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Angela Morgan joins WRRI as Program Coordinator

by Kelly Porter

Join us in welcoming Angela Morgan to WRRI. Angela came on as Program Coordinator the last part of August. This position was previously held for five years by Julie Mason who is now serving as the Contracts and Grant Specialist for the College of Natural Resources at NC State University.

Angela brings to WRRI over twelve years of administrative experience, which she is already putting to work. She earned a B.A. from Meredith College. Angela most recently worked in the Meredith College Alumnae Office as Departmental Assistant. She provided administrative support to the director and was responsible for event planning, organization, donor relations, and database management. She also brings substantial experience in accounting and word processing.

As the Program Coordinator in WRRI, Angela applies her expertise to administer all aspects of the WRRI program. She maintains the institute schedule for the annual call for proposals, the peer review process, the technical review process, and the report publishing process. The experience of processing proposals as a previous employee at NC State University serves Angela well as she administers the official contract and grant files for WRRI.

Angela provides administrative support to the WRRI director and other staff members. She helps the WRRI staff stay informed of schedules, task priorities, and upcoming event information. Since Angela oversees registration and other logistics of WRRI workshops, conferences and seminars, she is one of the first people you will see if you attend one of these events.

Angela Morgan, WRRI Program Coordinator

WRRI is excited to have Angela as part of its staff. If you would like to welcome her or have questions for her, she may be reached at angela_morgan@ncsu.edu or 919-515-2815.

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Director's Forum

Water Resource Challenges in the North Carolina Mountains

Gregory D. Jennings, Interim Director, Water Resources Research Institute

North Carolina citizens and policymakers have been quick to learn from extreme water resource challenges in the past decade. Following recent drought conditions, many communities are developing water conservation plans and identifying backup water sources. After enduring several hurricanes in eastern North Carolina, residents are better prepared for tropical storms and planners are working to remove flood plain hazards to prevent future flood impacts. Following major fish kills in coastal estuaries, aggressive programs to reduce nutrients from agriculture, wastewater, and urban stormwater have been implemented in coastal rivers. Now in 2004, we are learning from the storms in western North Carolina to look carefully at how mountain watersheds are developed.

The landslide in Peeks Creek in Macon County during Hurricane Ivan caused several deaths and destroyed a dozen homes as saturated ground at the top of the mountain gave way and rushed down through the valley carrying trees, boulders, and mud toward the Cullasaja River below. The landslide was a natural geologic event that could not have been anticipated in this remote mountain valley. It is amazing to observe how the powerful forces of nature work to reshape the landscape during extreme events. The lesson to be learned from this catastrophe is to be prepared for the unexpected during severe weather conditions.

Throughout the mountains, flooding caused by heavy rains damaged homes, businesses, bridges, and roads in rural and urban areas. Hydrologists estimate that floods of this magnitude have a very low probability of occurring each year. In most years, rivers and creeks remain within their banks except for occasional minor flooding. Increasing development in some mountain watersheds is resulting in hydrologic changes, including increasing stormwater runoff, increasing erosion and sediment transport, unstable streambanks, and loss of flood plains for dissipating energy during high stream flow. These changes will result in more frequent floods with greater impacts to low-lying communities.

Now is a good time to reexamine watershed management policies and tools, especially in rapidly developing mountain watersheds. Updated flood plain maps will help manage future development while minimizing loss of flood plain functions. Effective stormwater management and erosion control techniques will minimize runoff impacts, and maintain stream stability and habitat quality in rapidly developing areas. Stream buffers will maintain stream stability. Stream and flood plain restoration projects will improve water quality, habitat, and sediment transport. The natural environment will recover from these floods.

Hopefully, we will be better prepared next time.

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Steps Toward Implementing the Coastal Habitat Protection Plan

by Carla Burgess, freelance writer

The Fisheries Reform Act of 1997 set North Carolina on a prescribed course to ensure the future health of saltwater fish stocks and help stabilize the state's billion-dollar coastal fishing industry. Weakfish, summer flounder, river herring and red drum are among many important commercial and recreational fish species whose populations declined significantly in the 1980s and 1990s due to pollution, habitat loss, overharvesting and other sources. As the state tried to sort out priorities for conservation, the legislature established a moratorium on the issuance of new commercial fishing licenses (lifted in 1999).

A major part of the reform law required three of the state's regulatory commissions to jointly develop a unified plan for protecting and enhancing coastal fish habitat. The result has been unprecedented cooperation among the state's Marine Fisheries, Coastal Resources and Environmental Management commissions to produce the Coastal Habitat Protection Plan (CHPP). The completed draft, begun in 1999, was presented to the three commissions at a rare joint meeting in September. Each must adopt the plan by Dec. 31.

The CHPP will be a road map to guide decisions affecting coastal fish habitats in North Carolina from here on out. It is the only such comprehensive habitat management approach by any state in the country. The CHPP is designed to ensure consistent actions among the commissions and their companion agencies within the Department of Environment and Natural Resources (DENR)—the divisions of Marine Fisheries, Coastal Management and Water Quality. Though these entities have many overlapping goals, historically there have been problems when jurisdictions collided or interests diverged. In the past, the agencies and commissions have not been required to communicate about their decisions, let alone coordinate their actions. The CHPP should bridge these gaps.

Salt marsh along the coast of North Carolina.
Credit: Photo courtesy of NC Division of Tourism, Film and Sports Development

The law requires the CHPP to identify existing and potential threats to habitats and to identify actions to restore, enhance and protect these habitats. The plan describes six habitats in which coastal fish and shellfish feed, spawn and grow: the water column (all the water in oceans, estuaries and rivers draining to the coast), wetlands, underwater sea grasses, and three distinct types of bottom substrate: shell (as in oyster reefs), sediment ("soft" bottoms) and rock (typically offshore ocean reefs). The plan outlines four broad goals:

- ❑ To improve the effectiveness of existing rules and programs protecting coastal fish habitats;
- ❑ To identify, designate and protect strategic habitat areas (specific habitat sites that are especially productive and deserve particular attention and concentration of protection efforts);
- ❑ To enhance habitat and protect it from physical impacts; and
- ❑ To enhance and protect water quality.

Though the CHPP stacks up to 600 pages, it can be distilled into somewhat digestible pieces—an executive summary and introduction; six habitat chapters (which conclude with one- to two-page summaries); a chapter describing an approach to management of strategic habitat areas; and a final chapter composed of 19 recommendations (some with several parts) to achieve the four goals.

Reaching the goals of the plan won't always require new rules. Some goals may be achieved by coordinated enforcement of existing rules by the three regulatory agencies. At 24 public meetings on the plan, conducted mostly in 2003 and 2004, attendees overwhelmingly expressed frustration that existing rules have not been fully

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implemented. "The number one thing the public said they wanted was better enforcement and compliance," says Mike Street, chief of habitat protection for the Division of Marine Fisheries and primary author of the CHPP document.

Of the six habitats, the plan identifies the water column and shell bottom to be the two most threatened. The water column is acutely threatened because it is polluted by so many widespread and cumulative sources. The shell bottom is at risk because so little of it remains. Over the past 100 years, harvesting of oysters by mechanical dredges has decimated much of this rugged substrate. Oysters need shell bottoms to which they can attach, usually other oyster shells. This loss of habitat, coupled with shellfish closures due to polluted runoff, has led to a 90 percent reduction of oyster harvest during the past century.

The document identifies stormwater runoff as the greatest single threat to North Carolina's coastal fish habitats. This runoff carries with it sediment, human and animal wastes, fertilizer, chemicals and other pollutants. The components of runoff have collective impacts, including reducing water clarity, promoting algal blooms, decreasing dissolved oxygen fish need to breathe, contaminating sediments, and contributing to fish diseases and fish kills.

The plan identifies a suite of specific threats to fish habitats, including conversion of natural landscapes to impervious surfaces; certain fishing methods and gear such as bottom trawling for clams (clam "kicking") and dredging for crabs and oysters; mining; erosion from crop land; artificial stabilization of the natural shoreline (such as bulkheads); urban and suburban building activities; and dams that impede upstream migration of some fish species.

The area of North Carolina affected by the CHPP includes all eight of the river basins that drain to the coast, as well as the coastal portion of the Lumber River Basin in Brunswick County. This area is broader than the region under the jurisdiction of the Coastal Area Management Act, which mandated adoption of land use plans in 20 eastern counties.

Some critics of the CHPP say that it doesn't balance the importance of fish habitat with the economic benefits of tourism and development. "There's a value other than habitat," says Bob Muller, mayor of Nags Head and leader of the NC Coastal Communities Coalition. Muller says he and many other coastal mayors in the coalition oppose the plan because they says its implementation will prohibit beach nourishment (which scientists say buries important fish habitat and disturbs habitats when sand is mined from offshore or estuarine locations and deposited in the surf zone to widen the beach), too heavily regulate coastal development (such as unduly restricting the percentage of impervious surface allowed within a watershed or requiring expanded riparian buffers), and curtail the use of ocean outfalls to dispose of wastewater and divert stormwater.

"The town of Nags Head has an environmental record that is as good or better than any town in North Carolina," says Muller. "If we're not behind this, then they've really missed the boat."

Though it recommends bans on ocean outfalls, the CHPP suggests exceptions for emergency situations such as hurricanes. Street stresses that the plan recommends no specific limits on impervious surface, nor does it specify buffer widths. The CHPP affords latitude in how coastal communities can achieve some of the recommendations. Street says the language in the plan was changed to address some concerns of several interest groups, including coastal municipalities and foresters. "One of the criticisms that has validity is that we focused entirely on fish habitats," says Mike Street. But he says the reform law dictated that focus.

Jerry Schill, director of the North Carolina Fisheries Association, an organization of commercial fishermen and seafood dealers, says the bright side of the plan is its forced cooperation among the commissions and regulatory agencies. But he says his organization opposes any additional burdens on commercial fishermen, who he says are regulated to the hilt. Schill also takes exception to the credibility of some of the science referenced in the plan. He says he was disturbed by the citation of one paper that compares trawling to the clear-cutting of forests.

At heart, the CHPP is a synthesis of scientific research and data. It details the ecological role and function of fish habitats, describes current rules concerning each habitat, and provides status and trends on the quality and quantity of coastal fish habitats. The CHPP team (scientists from state agencies who oversaw technical aspects of the plan) met initially with more than 50 scientists, and more in subsequent years. The document contains a 52-page list of references. When the commissions adopt the CHPP, it will end five years of intense preparation.

So what happens next? The commissions must work together to decide how to implement the recommendations, and the strategies are still being ironed out. The commissions must adopt an implementation plan by July 1, 2005. The Intercommission Review Committee (IRC), which helped develop the plan and frame the recommendations, has discussed establishing a multi-tier approach and setting time frames for implementation of recommendations according to priority, says IRC Chair Barbara Garrity-Blake. (The IRC is composed of six members—two representatives from each of the three commissions.)

Some recommendations will be implemented through rule-making, fol-

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lowing the procedures (including public hearings) of the respective commissions and the NC Administrative Procedures Act. Recommendations that don't require rule-making may be implemented faster, such as fisheries actions that can be implemented by proclamation of Division of Marine Fisheries directors, says Garrity-Blake. In the meantime, DENR Secretary Bill Ross has drafted a list of actions that DENR can pursue immediately to begin achieving the goals outlined by the CHPP.

Setting research goals will be another important step. The plan also recommends specific research needs, which Street says the IRC and DENR will prioritize and circulate in early 2005.

The IRC will continue to be the essential mechanism by which the actions of the three commissions are coordinated. Regardless of how and when the entities proceed, the CHPP is a landmark accomplishment that advocates hope will forever change the way coastal policy-makers and agencies do business.

The plan (by chapter or in total) can be downloaded at http://www.ncfisheries.net/habitat/. Comments or questions can be directed to chpps@ncmail.net.

Editor's Note: *At this time, the Marine Fisheries, the Coastal Resources, and the Environmental Management Commissions have voted to adopt the CHPP. See the article on the action of the EMC on this page.*

UST article to appear in future issue

An article about experiences of other states that have eliminated or radically modified their underground storage tank cleanup trust funds will appear in a future issue of the WRRI News.

September, October, December action of the Environmental Management Commission

At its regular meeting on September 9, 2004, the EMC took the following action:

- ❑ Chair David H. Monroe mentioned that Jim Mulligan, Water Quality Supervisor, Division of Water Quality, Washington Regional Office, passed away suddenly in August. He was a long-term contributor to improving water quality in North Carolina. A scholarship fund is being set up through DENR.
- ❑ Approved to reclassify Rocky River to Class Water Supply III (WS-III) Critical Area (CA) contingent upon the Town of Siler City taking mitigation measures as well as the measures specified in the Commission's water supply watershed protection rules. The town wants to install a new dam structure below the existing dam. The new Dam would significantly enlarge the existing small impoundment to an approximately 160-acre reservoir. The town wishes to have the dam constructed and the resulting reservoir created in order to meet water demands through 2030. The Division of Water Resources suggested by 2020, Siler City water needs would exceed the Jordan River allocation and would require transfer of water to another basin. The WWTP needs to be improved before additional demands are placed on it by a larger reservoir. DWQ analysis suggested the WWTP has had problems with compliance but the plant has high effluent standards – more than most plants. The hearing officers directed DWQ to monitor effluent of the WWTP and see if the nutrients are having an effect on Rocky River water quality. The town will modify the ordinance to increase the buffers on the Rocky River and keep cattle fenced out. For the new dam the minimum release regime would be higher at dryer times of the year. DWQ staff should evaluate the NPDES permit in 2006.
- ❑ Approved the final draft of the Catawba River Basinwide Water Quality Plan. The plan is in the third cycle of basinwide plans that DWQ staff prepare for all 17 of the state's major river basins. The plan is used as a guide to water quality program management and implementation by DWQ as it carries out its Water Quality Program duties and responsibilities in the Catawba River Basin.
- ❑ Approved emergency revolving loan for Contennea Metropolitan Sewerage District in the amount of $900,000 to rehabilitate a portion of the Highway 11 sewer interceptor that collects wastewater from the Towns of Ayden and Winterville.
- ❑ Approved appointment of agent for service of process, pursuant to rule 4(J) of the rules of civil procedure. This agent will serve as an agent for service of summons, complaints, petitions for contested cases or other court papers naming the Commission as a defendant or respondent.
- ❑ Anne Barnes, a former NC legislator, made this her last meeting after serving for five years on the Commission. She has enormous respect for the work done by the staff and the EMC. She has brought a wealth of experience for local and state governments.
- ❑ Authorizes DWQ to prepare a

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statement on behalf of the EMC supporting the State Revolving Loan Fund.

- ❑ The Steering Committee met after the EMC meeting to discuss committee structure – how to split up the committees to better serve the work of the Commission.

At its regular meeting on October 13, 2004, the EMC took the following action:

- ❑ Adopted changes to the heavy duty diesel engine standards for model year 2008 and later. The rule requires that model year 2008, later model year heavy-duty diesel vehicles and medium-duty diesel vehicles or engines, be certified by the California Air Resources Board as meeting its model year 2007 and subsequent model year heavy-duty diesel emissions standards to be sold, leased, or registered in North Carolina.
- ❑ Approved amendments to the nitrogen oxide rule (15A NCAC 2D .0519); visible emissions rule (15A NCAC 2D .0521); monitoring rules (15A NCAC 2D .0606 and .0608); incinerator rules (15A NCAC 2D .1210 and 15A NCAC 2D .1208); nitrogen oxide emissions recordkeeping and reporting (15A NCAC 2D .1404); permit exemption rule (15A NCAC 2Q .0102); and adoption of permit exemption for certain portable crushers (15A NCAC 2Q .0901 and .0902). For detailed information on changes to these rules please see the October 13 agenda item 04-37 description at the EMC web site shown at the end of this article.
- ❑ Approved the cooperative agreement between the EMC, the Division of Water Resources and the Lumber River Council of Governments. This agreement should bring faster progress toward sustainable use of water sources and more comprehensive protection of the Black Creek and Upper Cape Fear aquifers through the guidance of the Lumber River Council of Governments and its stakeholders.
- ❑ Approved four of eight conditional strategies recommended by Tar-Pamlico Basin Oversight Committee under the Tar-Pamlico agriculture rule. This brings the total number of fully approved strategies from six to ten.
- ❑ Approved to uphold the EMC ruling of the reclassification of the Neuse River to WS-IV NSW as in accordance with the plain meaning of the Water Supply Watershed Protection statute. This decision was made after a presentation by the City of Raleigh requesting a declaratory ruling on the validity of 15 NCAC 2B .0315(o).
- ❑ Approved to adopt the Administrative Law Judge's decision as the final decision for the Olde Beau Golf Club versus DENR, SS 03-001, 03 HER 1260. DENR assessed Olde Beau Gold Club civil penalties and costs of $14,020 for water quality violations that occurred between September 30, 2002 and November 19, 2002.
- ❑ Information about the Environmental Stewardship Initiative (http://www.p2pays.org/esi/) and the Environmental Management Systems (http://www.p2pays.org/iso/) was presented.
- ❑ The EMC received the Pelican Award from the North Carolina Coastal Federation for dealing with the lawsuit against the Rules Review Commission.

At its regular meeting on December 9, 2004, the EMC took the following action:

- ❑ Approved the hearing officers' report on amendments to transportation facility rules and air toxic rules.
- ❑ Approved the fiscal year 2005 priority list and intended use plan for the EPA state revolving fund. This will be forwarded to EPA for final approval.
- ❑ Approved state revolving loans for the Towns of Norwood, Rutherfordton, Stantonsburg, and the City of Clinton; and an increase in loan funds to the Town of Pikeville.
- ❑ Approved the Coastal Habitat Protection Plan. The EMC stated their support protection of shellfish. No policy changes were made. The Marine Fisheries and Coastal Resources Commissions had voted to adopt the plan at their meetings. It will be used as a road map for the future.
- ❑ Adopted the Administrative Law Judge's decision to uphold the 401 water quality certification issued to Riegel Ridge, LLC, by DWQ. On December 16, 2002, DWQ issued this certification upon the request of Riegel Ridge to fill 0.69 acres of wetlands as part of the proposed construction of a municpal soild waste landfill in Clolumbus County, NC. The petitioner, persons who reside near or in the general area or in the general area of the proposed landfill, filed a petition contesting the 401 certification. It was determined that the area was not in a 100-year flood plain.
- ❑ Adopted to fine Riverhills, Inc. and W.E. Dansey, Jr., a total of $5,000. The EMC reduced the amount of the fine from $10,080.80. The original amount calculated was based on eight statutory factors. The Commission considered the significance of the

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eight factors and whether $5000 total was appropriate.

- ❑ The Water Allocation Committee postponed a decision due to inadequate information for the Concord Kannapolis petition for interbasin transfer.
- ❑ The Groundwater Committee approved to send the proposed rule to the full EMC in February with a request to recommend that the full Commission give approval for the proposed amendments to the thirty-three substances in rule 15A NCAC 2L.0202.
- ❑ The Air Quality Committee voted on nine action items pertaining to permit applications and asphault storage tanks.

More information is available at the EMC web site: http://dem.ehnr.state.nc.us/admin/emc/2004/emcagenda2004.htm

September, October, December action of the EMC's Water Quality Committee

At its regular meeting on September 8, 2004, the EMC's Water Quality Committee took the following action:

- ❑ Approved revised water supply protection ordinances in compliance with the water supply watershed protection rules for the City of Wilson; Towns of Yanceyville, Rolesville, Pembroke; and Iredell and Caswell counties.
- ❑ Approved Catawba River Basinwide Water Quality Plan to be sent to the EMC the following day.
- ❑ Approved eleven local programs implementing the Tar-Pamlico stormwater rule (15A NCAC 2B .0258) contingent upon local board approval and resolution of extraterritorial jurisdiction issues. Also approved staff request for the Director to grant final approval to these programs upon resolution of contingencies and to approve subsequent minor program amendments that these communities may propose from time to time. Local programs will begin implementing the new development requirements immediately following ordinance adoption. Local governments implementing stormwater utilities are the two larger municipalities of Rocky Mount and Greenville. The City of Oxford has also initiated actions to establish one. Full documentation for each local government can be accessed at http://h2o.enr.state.nc.us/nps/tarpam.htm.
- ❑ Heard update on the proposed water quality standard for Enterococcus in coastal waters. DWQ staff reviewed the proposed federal rule and has determined that significant questions surround the language of the potential final EPA bacteriological criteria. Public hearings have been delayed. EPA supposed to make final decision and implement in October. It is delayed to see what is in the EPA final standard. They want to make sure state proposal is consistent with federal language.

At its regular meeting on October 13, 2004, the EMC's Water Quality Committee took the following action:

- ❑ Approved sending to the EMC in December the Coastal Habitat Protection Plan for approval. DWQ staff gave an overview of the draft plan. Recommended actions to protect, enhance, restore, and manage coastal fish habitats was discussed. The four main goals of the recommended actions include the following: Improve effectiveness of existing rules and programs protecting coastal fish habitats; identify, designate, and protect strategic habitat areas; enhance habitat and protect it from physical impacts; and enhance and protect water quality. It was requested that changes between June and September copies be noted. DWQ will work closely with Drs. Monroe and Peterson prior to the December meeting. The draft plan was also shown to the Marine Fisheries Commission on October 11, and to the Coastal Resources Commission on October 27. The next step is to collect public comments through mid-November; and present to the EMC and the other two commissions in December. More information about the CHPP can be found on the DWQ home page: http://h2o.enr.state.nc.us and comments may be mailed to CHPPs@ncmail.net.
- ❑ Approved major variance from the Neuse River riparian area protection rule (15A NCAC 2B .0233) for Novo Nordisk Facilities Expansion Project in Clayton, Johnston County. Novo Nordisk Pharmaceuticals Industries, Inc., proposed to impact buffers along a stream to expand their existing facility. The unnamed stream is a Class

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"WS-IV NSW" tributary to the Neuse River. Stormwater management to control nitrogen, and payment into the Riparian Buffer Restoration Fund are proposed to mitigate the impacts.

- ❑ Approved DWQ staff to proceed with plan to update the in-lieu fee program. DWQ staff presented an overview of the existing program for the payment of fees into the Wetlands Restoration Program "in-lieu" of meeting the nitrogen stormwater loading limits for new developments in the Neuse River Basin. The in-lieu fee proposal includes developing an equation that would calculate fees based on actual construction and maintenance costs. The same equation would be used for both the Neuse and Tar-Pamlico River Basins and would provide a consistent process. Payments would be made to the Riparian Buffer Restoration Fund of the Ecosystem Enhancement Program. DENR feels that existing regulatory and statutory authority allows this course of action. A report will be presented to the EMC in March.
- ❑ Approved to send to EMC Tar-Pamlico Basin Oversight Committee (BOC) a request for local nitrogen strategies under the Tar-Pamlico agriculture rule. The BOC reported on their annual progress of implementing the Tar-Pamlico agricultural rule, 15A NCAC 2B .0256. For the entire basin, agriculture has achieved an estimated 45 percent reduction in nitrogen loss compared to a 1991 baseline. This shows a 10 percent increase from 2001 reductions estimated last year.
- ❑ The Neuse River BOC reported on their annual progress of implementation of the Neuse Agricultural Rule (15A NCAC 2B .0238). The agricultural community from the entire basin has achieved a 42 percent nitrogen reduction compared to the overall baseline.

At its regular meeting on December 8, 2004, the EMC's Water Quality Committee took the following action:

- ❑ Approved Towns of Cornelius and Lillington revised Water Supply Protection ordinances in compliance with the water supply watershed protection rules. The DWQ Water Supply Watershed Protection coordinator worked with these local governments to revise their ordinances.
- ❑ Approved to send the draft *French Broad River Basinwide Water Quality Plan* to public meetings. DWQ presented its improved public input process for water quality plans. The draft will include more continuous input from agency staff and organized groups. The draft incorporates more Ecosystem Enhancement Program and TMDL information. It will have a more streamlined Water Quality Committee review. The benefit will include more and better quality watershed information as well as more frequent and meaningful opportunities for public input. Public review will be done in February 2005. The committee showed concern with local groups keeping up with the pace of development that is occurring in the French Broad River Basin. Other concerns that were mentioned included sedimentation and erosion control plans; monitoring and nonpoint source pollution; and water quality at trout farms. Dr. Moreau requested to see a presentation on the 303(d) list. This agenda item will appear at a meeting after February 2005.
- ❑ Approved to proceed to the full EMC with proposed reclassification of a section of the Uwharrie River in Randolph and Montgomery Counties (Yadkin-Pee Dee River Basin) to Class B. The community wants to protect the river's recreational nature by changing the base classification from C to B. The primary recreational uses under this classification are swimming and diving (full body contact). The waterbody meets the criteria for organized swimming.
- ❑ Approved major variance to the Neuse River Riparian Buffer Protection Rule (15A NCAC 2B.0233). This major variance was requested to grant a variance from the Neuse River Riparian Area Protection requirements for a proposed renovation of an existing residential home in Cary next to their privately-owned pond. The renovation would increase imperviousness by 372 square feet within Zone 1 of the 50-foot buffer rule of the Neuse River. According to the Town of Cary buffer rules, a 100-foot buffer is needed around the pond.
- ❑ Heard presentation from DWQ on the draft rule text for waste not discharged to surface waters (non-discharge systems), 15A NCAC 2H.0200. These systems include wastewater collection systems, animal waste management systems, wastewater residuals, and other non-discharge systems (wastewater irrigation, reclaimed water utilization, groundwater remediation and soil remediation projects). The revisions to be made will include a fast track for sewer line extensions; delegation from EPA for the federal residuals program under 40 CFR parts 501 and 503; consistency in use of term "stream"; editorial updates and clarification of requirements; and reflection of current policy not previously addressed in the rules. The staff wants to begin interested stakeholder meetings beginning in January 2005. The Water Quality Committee requested to form a committee to be involved in the rulemaking process.

More information may be viewed at the EMC web site:
http://dem.ehnr.state.nc.us/admin/emc/2004/emcagenda2004.htm

Water Conservation and Municipality Revenue, a Paradox?

by Carla Burgess, freelance writer

Water providers and customers in North Carolina learned invaluable lessons from the record drought that reached its peak in the summer of 2002. It was the driest one-year period in 108 years. At the drought's most severe point, several water supply reservoirs had fewer than 100 days of water remaining for its consumers. Mandatory conservation measures were widespread, and many people became good at rationing water. When the drought finally abated during the fall of that year, those consumers often continued to use water judiciously. Such habits, they learned, not only conserved a precious resource but it also saved them money. But some municipal providers were crippled by lost revenue, a trend that continues in many systems.

In the two years since, many consumers have been treated to rate increases in spite of their thriftiness. The reasons are clear to municipalities that provide water, but often much less obvious to the customers paying the bill. When public water suppliers see their income decrease, they must continue to pay their staff, keep their facilities operating and in many cases pay for capital improvements such as new water supply reservoirs or treatment facilities that have been built or need to be built to accommodate and serve a growing number of residential and commercial customers.

Such challenges are a fact of life that municipalities hope lawmakers and state officials will keep in mind as they assess water conservation and efficiency efforts statewide and make recommendations for new rules and policies. In October 2002, the N.C. General Assembly passed a law designed to address water supply issues and drought preparedness statewide. The law contains a suite of provisions related to water conservation and water supply planning. One section requires the Environmental Management Commission to adopt statewide rules that govern water conservation during droughts or other water emergencies; this cumbersome process is still underway. The law also required the Department of Environment and Natural Resources to prepare an evaluation of current everyday approaches to water efficiency and conservation in the state and to identify incentives for customers to conserve and reuse water. This provision's intent is to encourage providers and consumers to shift their behavior from crisis response to sustainable, everyday practices—in effect, "drought prevention."

Water efficiency and water conservation are often used synonymously but are somewhat different in objective. Municipalities can become more efficient and solvent by identifying "unaccounted for" water such as leaks within the system or inadequate metering. Efficiency also encompasses improved technology that allows customers to get more mileage from the same amount of or less water—such as water recycling or reclamation. Conservation, on the other hand, typically involves curtailing overall consumption, usually to meet an immediate need.

Although efficient use of water can be extremely beneficial in communities without a plentiful supply, it can create problems for some providers, especially those with a greater supply of water than demand for it.

"Public water providers are presented with a conundrum in that providing water is in essence a business," says John Spurrell, senior policy analyst with the North Carolina League of Municipalities. "Reduced use means reduced income. Reduced income ultimately could affect the efficient operation of the utility, which may include plans for water reuse infrastructure. A balance must be struck, and local government leaders across the state do an exceptional job weighing many competing demands."

The community of Hillsborough in Orange County is a prime example of a place where the scales are tipped toward a shortage of income, not water. The town built a $10 million reservoir on the West Fork Eno River, largely to accommodate a textile plant. The plant, which accounted for about 35 percent of the water and sewer revenues, closed its doors in 2001. Such stories were common in North Carolina in the 1990s. The town imposed back-to-back rate hikes of 15 percent and 19 percent, making water in Hillsborough among the most expensive in the state. "Right now it's to our benefit for our customers to use as much water as they can to pay off what we bought," says Kenny Keel, Hillsborough's town engineer and utility director. "For the next several years I don't anticipate us stressing conservation to a great extent because we need the revenues and we have an ample supply."

Rate increases are an obvious means of keeping water and sewer services flowing. Unlike corporate providers of electricity or natural gas, public water utilities lack supplementary revenues. In general, the prices charged for water rates have not kept pace with

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Water Conservation *continued*

rising costs of operation.

"We in the water industry, in North Carolina at least, have always considered that water is undervalued," says Vicki Westbrook, conservation coordinator with the City of Durham. During the drought of summer 2002, Durham's customers collectively reduced water usage by about 25 percent and in many cases continued conserving even when water became plentiful, she says. The annual average demand before the drought was 32.4 million gallons per day; in 2003 and 2004 the annual average demand was about 27 million gallons per day, says Westbrook. Durham reevaluated its rates, and raised water and sewer rates this year.

To spread the burden equitably, municipalities may charge more for different uses such as irrigation; institute seasonal and emergency rates; or vary rate structures for different types of customers.

Increasingly, municipalities are working with commercial users to help them be more efficient in their use of water, thus saving businesses and industries money and enticing them to remain in the community. Their presence increases the tax base and provides jobs and other public benefits. Yet there still are lost water revenues to recoup. Solving the equation can be a real brainteaser.

"Deciding what you're going to charge people is an art as much as a science," says Jay Stowe, utilities director for the town of Shelby. "Almost always, one group, either residential, commercial, or industrial, is going to carry more or less of a load than the others."

Stowe points out that rate hikes needn't be the only strategy for meeting needs. Some communities imperiled by water shortages and limited capacity might be able to explore regional solutions, such as pooling resources and sharing infrastructure where possible. When the cost-benefit ratio warrants it and the logistics allow, water utilities might be able to interconnect their systems to accommodate emergencies as well as to satisfy everyday operational needs. Some changes in regional politics and attitudes might be necessary to make this happen, says Stowe. He believes that the state should focus more on providing incentives to encourage these liaisons when practical, rather than pursuing what may ultimately amount to a one-size-fits-all approach to water management issues statewide.

The complexities of water supply management often transcend the current level of understanding of many politicians and their constituents. The public has learned from long-standing educational awareness campaigns how to be good stewards of water resources. Now consumers may need to get the message that they're paying for more than what pours from the tap at a given moment.

WRRI recognized as model institute once again

The Water Resources Research Institute of the University of North Carolina was named an exemplary institute along with five other State Water Resources Research Institutes. A panel evaluated the activities of the 54 institutes and centers authorized by the Water Resources Research Act during the period 1998 through 2002. The panel commended Dr. Kenneth Reckhow, director during the 5-year period, and all others associated with the Institute for their continuing commitment to and demonstration of excellence. WRRI received this same honor during the last evaluation period of 1993 through 1997.

The other five institutes identified with exemplary programs for the period 1998 through 2002 include:

- ❑ State of Washington Water Research Center
- ❑ Water Resources Center, University of Minnesota
- ❑ Texas Water Resources Institute
- ❑ Water and Environmental Research Institute of the Western Pacific, University of Guam
- ❑ Virgin Islands Water Resources Research Institute

WRRI-sponsored research reported

The principal investigator on a WRRI-sponsored research project may fulfill the obligation of providing a final project completion report by submitting a refereed journal publication that meets specific criteria (see policy at http://www.ncsu.edu/reports/guidelines/policy.html). The journal articles summarized below have been accepted as a final completion report under the new policy. A limited number of reprints of the full journal articles are available from WRRI. Send requests to WRRI at water_resources@ncsu.edu or call 919-515-2815.

Predicting the Frequency of Water Quality Standard Violations: A Probabilistic Approach for TMDL Development

Mark E. Borsuk, Craig A. Stow, and Kenneth H. Reckhow, Duke University

Environmental Science & Technology 36 (10):2109-2115, 2002

This refereed journal article has been accepted as the final technical completion report for WRRI projects 50255 and 50257, "Neuse River Modeling and Monitoring State II", Kenneth H. Reckhow, Duke University. It has been designated WRRI-2004-343-A (JA7-1).

All states are required to develop total maximum daily loads (TMDLs) for all impaired waters as stated in the Federal Clean Water Act, Section 303(d). A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. TMDLs are usually developed through water quality simulation modeling and require predicting future compliance, after a pollutant load reduction.

Federal regulations prohibit the addition of certain new sources and new discharges of pollutants to waters until a TMDL is established for these impaired waters. Over the next 10 to 15 years, over 40,000 TMDLs for pollutants need to be determined. This demonstrates the great need for TMDL development. The investigators used a probabilistic approach for TMDL development rather than a deterministic approach which is currently used by most water quality models. The deterministic approach output results uniquely determined by the inputs and predictions that consist of a single value at a point in time and space. Since deterministic models do not incorporate residual variability and parameter uncertainty into their predictions they are unsuitable for TMDL development. The investigators state that a probabilistic approach to model-based TMDL assessment is suitable for any type of mathematical model. The percentile-based standards used by the EPA and the requirement offer a margin of safety in TMDLs necessitate that model predictions include quantitative information on uncertainty. This information can provide decision-makers and stakeholders with a measure of the degree of confidence they can have in model results and provide an explicit basis for the choice of margin of safety in setting a TMDL.

For the analysis, the investigators applied a probabilistic approach to a eutrophication model for the Neuse River Estuary where the investigators looked at TMDL for nitrogen developed to satisfy the state chlorophyll standard. Since the deterministic portion of the model cannot account for all of the variability in the observed data, inclusion of the residual variability still indicates that there is some probability that samples collected on most days in the downstream sections would exceed the state chlorophyll standard. The investigators suggest that TMDLs are likely to require considerable over-design to accommodate margin of safety requirements. The size of margin of safety has a direct impact on the pollutant load reduction required and, therefore, on the cost of watershed management. Modelers and decisionmakers should place a high priority on selecting and developing TMDL models that facilitate the assessment of prediction error. The investigators conclude that an urgent need exists to develop a process-based model that accommodates rigorous and complete error analysis. This type of model will allow for the direct assessment of the frequency of standard violations and facilitate the determination of an appropriate margin of safety – both essential tasks within the current TMDL framework.

A Bayesian network of eutrophication models for synthesis, prediction, and uncertainty models

Mark E. Borsuk, Craig A. Stow, and Kenneth H. Reckhow, Duke University

Ecological Modelling 173:219-239, 2004

This refereed journal article has been accepted as the final technical completion report for WRRI projects 50255 and 50257, "Neuse River Modeling and Monitoring State II", Kenneth H. Reckhow, Duke University. It has been designated WRRI-2004-343-A (JA7-2).

The investigators used a Bayesian network of eutrophication models and applied it to the Neuse River estuary in North Carolina. A Bayesian network consists of a graphical structure and a probabilistic description of the relationships among variables in a system. The graphical structure explicitly represents cause-and-effect assumptions that allow a complex casual chain linking actions to outcomes to be factored into an articulated series of conditional relationships. The models were developed using a range of methods, including process-based models statistically fit to long-term monitoring data, Bayesian hierarchical modeling of cross-system data gathered from the literature, multivariate regression modeling of mesocosm experiments and judgments elicited from scientific experts. With the primary causal relations leading

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Research reported *continued*

from nitrogen inputs to publicly meaningful ecosystem attributes established, the next step was to quantify all these relations with conditional probabilities. The investigators' purpose in developing this Bayesian network was not to create a model that more realistically represents the actual Neuse River ecosystem, but rather to develop a model that more realistically represents current scientific knowledge about the ecosystem. The Bayesian network is the first to quantitatively predict changes in policy-relevant ecosystem attributes. The investigators state that a compromise is necessary between policy relevance and predictive precision, and that, to select defensible environmental management strategies, public officials must adopt decisionmaking methods that deal explicitly with scientific uncertainty.

Southeastern Estuarine Research Conference Convened in Wilmington

The Southeastern Estuarine Research Society (SEERS), a nonprofit educational organization, convened October 14-16, 2004, for its Semiannual Meeting at the Cape Fear Coast Convention Center in Wilmington, NC. There were approximately 74 people in attendance, including 35 undergraduate and graduate students, from the states of North Carolina, South Carolina, Georgia, and Florida.

There were a total of 23 oral presentations, six being students, and 20 poster presentation, 16 being students. Much of the research presented focused on stormwater impacts in the estuarine and near shore marine habitats. Research shows how nutrients and microbial pathogens from runoff can negatively impact habitats such as the Florida reefs, South Carolina beaches and swashes, and North Carolina tidal creeks and boat ramp areas.

Byron Toothman, a doctoral candidate at UNC Wilmington, did an oral presentation titled "Phosphorus Limited Survival and Growth of Fecal Coliform, Fecal Enterococcus, and Fecal Streptococcus in Aquatic and Tidal Creek Sediments." Toothman's research is funded in part by WRRI and US Geological Survey. Drs. Lawrence B. Cahoon and Michael A. Mallin of UNC Wilmington are the principal investigators of this research titled "Is There a Relationship Between Phosphorus and Fecal Microbes in Aquatic Sediments?" (See WRRI 2004-2005 Annual Program, page 4)

The SEERS meeting provided a comfortable, yet professional setting for researchers and students to network and exchange ideas dealing with estuarine and related research problems of the southeastern United States. This meeting offered a great opportunity for students to present their research findings and receive constructive feedback. Four students were recognized for their presentations: Ms. Azure Bevington, Coastal Carolina University, Best Undergrad Oral; Mr. Kurt Bretsch, University of South Carolina , Marine Science Program, Best Grad Poster; Mr. Jeremy E. Saeger, Coastal Carolina University, Best Undergrad Poster; and Ms. Chrissy E. Smith, College of Charleston, Environmental Studies Program, Best Grad Oral.

The next SEERS meeting will be held in Charleston, South Carolina. SEERS is an affiliate society of the Estuarine Research Federation. More information about SEERS is available at: http://links.baruch.sc.edu/seers/index.htm.

WRRI was one of the contributing sponsors for this meeting.

SEERS conference attendees network as they view the posters and displays at the evening poster session and social.

CALL FOR ABSTRACTS
8th Annual Conference

Managing Water Quality & Quantity: Integrating Science, Technology and Policy

April 5, 2005
McKimmon Center
NC State University
Raleigh, NC

Abstract Submittal Deadline: January 19, 2005

Conference Sponsors:

- ❑ Water Resources Research Institute
- ❑ North Carolina Water Resources Association
- ❑ NC State University Water Quality Group
- ❑ NC Department of Environment and Natural Resources
- ❑ US Geologic Survey

The Water Resources Research Institute of The University of North Carolina (WRRI) requests abstracts for oral and poster presentations at its 2005 Annual Conference, **Managing Water Quality & Quantity: Integrating Science, Technology and Policy**.

We are soliciting for oral and poster presentations related to the theme and other relevant water issues in North Carolina. Technical session themes will be based on abstracts received for oral presentations. Thirty-six abstracts will be selected for oral presentations. Abstracts not accepted for oral presentations may be presented as posters.

Undergraduate and graduate students are encouraged to submit abstracts for poster presentations. The North Carolina Water Resources Association will be selecting outstanding student posters for recognition at the conference on April 5, 2005.

Early response is encouraged. We have a limited number of slots for oral and poster presentations. Please submit abstracts of 500 words or less via the abstract submission form by January 19, 2005. For the required abstract format and submission form, please go to http://www.ncsu.edu/wrri/wrriconference.html. All selected abstracts will be posted to the WRRI web site in PDF format.

Decisions on oral and poster presentations will be made by January 31, 2005, and all authors will be notified by email of the status of their submissions. **Questions?** Contact Kelly Porter at 919-515-2815 or kelly_porter@ncsu.edu.

In conjunction with our Annual Conference, WRRI will also sponsor a Preconference Symposium: **Low Impact Development Approaches for Sustainable Water Management**
April 4, 2005,
McKimmon Center, Raleigh, NC

For more conference information please visit
http://www.ncsu.edu/wrri/wrriconference.html

Estuarine Research Federation 2005 Biennial Conference

The Estuarine Research Federation (ERF) 2005 Biennial, International Conference will be held October 16-21, 2005, in Norfolk, Virginia. The conference theme, "Estuarine interactions: biological-physical feedbacks and adaptations," will promote interaction among estuarine scientists and managers and integration across disciplines. The Federation is a society that nurtures student participation and promotes access for professionals at all stages of their development. The conference is designed to:

1. Maximize the time for scientific interaction through structured/unstructured elements and minimize competition from other factors.
2. Maximize the opportunities for participants to give presentations while keeping meeting costs affordable.
3. Maximize the diversity of scientific/management presentations.
4. Maximize the opportunity for big picture synthesis—new and exciting science.

The program promises to be intellectually stimulating with over 40 special sessions and symposia. Many of the sessions and symposia address various aspects of biological-physical interactions. Numerous special sessions and symposia address management issues or the newly developed observing systems. These sessions of invited participants will include both oral and poster presentations, as will numerous sessions of contributed presentations open to all. Efforts will be made to synthesize information from multiple sessions through panel discussions. ERF is also linking with the Chesapeake Research Consortium (CRC) on the last day of the ERF Conference for a joint colloquium about the Chesapeake Bay and human impacts to estuaries. The CRC will continue with its own conference the day following the ERF Conference. In addition to the sessions of scientific presentations, participants will have opportunities to attend workshops, go on field trips, and enjoy the company of others at social gatherings. Overall, ERF has a reputation for excellent meetings – a reputation it intends to continue.

The conference "Call for Abstracts" appeared in the October 2004 issue of the *Estuarine Research Federation Newsletter* and can also be accessed through the ERF web site, http://erf.org. They contain a listing of all session topics and information about the Conference. Abstract submission begins January 5, 2005. The deadline for submission is March 15, 2005. Details will appear on the Conference web site for abstract submittal.

Many of the organizers of the conference are from the middle Atlantic States. Linda Blum (University of Virginia) is the conference chair. Program committee co-chairs are Bob Christian (East Carolina University) and Arnoldo Valle-Levinson (Old Dominion University). While the Conference is international and has a broad perspective, the local ecosystems and management issues will be highlighted appropriately. For questions or comments about the conference contact ERFMeeting@mail.ecu.edu.

North Carolina Precipitation/Water Resources

Rainfall (+/- average)

	July	August
Asheville	4.68" (+.81")	3.79" (-0.51")
Charlotte	6.84" (+3.05")	5.43" (+1.71")
Greensboro	7.14" (+2.70")	2.10" (-1.61")
Raleigh	8.16" (+3.87")	9.26" (+5.48")
Wilmington	7.14" (-0.48")	10.03" (+2.72")
Elizabeth City	6.91" (+1.96")	8.79" (+4.19")

Streamflow

Index Station (County, Basin)	July mean flow (CFS) (% of long-term median)	August mean flow (CFS) (% of long-term median)
Valley River at Tomotla (Cherokee, Hiwassee)	159 (129%)	107 (93%)
Oconaluftee River at Birdtown (Swain, Tenn)	434 (131%)	322 (105%)
French Broad River at Asheville (Buncombe, FB)	1,720 (126%)	1,530 (107%)
South Fork New near Jefferson (Ashe, New)	310 (91%)	261 (88%)
Elk Creek at Elkville (Wilkes, Yadkin/Pee-Dee)	47.7 (70%)	45.2 (82%)
Fisher River near Copeland (Surry, Yadkin/Pee-Dee)	147 (104%)	93.9 (85%)
South Yadkin River near Mocksville (Rowan, Yadkin/PD)	143 (61%)	125 (61%)
Rocky River near Norwood (Stanly, Yadkin/Pee-Dee	342 (90%)	625 (200%)
Deep River near Moncure (Lee, Cape Fear)	364 (106%)	1,020 (272%)
Black River near Tomahawk (Sampson, Cape Fear)	221(63%)	886 (238%)
Trent River near Trenton (Jones, Neuse)	148 (177%)	644 (942%)
Lumber River near Boardman (Robeson, Lumber)	351 (66%)	645 (104%)
Little Fishing Creek near White Oak (Halifax, Pamlico)	41 (92%)	302 (941%)
Potecasi Creek near Union (Hertford, Chowan)	183 (479%)	800 (1,616%)

Groundwater

Index well (Province)	July monthly mean water level (ft) (Monthly mean last month - ft)	August monthly mean water level (ft) (Monthly mean last month - ft)
Blantyre (Blue Ridge)	31.07 (30.68)	31.26 (31.07)
Mocksville (Piedmont)	17.31 (16.70)	17.83 (17.31)
Simpson (Coastal Plain)	4.08 (3.90)	3.54 (4.08)

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

Peeks Creek Landslide

A picture of what the powerful mudslide during Hurricane Ivan left behind at Peeks Creek in Macon County. Dr. Greg Jennings is standing in the right center portion. For more information see the Director's Forum on page 2.

People

Dr. JoAnn Burkholder, professor of botany and director of the Center for Applied Aquatic Ecology at NC State University, was recently elected a fellow of the American Association for the Advancement of Science. She was recognized for her distinguished contributions to the field of phycology, the study of algae.

Michelle Czaikowski, formerly a reference librarian with Wake County Public Libraries, recently joined the Office of Environmental Education as the new librarian for the Department of Environment and Natural Resources (DENR). She will be maintaining the library's environmental education collection, conducting DENR library environmental education workshops, and promoting and providing environmental education resources throughout the state.

J. Todd Kennedy, formerly an environmental modeler with the NC Division of Water Quality, has joined the Department of Transportation's Office of Natural Environment as an environmental supervisor. Kennedy is working with indirect and cumulative impact analysis and water quality modeling.

Reserve Your Calendars

WRRI Preconference Symposium
Low Impact Development Approaches for Sustainable Water Management
April 4, 2005
Jane S. McKimmon Center
Raleigh, NC

WRRI 8th Annual Conference
Managing Water Quality & Quantity: Integrating Science, Technology & Policy
April 5, 2005

Both will take place at the
Jane S. McKimmon Center
NC State University
Raleigh, NC

See **Call for Abstracts** in this issue or go to http://www.ncsu.edu/wrri/ for more information.

Advanced Erosion and Sedimentation Control for Construction Sites Workshops

March 2-3, 2005
Blockade Runner
Wrightsville Beach, NC

April 26-27, 2005
Renaissance Asheville Hotel
Asheville, NC

Purpose: These workshops are presented to update design professionals who develop erosion and sedimentation control plans—including engineers, landscape architects, and surveyors—on regulations related to erosion and sedimentation control and present new design concepts and approaches. We anticipate offering 12 professional development hours to professional engineers and land surveyors, and ten continuing education units to landscape architects for completion of both days.

Registration will begin in mid-January. More information is available at:
http://www.ncsu.edu/wrri/erosionseminars.html

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