremely rare. He pointed out that the EMC cannot change the law regarding forestry operations.

In discussion following the presentations, EMC Chairman David Moreau said, "What the EMC said in its decision was that *that* particular situation was an unacceptable outcome of our rules. It seems to me what we reacted to was downstream damage that was state sanctioned. It seems clear that it's not possible to meet the [numeric turbidity] standard instantaneously. However, it's not acceptable to have state-sanctioned damage downstream that can go on for some time.

"I'm not sure how to fashion a remedy," Moreau said. "We may need to separate the issues of sediment and turbidity."

In the end, staff got no immediate help from the EMC on application of the turbidity standard. The committee voted to ask the staff to study the specific concerns raised by the decision and to come back with a report, including how other states are dealing with the turbidity issue, and recommendations on how to address the circumstances that brought about the EMC decision.

Following the committee meeting, Commissioner Dan Besse warned against "sky is falling" assumptions about implications of the EMC's decision and recommended that agency personnel and regulated communities remember that the decision applies narrowly to one particular set of circumstances.

N.C. Sedimentation Control Commission to establish technical committees

At the November 2000 meeting of the North Carolina Sedimentation Control Commission, a committee was formed to study and make recommendations regarding implementation of requirements under the Sedimentation Pollution Control Act for "buffer zones" along "watercourses." Chairman Kenneth H. Reckhow also announced that he will appoint two technical subcommittees to examine the issues of turbidity and enhanced erosion and sediment control in Nutrient Sensitive Waters. For information contact the N.C. Land Quality Section at (919) 733-4574.

*The Water Resources Research Institute
of The University of North Carolina
Annual Conference*

WATERSHEDS TO ESTUARIES: BASIN MANAGEMENT IN THE 21ST CENTURY

March 29, 2001

Jane S. McKimmon Center
N.C. State Univ., Raleigh, NC

WRRRI's Annual Conference provides an opportunity for university, agency, and private sector scientists and resource managers in North Carolina to share the results of their water research and management initiatives with each other and the interested public. This year 48 oral presentations will be made and more than 25 technical posters will be displayed. The focus of this year's conference is basinwide water quality management, although a wide range of topics will be explored in the presentations.

The conference agenda
and registration information
are online at

<http://www2.ncsu.edu/ncsu/CIL/WRRRI/2001conference.html>
or call WRRRI at (919) 515-2815.

Legislation passed by 106th Congress

Following is some environmental legislation passed by the 106th Congress. This list is not comprehensive.

H.R. 999 (PL 106-284) The Beaches Environmental Assessment and Coastal Health Act of 2000. Provides that states shall adopt and submit to EPA water quality criteria and standards for coastal recreational waters for pathogens and pathogen indicators for which EPA has published criteria. If a state does not adopt such criteria and standards, EPA shall propose them for the state. EPA is to publish performance criteria for monitoring and assessment of coastal recreation waters and for notification of the public, local governments, and EPA of exceedances of standards for pathogens and pathogen indicators. EPA is directed to conduct studies on potential human health risks from exposure to pathogens in coastal recreation waters, appropriate indicators of pathogens and detection methods, and guidance for states on use of criteria for pathogens and pathogen indicators accounting for diversity of geographic and aquatic conditions. EPA is to publish new or revised water quality criteria for pathogens and indicators based on results of studies. Provides for grants to states and local governments to implement monitoring and notifications programs. Spells out required content of state and local government programs. Authorizes \$30 million a year for 2001 through 2005 for program.

S 835 (PL 106-457) The Estuaries and Clean Water Act of 2000. Establishes an estuary habitat restoration program under the Secretary of the Army. Establishes the Estuary Habitat Restoration Council (federal agency heads) to develop habitat restoration strategy and to solicit, review and evaluate habitat restoration project proposals. Provides for public review of estuary habitat restoration strategy to be developed by Council. Provides that NGOs may serve as non-Federal interest for projects. Sets a goal of restoring 1 million acres of estuary habitat by 2010. Authorizes \$40 million for 2001, \$50 million for 2002 and 2003, \$60 million for 2004, and \$75 million for 2005 for projects. Provides additional authorizations for acquiring monitoring data on projects. Mandates identification and mapping of dredged material that could be used in restoration projects. Mandates EPA study of bioremediation technologies related to estuarine pollutants. Includes provisions for Chesapeake Bay Restoration, Long Island Sound Restoration, and Lake Pontchartrain Basin Restoration. Authorizes appropriations for the National Estuary Program and adds Lake Pontchartrain Basin in Louisiana and Mississippi and Peconic Bay, New York, to program. Authorizes EPA to establish a pilot program to make grants to States and others for alternative water source projects to meet critical water supply needs. Authorizes \$75 million for 2002-2005 for alternative water supply projects. Authorizes grants to states for the Clean Lakes Program. Includes provisions for Tijuana River Valley Estuary and Beach Cleanup.

H.R. 4577 (PL 106-554) Labor, Health and Human Services and Education appropriations act. **Section 221 of this legislation provides for grants to states, municipalities or municipal entities for control of sewer overflows.** In selecting municipalities or municipal entities for grants, priority will be given to "financially distressed" communities that are implementing specified minimum controls. Authorizes \$750 million for 2002 and 2003 for program and directs how amounts will be allocated among states and municipalities.

H.R. 4788 (PL 106-472) Grain Standards and Warehouse Improvement Act of 2000. **Section 313 of this act amends the Watershed Protection and Flood Prevention Act** to provide for cost share and technical assistance for rehabilitation of dams constructed by local entities under small watershed programs of the USDA Natural Resources Conservation Service. Authorizes appropriations.

Study implicates fertilizer runoff in amphibian decline

Researchers have found that nitrate and nitrite concentrations well below drinking water standards can cause significant mortality rates among some frog and salamander larvae.

A researcher at Oregon State University and colleagues placed larvae of the Oregon spotted frog, red-legged frog, Western toad, Pacific treefrog, and Northwestern salamander in water with varying concentrations of nitrate and nitrite. (Control groups were maintained in purified water.) The researchers report significant differences in sensitivity to nitrate among species, with the Oregon spotted frog and northwestern salamander showing the most effects. The recommended level of nitrate for warmwater fishes (90 mg/L) was found to be four times higher than the 15-day LC_{50} for the Oregon spotted frog, now rare in Oregon and Washington.

The researchers report that nitrite levels as low as 2 milligrams per liter killed half of the amphibian larvae after 15 days of exposure. The 15-day LC_{50} for nitrite for all species was below the level recommended for warmwater fishes (5 mg/L).

The researchers speculate that runoff of nitrogen-based fertilizers could contribute to the decline of the Oregon spotted frog and other sensitive amphibians. The U.S. Geological Survey has found that nitrate levels in 15 percent of groundwaters sampled and in some streams in agricultural areas exceed the drinking water standards (10 mg/L).

The study, "Sensitivity to Nitrate and Nitrite in Pond-breeding Amphibians from the Pacific Northwest USA," can be found in the online version of *Environmental Toxicology and Chemistry* Vol 18 No 12 at <http://www.setac.org>.

Storms of '99 could signal effects of climate change on Pamlico Sound

Following record rainfall along the N.C. coast caused by three sequential hurricanes (Dennis, Floyd and Irene) in fall of 1999, scientists began analyzing the impacts of the intense freshwater inputs to Pamlico Sound and speculating about the ecological consequences. The results of these analyses have been published in *Eos Transactions, American Geophysical Union* 81(40): 457-462. ("Hurricanes' hydrological, ecological effects linger in major US estuary" by H.W. Paerl, J.D. Bales, L.W. Ausley, C.P. Buzzelli, L.B. Crowder, L.A. Eby, M. Go, B.L. Peierls, T.L. Richardson and J.S. Ramus)

Scientists at the UNC-CH Institute of Marine Sciences, U.S. Geological Survey, N.C. Division of Water Quality, and Duke University Marine Lab found that after the three storms passed over the Pamlico Sound watershed, nutrient-laden floodwaters displaced 83% of the volume of Pamlico Sound. During the same time period under normal circumstances, freshwater inflow would displace about 13% of the Sound's volume. During September of 1999, water residence time for the Pamlico and Neuse river estuaries was about 7 days, compared to about 70 days under normal conditions.

By late September, the Pamlico and Neuse estuaries, which normally have salinities of 10-13 psu, were entirely fresh. Surface salinity in Pamlico Sound, which is normally 15-20 psu in September, declined to about 8.9 psu.

From mid-September to mid-October, dissolved inorganic nitrogen loading to the Neuse Estuary was over 800 metric tons, which is more than 70% of an average year's loading. Total nitrogen loading to the Neuse Estuary was more than double the loading to the Pamlico, despite higher flows in the Tar-Pamlico River Basin.

All the external dissolved inorganic nitrogen enrichment stimulated phytoplankton growth in the system. Phytoplankton biomass, measured as chloro-

phyll *a*, increased three- to five-fold. Elevated phytoplankton growth was still evident in mid-2000.

As floodwaters from Dennis and Floyd reached Pamlico Sound in late September, unusually strong vertical stratification, increased phytoplankton production, and organic matter enrichment depressed dissolved oxygen (to less than 2 mg/L) in bottom water. The stratification and hypoxia lasted until mid-October, when winds and rain from Irene stirred up waters. Between Floyd and Irene, many dead or dying blue crab and shrimp were collected from the oxygen-depleted portion of the Sound. Following Irene, trawls caught more finfish and live crabs, but significant percentages of fish had sores or sloughing skin and a high percentage showed signs of systemic bacterial infections.

Because Pamlico Sound is relatively shallow and slowly flushed, scientists think that most of the internal and external loading of nutrients and organic material will be deposited in the sediments. They expect that this sediment enrichment will increase rates of oxygen consumption and release of inorganic nutrients. Increased release of nutrients could sustain elevated phytoplankton production possibly into 2001. They say that measured rates of denitrification in the system promise only a small amount of nitrogen removal by this mechanism.

The authors say that the hurricanes of 1999 could provide a glimpse of the effects of future climate on the Pamlico Sound system. Weather experts have predicted more tropical storm and hurricane activity over the next few decades. Given what has been observed after the hurricanes of 1999, it is reasonable to speculate that an increase in intense meteorological events would seriously disrupt ecosystems critical for fishery resources, economic development, and habitability of the coastal zone.

WRRRI reports available

WRRRI has recently published peer-reviewed technical completion reports on research projects for which it provided funding. Single copies of WRRRI 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 WRRRI, Box 7912, North Carolina State University, Raleigh, NC 27695-7912 or call (919) 515-2815 or email: water_resources@ncsu.edu.

Neuse River Estuary Modeling and Monitoring Project Stage 1: Predictions and Uncertainty Analysis of Response to Nutrient Loading Using a Mechanistic Eutrophication Model **Report Number 325-D October 2000**

James D. Bowen and Jeffrey Hieronymus, University of North Carolina at Charlotte

Eutrophication modeling of the Neuse River Estuary was conducted using a modified version of an existing two-dimensional, laterally averaged model (CE-QUAL-W2). The calibrated model was used to predict the water quality improvement in the estuary associated with a 30% reduction in riverine loading of inorganic nutrients. Three cases were examined: 1) reduced inorganic nitrogen, 2) reduced inorganic phosphorus, and 3) reduced inorganic nitrogen and phosphorus. Water quality improvement was quantified by comparing the predicted chlorophyll-*a* and dissolved oxygen concentrations for the nutrient reduction scenarios to a case without nutrient reduction. An uncer-

tainty analysis was also performed to investigate the feasibility of the method and to quantify the uncertainty of model predictions. The uncertainty analysis examined only model specification error, using a regional sensitivity method, for a small subset of the model parameters that were considered to be important to quantifying phytoplankton growth.

Based upon comparison of the three inorganic nutrient reduction scenarios, nitrogen reduction was found to be more effective than phosphorus reduction in producing water quality improvements. For each nutrient reduction scenario, the largest reduction in phytoplankton biomass was predicted to occur in the lower estuary. In this area, a 30 percent reduction in riverine inorganic nitrogen loading decreased median chlorophyll concentrations by 2 - 20%. For the entire estuary, nutrient reduction was predicted to reduce median chlorophyll concentrations by 7 - 11%. The model predicted that dissolved oxygen concentrations would increase only very slightly in response to nutrient reduction, which was considered to be indicative of the important role that sediment processes play in determining water column dissolved oxygen concentrations.

The regional sensitivity analysis approach was found to be a computationally time-consuming method for assessing model specification error, necessitating an initial parameter filtering procedure. The uncertainty analysis also indicated that predictions of changes in median chlorophyll concentration were significantly more certain than predictions of changes in the frequency and intensity of phytoplankton blooms.

The authors say that the two years used to predict water quality improvement (1997-1998) were rather benign with respect to water quality and that the degree to which model predictions of water quality improvement are affected by the relatively short data set is not known. They say further research should be conducted to collect data needed to simulate a wider range of hydrologic and estuarine water quality conditions.

Neuse River Estuary Modeling and Monitoring Project Stage 1: Hydrography and Circulation, Water Column Nutrients and Productivity, Sedimentary Processes and Benthic-Pelagic Coupling, and Benthic Ecology **Report 325-B August 2000**

Richard A. Luettich, Jr., Jesse E. McNinch, Hans Paerl, Charles H. Peterson and John T. Wells, Institute of Marine Sciences, Morehead City, NC

Marc Alperin and Christopher S. Martens, University of North Carolina at Chapel Hill

James L. Pinckney, Texas A&M University

The Neuse River Estuary Modeling and Monitoring (ModMon) project was initiated in 1997 to bring coordinated modeling and observational capabilities to assist with the management question of how to best improve water quality in the Neuse. The primary objectives of the monitoring phase of ModMon have been (1) to build an observational database in the Neuse River Estuary that can support and complement the ongoing water quality/ecosystem modeling in the system and (2) to conduct simple, process-based research that enhances our understanding of the basic behavior of the Neuse River Estuary. This report presents the findings of a closely coordinated program of observational research into the circulation and hydrography, water column nutrients and productivity, sediment characteristics, sediment-water column coupling and benthic ecology in the Neuse. One of the principal products of this research is the database contained on the supplemental CD-ROM (available on request) that consists of from 18-24 months of data that will be the basis for ongoing and future modeling and analysis efforts in the Neuse River Estuary.

A few of the findings of this research are:

■ Longitudinal water exchange in the Neuse River Estuary is principally driven by fresh water discharge and low frequency meteorological forcing of the lower Neuse and Pamlico Sound. Winds blowing toward the northeast move water out of the Neuse into Pamlico Sound, and winds blowing toward the southwest move water into the Neuse from Pamlico Sound. Significant change in water level can occur quickly (hours) in response to rapid wind shifts. Astronomical tidal constituents are minimal in the Neuse. Standing-wave-like sloshing in the diurnal and higher frequency range constitutes the majority of the longitudinal velocity signal but is relatively ineffective at displacing significant volumes of water.

■ Oxygen uptake in the sediments and water column are of comparable magnitude. In concert, benthic and pelagic respiration are capable of fully depleting the O_2 pool in stratified bottom water in less than 5 days. However, the "lifetime" of the sediment O_2 demand (about 2.6 years) greatly exceeds that of the water column (about 5 days), so that the benthic flux will control how the estuary responds to a long-term reduction in eutrophication.

■ In the section of the Neuse upstream of Cherry Point, upwelling of near bottom water along the shorelines is a common and highly transient phenomenon. Winds in the prevailing northeast-southwest directions drive surface water against the downwind shoreline and cause upwelling of bottom water against the upwind shoreline. If upwelling occurs following a period of prolonged stratification, the upwelled water will have low oxygen levels that will likely be harmful to fish. Strong wind events can cause vertical mixing near the centerline of the Neuse yet still generate upwelling at the upwind shore.

■ Neuse River sediments represent vast repositories of nutrients and O_2 demand. The uppermost 2 centimeters

Study finds relationship between impervious surface area and bacterial contamination

A study conducted in five estuarine watersheds in New Hanover and Pender counties, NC, has established a strong correlation between the percentage of impervious surface area in a watershed and mean estuarine fecal coliform abundance.

Michael A. Mallin and Kathleen E. Williams of the UNC-W Center for Marine Science, E. Cartier Esham of the University of Georgia, and R. Patrick Lowe of the New Hanover County Planning Department are authors of an article detailing the study that was published in Vol 10, No 4 of *Ecological Applications* (online at <http://www.esajournals.org/>).

Over a four-year period the researchers analyzed the abundance and distribution of fecal coliform and *E. coli* bacteria at multiple stations in Futch Creek, Pages Creek, Howe Creek, Bradly Creek, Hewletts Creek and Whiskey Creek, which all drain into the Atlantic Intra-coastal Waterway. They also analyzed water samples at each station for temperature, salinity, dissolved oxygen and turbidity and collected samples for analysis of nitrate and orthophosphate.

The New Hanover County Planning Department determined watershed land use and demographics of each watershed.

A random sampling of parcels within each watershed was used to develop impervious surface area ratios, which were checked with digital orthophotography.

The researchers found that fecal coliform abundance correlated significantly with turbidity and highly significantly with nitrate concentration. They say other research has suggested that transport of fecal bacteria via suspended sediments is an important mechanism. They also say other work has provided evidence that nutrient loading can stimulate growth and prolong survival of fecal bacteria indicators.

They found a significant correlation between watershed population and fecal coliform abundance and a highly significant correlation between fecal coliform concentration and percent development of the watershed. However, they found the strongest relationship between percentage watershed impervious surface area and average estuarine fecal coliform abundance.

They suggest shellfish closures and threat to human health can be reduced by land use planning and development that minimizes the use of impervious surface area while maximizing water treatment function of natural areas.

Report 325-B *continued*

of the sediment column contains 86,000 tons of organic carbon and 7,800 tons of nitrogen. This quantity of organic carbon is two orders of magnitude greater than the inventory of O_2 in the bottom water and ten times greater than the total nitrogen content of the entire 3-4 meter water column.

■ The benthic NH_4^+ flux is 3-4 times greater than external loading of particulate and inorganic nitrogen. Sediment uptake of NO_3^- (denitrification) moderates the release of NH_4^+ and provides a net sink for fixed nitrogen at

least at one of the sampling sites examined.

■ Groundwater advection is not a significant source of nutrients to the water column at any of the 8 stations sampled for porewater Cl.

The authors emphasize the need to build a long-term database of critical water quality and ecological parameters to allow the calibration and verification of ecosystem models, to distinguish ecological trends from annual variability, and to fully evaluate the effectiveness of management actions.

Publications

Proceedings: National Conference on Tools for Urban Water Resource Management & Protection (EPA/625/R-00/001) (EPA/625/C-00/001CD-ROM) A major focus of this conference was to provide practical information on the most effective tools and technologies for meeting new NPDES Phase II permit requirements. Program topics were chosen to reflect the Phase II Program's six priorities, including public education, public involvement, detection and elimination of illicit discharges, construction site runoff control, post-construction stormwater management, and pollution prevention for municipal operations. The proceedings include 46 peer-reviewed papers. This is a free publication. Send order to ORD Publications, U.S. Environmental Protection Agency, NCEPI, P.O. Box 42419, Cincinnati, OH 45242. The publication can also be ordered online at <http://www.epa.gov/ttbnrmrl/625/R-99/002.htm>.

The Practice of Watershed Protection. This is a collection of more than 800 pages of the best feature articles and technical notes spanning the past seven years of the Center for Watershed Protection's journal, *Techniques*. It may

be ordered for \$80 from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043. Phone 410-461-8323, <http://www.cwp.org>.

Wildstream: A Natural History of the Free-flowing River. Introduces the fundamentals of stream and river ecology. 600 pages, illustrated. \$22.00 plus \$2.25 shipping. Riparian Press, 2551 Charlotte Street, St. Paul, MN 55113-2808. 1-877-953-7487. <http://www.streamsanddrivers.com>

Websites

The N.C. Division of Water Quality has developed an online **North Carolina Water Quality Research Catalog** to help water quality researchers in the state keep up to date with the work others have in progress and to encourage collaborative research. Researchers are invited to submit a catalog "page" for each work project. Go to website: <http://www.esb.enr.state.nc.us/Catalog/cataloghome.htm>

North Carolina Precipitation/Water Resources

	November	December
Rainfall (+/- average)		
Asheville	4.25" (+0.66")	2.37" (-1.15")
Charlotte	2.75" (-0.48")	1.07" (-2.41")
Greensboro	1.95" (-1.02")	1.14" (-2.22")
Raleigh	2.56" (-0.42")	1.52" (-1.72")
Wilmington	4.71" (+1.60")	1.64" (-1.99")

Streamflow Index Station (County, Basin)	November mean flow (CFS) (% of long-term median)	December mean flow (CFS) (% of long-term median)
Valley River at Tomotla (Cherokee, Hiwassee)	90.6 (68%)	96.1 (42%)
Oconaluftee River at Birdtown (Swain, Tenn)	285 (76%)	333 (64%)
French Broad River at Asheville (Buncombe, FB)	936 (57%)	1,136 (55%)
South Fork New near Jefferson (Ashe, New)	149 (42%)	160 (34%)
Elk Creek at Elkville (Wilkes, Yadkin/Pee-Dee)	22 (35%)	20.3 (23%)
Fisher River near Copeland (Surry, Yadkin/Pee-Dee)	61.1 (44%)	76 (46%)
South Yadkin River near Mocksville (Rowan, Yadkin/PD)	80.3 (34%)	96.2 (30%)
Rocky River near Norwood (Stanly, Yadkin/Pee-Dee)	176 (34%)	216 (19%)
Deep River near Moncure (Lee, Cape Fear)	144 (40%)	251 (23%)
Black River near Tomahawk (Sampson, Cape Fear)	391 (115%)	596 (84%)
Trent River near Trenton (Jones, Neuse)	41.4 (74%)	99.5 (69%)
Lumber River near Boardman (Robeson, Lumber)	607 (78%)	1,021 (84%)
Little Fishing Creek near White Oak (Halifax, Pamlico)	71.5 (117%)	104 (70%)
Potocasi Creek near Union (Hertford, Chowan)	47.1 (126%)	132 (90%)

Groundwater

Index well (Province)	November depth below surface (ft) (departure from average for month)	December depth below surface (ft) (departure from average for month)
Blantyre (Blue Ridge)	39.26 (-5.66)	39.45 (-6.02)
Mocksville (Piedmont)	20.64 (-3.06)	20.68 (-3.57)
Simpson (Coastal Plain)	4.16 (+0.69)	3.74 (+0.12)

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

WRR I wins

"Cares for the Air" contest

The Water Resources Research Institute, located in Jordan Hall on the N.C. State University campus, won the "N.C. State Cares for the Air Contest" sponsored by the N.C. State Transportation office. The contest, held from May through September, aimed to heighten the awareness of the need to use alternative modes of transportation during the months when ozone levels are a problem for the environment. Departments tracked people using vanpooling, carpooling, flex time telecommuting, walking, bicycling and the transit system.

A new EPA website provides **model local ordinances and real-life examples for protecting water resources**. Several of the topic areas are related to the Stormwater Phase II priorities, including erosion and sediment control, stormwater control operation and maintenance, illicit discharges, and post-construction runoff control. Go to website: <http://www.epa.gov/owow/nps/ordinance>.

The **Stormwater Manager's Resource Center** includes features such as a searchable stormwater library, 10 slide shows, a manual builder, an ordinance selector, and more than 50 fact sheets on virtually every topic necessary for a community to implement phase I or II stormwater requirements. Go to website: <http://www.stormwatercenter.net>.

Conferences and workshops

Enigmas of Ground Water in Crystalline Rocks: Problems and Solutions. February 16, 2001, N.C. State University Club, Raleigh, NC. Sponsored by the Carolina Sections of the Association of Engineering Geologists and the American Institute of Professional Geologists. Early Bird Registration by Feb 5, 2001 is \$80.00. After Feb 5, \$95.00. Includes two coffee breaks and lunch. No registration at the door. For information contact Dr. Charles Welby at (919) 787-7477 or cww_ral@hotmail.com.

Improving Public Decision-Making through Participation: Leadership, Governance and Community. March 27, 2001. Hickory Holiday Inn and April 4, 2001 Greenville Hilton

The purpose of this conference is to improve the understanding of and support for collaborative decision-making processes within the public sector in North Carolina by expanding the number and capacity of people from all sectors participating in such processes, encouraging the use of such processes by local governments, raising the status of collaborative decision making within our state's political culture, and showing how to practice collaborative decision making with integrity. For registra-

2000-2001 Water Resources Research Seminar Series

Presentations take place in the Ground Floor Hearing Room of the Archdale Building in downtown Raleigh or in Room 1132 of Jordan Hall on the N.C. State University campus. This schedule is also posted on the WRRRI website, and any changes will be posted there (<http://www2.ncsu.edu/ncsu/CIL/WRRRI/2000seminars.html>). For additional information contact Associate Director Robert Holman at (919) 515-2815 or Robert_Holman@ncsu.edu.

Presentations begin at 3 pm.

Tuesday, January 30, 2001
Jordan Hall
Assessment of the North Carolina Water Reuse Regulations
Assistant Professor Helen Hilger
Department of Civil Engineering
UNC-Charlotte

Tuesday, February 27, 2001
Archdale Building
Effectiveness of Multiple Best Management Practices in Agriculture
Professor Carlyle Franklin
Department of Forestry
N.C. State University

Tuesday, March 27, 2001
Jordan Hall
Assessment of Changing Land-use Practices on Basin Sediment Yields
Professor Jerry Miller
Department of Geosciences
Western Carolina University

Tuesday, April 24, 2001
Archdale Building
A Comparative Analysis of Compact and Low-Density Development
Associate Professor Philip Berke
Department of City and Regional Planning, UNC-Chapel Hill

Tuesday, May 22, 2001
Jordan Hall
Technical and Economic Evaluation of Alternative Animal Waste Management
Professor Michael Overcash
Department of Chemical Engineering
N.C. State University

tion materials and a detailed program go to website <http://www.iog.unc.edu/participation> Sponsored by the Dispute Settlement Center of Orange County, the UNC Institute of Government, N.C. Cooperative Extension Service, and Natural Resources Leadership Institute

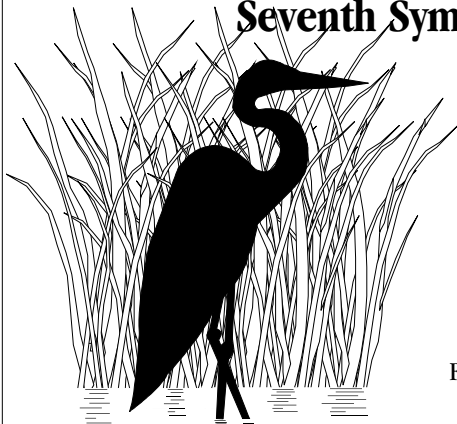
Biosolids 2001: "Building Public Support" February 21-24, Sheraton San Diego Hotel & Marina, San Diego. Sponsored by the Water Environment Federation and others. Details online: <http://www.wef.org/conferences/biosolids2001/opening.jhtml>

TMDL Science Issues Conference. March 4-7, Cervantes Convention Center, Adams' Mark Hotel, St. Louis, Missouri. Sponsored

by Water Environment Federation and Association of State and Interstate Water Pollution Control Administrators. Details online: <http://www.wef.org/conferences/tmdl2001/opening.jhtml>

Participating in the NPDES Permitting Process: A Workshop. February 1-2, Seattle, Washington; April 12-13, Denver, Colorado; June 14-15, Charleston, South Carolina; August 9-10, 2001, Minneapolis, Minnesota; October 25-26, Los Angeles, California. Sponsored by Water Environment Federation and U.S. EPA. This workshop is targeted to permit applicants and permit holders. Details online: http://www.wef.org/Conferences/Workshop_Semin/npdes_course.jhtml

Seventh Symposium on Biogeochemistry of Wetlands



June 17-20, 2001

R. David Thomas Center, Durham, NC

This symposium will emphasize various biogeochemical processes occurring in freshwater and estuarine wetlands and provide numerous opportunities to discuss up-to-date research from around the world. A field trip to a nearby Southeastern wetlands will be optional, beginning Wednesday, June 20, and running through Thursday, June 21.

For program and registration information go to website: http://www.env.duke.edu/wetland/svnth_sym.htm

Sponsored by the Duke University Wetland Center. Co-sponsors: Water Resources Research Institute of The University of North Carolina, N.C. Wetlands Restoration Program, University of Florida, Wetland Biogeochemistry Institute, LSU



2000 - 2001 Luncheon and Forum Schedule

February 5, 2001

April 9, 2001

September 17, 2001

December 3, 2001

Water Reuse

Dam Removals in North Carolina

On-Site Wastewater Issues

Flood Plain Management

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).

Luncheon cost for nonmembers will increase to \$20 January 1, 2001. Join NCWRA and save!. Contact WRRRI.

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