AFTERMATH OF A FLOOD

Also in this issue: History Off the Record,
Opera at Full Throttle, Safety First
and Erasmus, Man of Letters
Eastern North Carolinians gained a new measuring stick for hurricanes in the fall of 1999. To measures of wind and storm surge, they now add rain.

By the time Hurricanes Dennis, Floyd and Irene had done their damage, dumping more than 36 inches of rain in some places, people knew the meaning of a 400-year-flood event. All told, 19,000 square miles of farms, towns and forests were flooded—an area nearly twice the size of the state of Maryland, Two elementary schools were destroyed, and of the 57,000 homes flooded, about 7,000 were damaged beyond repair.

In Pitt County, home of East Carolina University, the Tar River crested at 17 feet above flood stage. One-third of the county was under water. The campus suffered $7 million in damages when Green Mill Run, a tributary of the Tar, overflowed. Hundreds of students and staff living off campus lost their homes, clothes and cars.

Even scientists who had long warned of the potential for such events were stunned. Dr. Stanley R. Riggs, professor emeritus of geology, canoed through the tops to check on a cabin he owns on the south side of the Tar River. “I wouldn’t have thought in a thousand years I’d see my cabin in the river,” he said.

Despite the personal loss, Riggs saw the beauty of a deep blue sky reflected in the flowing water. Then a strong north wind brought the mooing of cattle from the far side of the river. “As I was standing there, the mooing from the cattle became louder and more and more frantic,” he said. “Then after 10 or 15 minutes, it went totally silent. Three hundred head of cattle drowned. It brought very clearly into focus that this was a serious economic disaster for a lot of people.”

Throughout the crisis, the ECU family pitched in to help. Faculty and staff of the School of Medicine helped guide Pitt County Memorial Hospital as it coped with loss of power and water and called in the National Guard to ferry supplies and patients from areas cut off by flood water. University students, faculty and staff...
mucked out the homes of neighbors and friends, retrieved salvageable belongings and raised money for relief efforts. Faculty monitored water quality and advised state and local officials on environmental safety and structural damage.

As the immediate crisis passed, the university turned its attention to the future. Chancellor Richard Eakin led a three-day fact-finding tour of affected counties and offered ECU’s expertise in helping map the recovery process. More than 250 faculty, staff and other professionals volunteered their services free of charge to communities, businesses and individuals. Many did not wait to be asked. They launched service and research projects to help people cope with the disaster and to learn from it. A few of their stories follow.

COPING WITH TRAUMA

Six months after the flood, gutted homes and piles of trash attest that life has yet to return to normal in eastern North Carolina. At the United Methodist Church in Grifton, where the School of Medicine is running a twice-a-month mental health clinic, other signs appear: depression, fatigue, irritability and a host of symptoms that add up to the condition known as post-traumatic stress disorder.

“The moment the weather changes, especially if it clouds up or starts to rain, they get anxious,” said Dr. Thaddeus Ulzen, associate professor of psychiatry. “People are more affected by what happened than they thought they would be. The flood has left the headlines, but people are still struggling to get their lives together.”

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Rising waters forced 700 people to flee their homes in this small Pitt County town. One Saturday in mid-February, 40 of them visited the clinic. There the team of psychiatrists, family physicians, psychologists, pharmacists and clinical social workers tried to help them begin to reorder their lives and to understand that their feelings are normal, even if their circumstances aren’t. The clinic will run into the summer.

In Pitt County Schools, another ECU group is assessing and helping students traumatized by the flood through school- and home-based interventions. “We know that over 2,000 kids lived in homes that had serious damage,” said Dr. Lane Geddie, assistant professor of psychology. “We saw ourselves as one of the few organizations with the manpower to reach such a large number.”

Eight faculty members and 30 students from psychology, marriage and family therapy, nursing and psychiatry are involved in the project. One is Dr. Kaye McGinty, assistant professor of psychiatry. She spoke of a pre-holiday workshop for students. “Their parents were working three or four jobs to try to get their families back on their feet,” she said. “The teenagers talked about getting jobs to help the families. The people in our group were flabbergasted. The teens seemed to be coping pretty well, but the stress in their families is extreme.”

The N.C. Division of Mental Health is looking into expanding school-based interventions. It has applied for a grant from the Federal Emergency Management Agency to train social workers and psychologists in 31 counties to lead group sessions for children on coping with trauma. It has asked McGinty and others in the Department of Psychiatry to act as trainers and advisers.

STRESS RELIEF

In Edgecombe County, a different kind of school-based intervention is taking place. On a sunny day in November, about 25 fourth-graders huddled on the makeshift playground at the makeshift school.

“All right, let’s go over the rules,” Dr. Carmen Russoniello told them. “No fighting. No hitting. If you break the rules, it’s over.”

Then Russoniello, assistant professor of recreation and leisure studies, mentioned the event that shadowed their young lives. Who lost something in the flood? Almost every youngster raised a hand. “I lost my house, my grandma’s house and my uncle’s house,” one said, “and my clothes and my shoes.”

A minute more of quiet talk, and they broke the huddle with a mighty yell. For the next 40 minutes they ran relays, played kickball and tossed Frisbees — working off more energy than the average adult can even remember.

“What we’re trying to do, in addition to normal growth and development, is to do things that address the behavioral problems that are emerging,” Russoniello said. “This is an opportunity to plant seeds that will help them deal with trauma.”

Russoniello brought this combination of mental and recreational therapy to Edgecombe County in answer to a cry for help. About half of the 500 fourth- and fifth-graders in Tarboro’s Pattillo Elementary lost their homes in the flood. They also lost their school. Pattillo now operates out of mobile classrooms set up on the grounds of the National Guard Armory. For nearly the entire day, even lunchtime, the children are confined to a single classroom. Soon after school reopened, children and teachers neared their limits.

Then Dana Alexander, the school social worker, made a phone call, and Russoniello and his students arrived, armed with recreational equipment and almost as much energy as the children.

“You could see the difference in the children immediately,” Alexander said. “They can learn math much better at 2 o’clock if they’ve been outside and run off some of that energy.”

What began as impromptu assistance has become a formal alliance. Russoniello’s students travel to Pattillo three days a week as part of their classwork. Some lead youngsters in group activities while others work one-on-one with children having emotional and behavioral problems. A special stress-reduction workshop answered the needs of teachers. The university funded a graduate student to coordinate the project and provides a university van.

As the recreation students arranged donations of playground equipment, others at
ECU also adopted Pattillo. One volunteer group launched a “T’s and Tales” drive to collect T-shirts and new books for the children. Another group raised enough money to bus the entire school to Greenville for a theater production of *Charlotte’s Web*. Russoniello said the alliance will last until the children get into their new school — or longer.

**BEFORE AND AFTER**

A broader perspective on mental health comes from the social sciences. “There are a lot of articles about how a natural disaster affects your mental health, but almost none of it has any indication of mental health beforehand for comparison,” said Dr. Marieke Van Willigen, assistant professor of sociology. She can now supply the missing information.

Luck played a role. Early last fall, Van Willigen was studying the social and psychological benefits of volunteering. As part of her research, she had included questions about three key indicators of mental health on the Annual Survey of Eastern North Carolina conducted by the ECU Survey Research Lab beginning last August. The flood interrupted the survey. When it was completed, Van Willigen was able to compare the psychological well-being of respondents before and after the flood.

Her questions included three measures recognized as indicators of psychological well-being: whether people feel a sense of control over their lives, whether they feel part of a support network of people and whether they feel their lives have meaning or purpose. The flood hit women particularly hard on two of the three measures. When it came to the sense of control over their lives, both men and women scored lower after the flood without any major differences between the sexes. In terms of social support and sense of purpose, women scored much lower than men.

“With social support, that’s significant because women tend to have higher levels of social support, and here it actually flipped,” she said. “Women were higher before the flood and lower after it. The results concerning sense of purpose or meaning were interesting, too. [My students] thought people would have had eye-opening experiences that added meaning to their lives, but that is not reinforced at all.”

**EVACUATIONS**

Van Willigen is part of a team of social scientists examining the impact of the flood from several angles. The team is led by sociology professor Dr. John Maiolo and also includes Drs. Bob Edwards and Ken Wilson in sociology and John Whitehead in economics.

The collaboration began in 1998. After Hurricane Bonnie, the N.C. Division of Emergency Management contracted with them to study the evacuation patterns of households and businesses in the eight counties that touch the Atlantic Ocean. They also collected information on property damage. The study involved surveying 1,000 residents and 600 businesses and created a tool the state can use to estimate the economic effects of an evacuation order.

Among their findings:

- 26 percent of residents on the coast evacuated.
- Evacuation cost the average household about $200.
- The cost of an evacuation to businesses varied substantially according to the type of business and timing of the evacuation.
- People with disabilities were less likely to evacuate than were able-bodied people.

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Property owned by blacks was more likely to suffer damage, but the damage was less severe than to property owned by whites.

Households where there was a disability were more likely to suffer damage and the damage amounted to a substantially larger percentage of household income than for households without a disability.

Now they plan to repeat the survey in those eight counties and to extend it to 31 inland counties, refining the economic assessment tool and teasing out more information along the way.

BUSINESS LOSSES

The team was on a faster track to assess Floyd’s damage to businesses in eastern North Carolina. They had 30 days to complete the study and turn in a report to the Federal Emergency Management Agency.

In most disaster areas, FEMA contacts businesses individually to gather damage assessments. In this case, that would have meant calling on 100,000 business owners. FEMA sought another way.

Using their experience with the Bonnie study, the social scientists surveyed a random sample of 3,000 business in the 44 counties. Based on the survey, they projected a total of $1 billion in physical damages and $4 billion in lost revenue.

Wilson was stunned by some of the particulars. Going in, he expected that any job loss figures would reflect plants that had to close because of flood damage. Not so. “Eastern North Carolina lost over 30,000 jobs,” he said, “but most of those were in businesses laying off one or two people. These are very small cutbacks, but when you get 30,000 pinpricks, it can have an effect on the economy.”

Another finding also had long-term consequences. Of all the businesses that had been planning to expand before the flood, only half expected to carry through with those plans at the time of the survey. “I’m not sure that it won’t bounce back over time as the economy gets more positive,” Wilson said. “But at least for a while they’re waiting to see what happens.”

THE FUTURE

The flood exacerbated already dire conditions in eastern North Carolina. The area has long been mired in poverty. Recent developments in the tobacco industry and declining prices for pork and other agricultural commodities promised to drag the economy down further. How, many asked, can an area with so few resources rebound?

“This is so huge that no one knows what the first step should be,” said Albert A. Delia, associate vice chancellor for regional development. “We need a coordinated response.”

To lead the response, ECU has established the Sustainable Economic Recovery and Growth Center. The center’s purpose is to focus the resources of ECU and other institutions on revitalizing the 40-county region. Its multi-pronged approach will include applied research, policy analysis, a venture capital fund and new models for community development and transportation planning.

Eastern North Carolina legislators have pledged to push the General Assembly to allocate funds for a permanent endowment for the center.

THE FLOODPLAIN

Snow and ice dotted the landscape on a February Saturday when a team of ECU scientists piled out of a van at a deserted filling station. Time was precious. Before spring growth could disguise the landscape, they had a chance to study sediment deposited by a massive flood. So in the early morning chill, they pulled on rubber boots, collected their gear and headed off down the dike that once protected the town of Princeville from the Tar River.

“The question geomorphologists have is whether a rare event like this deposits a lot of sediment,” said Dr. Scott Lecce, assistant
professor of geography. “The answers have a lot of implications for how we interpret the stratigraphic record.”

Along with Lecce, the group consists of Drs. Paul Gares and Pat Pease in geography and Catherine Rigsby in geology. From Tarboro to Washington, they are surveying the floodplain to see what the Tar River left behind. Along the way, they collect samples to be analyzed for soil type, heavy metal content and chemical contamination. They plot each location using the satellite-based Global Positioning System. In the end, they will map the patterns of distribution and link those with the typography, land use and flood records. They also will be able to compare actual sediment distribution with estimates prepared by the U.S. Geological Survey.

“If I were guessing ahead of time, I would have thought we’d find two to three centimeters of sediment,” Lecce said. “It would have been that noticeable.”

In most places, however, they find so little they must carefully separate flood-deposited soil from autumn's leaf fall. When one small area turned up an inch-thick layer of crusted and cracked mud, it was enough to start the speculation. “I think the interesting thing is why here,” Gares said. “Where does this stuff come from and why is it deposited here and not elsewhere?”

The group huddled. Perhaps frequent low-level flooding routinely flushes out the system. Maybe it had to do with the sequence of events last fall. North Carolina had been in a drought before hurricane season and the river level was exceptionally low. Then when Dennis, the first major storm hit, maybe it eroded most of the loose soil and carried it to the estuary before the river topped its banks. Or maybe this river simply doesn’t carry much sediment.

Somewhere in the muck, they hope to find the answers.

THE SOUND

For biologists, the flood has left a different set of questions. One of the most serious question marks hangs over Pamlico Sound, the largest body of water in the state and a major nursery for East Coast fisheries.

As flood waters washed out hog lagoons and municipal sewage treatment plants and swept across fields and lawns, it bypassed nature’s normal filtering process and carried an extraordinary load of nutrients straight into the sound. There, trapped by the Outer Banks, these nutrients hold the potential to wreak havoc in the delicate ecosystem.

Last fall, the strain was already showing. The huge quantity of fresh water had trapped the heavier, oxygen-poor brackish water at the bottom. Hurricane Irene came along and stirred the waters. Disaster averted. The next critical time is approaching fast.

“We don’t know what the consequences will be next summer,” said Dr. Robert Christian, professor of biology. “The temperature will be higher and the ability of the water to hold oxygen will be lower. What happens when the bacteria and algae start growing?”

The concern is that the nutrients will feed an unusually large crop of algae. As it dies, it will add even more nutrients to the shallow waters. Natural bacteria feasting on all the decaying matter will rob the water of oxygen. In a worst case scenario, this could lead to massive fish kills. With little chance to exchange water with the open ocean, the sound’s recovery could be slow.

Despite the sound’s importance for fisheries and tourism, Christian said, little attention has been directed to understanding its response to events like floods and hurricanes. Working with Dr. Hans Paerl, professor of marine and
environmental sciences at UNC-CH, Christian wants to remedy that. They will be keeping close tabs on the sound’s nutrient levels and biological activity for the next year or longer. They hope to assess the impact of the flood and to create a model that will predict the likely biological impact of any future storms.

The predictive capacity may be as important as understanding current conditions. Climatologists expect more and stronger hurricanes over the next two to three decades.

THE MAPS

The extent of the flooding drove home an important point for almost everyone. Floodplain maps need to be updated and expanded. Three geographers are examining the tools available for quick-response flood mapping and modeling and for updating floodplain maps.

Digital elevation models from the U.S. Geological Survey are a readily available and inexpensive tool for estimating the extent of the flooding. They have just one problem. “There are some questions about how accurate they are in areas of low relief, like it is here,” said Dr. Jeffrey Colby, assistant professor of geography. Images from the new Landsat 7 satellite offer another possibility, but dense vegetation can obscure flooding in some areas.

The geographers, Colby and Drs. Karen Mulcahy and Yong Wang, are investigating whether these tools can be combined for better results. Their first step is to compare both the digital models and satellite imagery taken before and during the flood with actual flood level readings.

THE RIVER

Only the magnitude of the flood surprised geologist Stan Riggs. “If you look at the natural process, the river was doing exactly what it was made to do, and we got in the way,” he said. “Moving water is a very powerful force. It erodes mountains and canyons and sculpts the land in a very vigorous fashion. It always has, and it always will.”

The question he is trying to solve now is how much people contributed to their own undoing last fall. Ditches drain thousands of acres of forest and farmland. Streams have been channelized to move water faster. Urban development has increased runoff. Roads and bridges, on the other hand, often block the natural flow of water. “We probably exacerbated this flood significantly through our lack of attention to what we’ve been doing,” he said.

With a multidisciplinary team, Riggs hopes to detail what happened on the Tar River and its tributaries: how the natural system worked where it was relatively intact and how human modifications altered the outcome. He has enlisted the aid of Dr. Richard Spruill, a hydrologist, and Drs. Robert Christian and Mark Brinson in biology. Their end product, he said, will be a database to help people judge the wisdom of policies and practices.

“No one even knows how many streams have been channelized or how many bridge dams there are and where they are,” he said. “A bridge dam on one kind of stream might actually be good because it might hold some of the storm water back whereas on another part of the stream it might be bad because it holds the water back right into town. This is where understanding the dynamics is so crucial to society. You can’t have one rule that fits everything. It’s a complex system.”

ECU Conference on Floyd, Flooding Attracts Big Names in Disaster Planning

Some of the nation’s leading authorities on natural disasters will address a three-day conference at ECU on the effects of Hurricane Floyd. The conference, to be held May 24-26, is expected to bring together policymakers, research scientists, relief and recovery specialists, federal and local disaster experts, and citizens of eastern North Carolina.

“We expect this conference to provide the first organized assessment not only of Floyd’s place among other natural disasters but equally important, how we can use the lessons of this storm to mitigate loss of life and property in future calamities,” said Dr. John Maioio, conference chair and professor of sociology.

Among the highlights will be:
- “Disasters by Design” — Dr. Dennis Mileti, director of the Natural Hazards Research and Applications Information Center in Boulder, Colo., and author of Disasters by Design: A Reassessment of Natural Hazards in the United States.
- “Mitigation in an Institutional Context” — Dr. Rutherford Platt, author of Disasters and Democracy: The Politics of Extreme Natural Events and professor of geography and planning law at the University of Massachusetts.

Godshalk also is professor and former chair of city and regional planning at UNC-Chapel Hill.
- “Extreme Weather Events in Eastern North Carolina’s Future” — Dr. Robert Sheets, former director of the National Hurricane Center.

The conference also will include a series of workshops reporting on research related to the natural, physical, social and economic impacts of Hurricane Floyd and the floods, a panel discussion on “Living in the Eye of the Storm” and roundtable discussions on selected topics.

More details on the conference are available from the website www.ecu.edu/coas/floyd or by contacting Laura Edwards at 252-328-2484, email EdwardsLV@mail.ecu.edu. The deadline for registration is May 10.