PHILANTHROPY

Research vessel memorializes Watts Hill, Jr.

CEP Director Doug Crawford-Brown (first row, left), Morehead City Field Site Director Rachel Noble (first row, center) and Mary Hill (first row, right) with the 2003 Morehead City Field Site students and the R/V Watts Hill, Jr.

To memorialize their late friend, George Watts Hill, Jr., a founding member of the CEP Board of Visitors, current board members decided to raise funds to commission the R/V Watts Hill, Jr., a research boat owned by the CEP and based at UNC's Institute of Marine Sciences in Morehead City, North Carolina.

Each fall, the Jones Brothers flat-bottom skiff will be used by students at the CEP's Morehead City Field Site. Flat-bottom skiffs are essential for collecting research samples and data in the very shallow waters of the Neuse River Estuary and Pamlico Sound. During the remainder of the year, the R/V Watts Hill, Jr. will supplement the Institute's fleet of boats used by UNC faculty and graduate students to pursue their research.

"The generosity of the board and Mr. Hill's family and friends has enabled our students to do real fieldwork and real science, the same way that established local marine scientists do," said Field Site Director Rachel Noble. "It has allowed several of our students to identify the fact that this is what they would like to do for their careers."

Approximately 60 friends contributed to the fund. Jones Brothers, Inc., the boat manufacturer, offered state contract pricing to make the gift possible.

"From the very beginning, my husband was hardly ever far from the water: Virginia Beach with family in the summer, life guarding, plane spotting on the coast as a teenager during World War II, and the Navy," Mary Hill recalled. "He always felt connected to nature, the environment and conservation.

"This memorial from the CEP board was just the thing he would have loved. I can see him wanting to go out with the students on the boat immediately and learn and explore what they were working on. It means so much to me because I know how pleased he would have been, and I feel proud that he was recognized by his associates for something that he loved and shared with them. There can never be enough thanks for their generosity and insight with such a perfect remembrance." ■

Upcoming 2004 CEP events

CEP Annual Commencement Reception:
May 9, 2004
1:00 pm
Miller Hall Lawn

CEP Annual Environmental Colloquium:
Valuation and the Environment.
November 12 & 13, 2004
time and place
to be announced

Carolina Environmental Program
The University of North Carolina at Chapel Hill
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Chapel Hill, NC 27599-1105

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SPRING 2004

News from the Carolina Environmental Program at The University of North Carolina at Chapel Hill

RESEARCH

Ecology of Infectious Diseases award fuels groundbreaking research at CEP

Funding from national agencies aimed at understanding the relationship between human-induced environmental changes and infectious diseases

When that new housing development or golf course is built along the river, what will the impact be on human health?

That's the type of question UNC-Chapel Hill researchers hope to answer, with the aid of a $1.6 million grant to the Carolina Environmental Program from the National Science Foundation and the National Institutes of Health. The four-year Ecology of Infectious Diseases grant was awarded in November to study what happens when nutrients and microbes interact and flow into North Carolina's Neuse River, which is polluted with excess nutrients – and the implications for public health.

CEP Director Doug Crawford-Brown is the grant's principal investigator. UNC's was one of six proposals chosen for funding from about 100 applicants.

"When nutrients flow into rivers, lakes and streams, bacteria and viruses attach themselves to these nutrients in the water," Crawford-Brown explained. "Until recently, both the scientific and policy communities thought of eutrofication (excessive nutrients in water) as a purely ecological problem – bad for the fish, for example, but not related to human health. Recently, however, people have started to ask: If eutrofication occurs, and these bacteria and viruses have lots of nutrients to feed on, does that affect human health? Through this project and others we're linking to at Carolina, our goal is to understand how human patterns of development in the watershed – building suburbs and cities, golf courses, and the like – affect water quality and human health."

Ecology of Infectious Diseases is a joint program by the NSF and NIH that supports efforts to understand the underlying ecological and biological mechanisms governing relationships between human-induced environmental changes and the emergence and transmission of infectious diseases. Interdisciplinary projects funded by this program are studying how large-scale

continued on page 3

UNC William R. Kenan Professor of Marine Sciences Hans Paerl in the field. Paerl is a major participant in the CEP's Ecology of Infectious Diseases project, providing measurements of nutrients in the Neuse River Estuary. These will be correlated with microbial concentrations and, ultimately, health effects in people living along the Neuse River.

RESEARCH / PHILANTHROPY

CEP receives generous gift from Progress Energy

Corporate partner's support will help advance watershed management and coordinated conservation in North Carolina

The Carolina Environmental Program has received a $150,000 gift from Progress Energy that will help the program move rapidly in two important areas: watershed management and coordinated conservation. It is part of a larger gift from Progress Energy to UNC-Chapel Hill that will also be shared by the UNC School of Education and the Kenan-Flagler Business School.

Progress Energy's gift to the CEP will support development of a web-based information tool that can be used by conservation groups, developers and planners to identify areas of land and water most in need of conservation in North Carolina. This project, part of the One North Carolina Naturally initiative, builds on a generous award from the Z. Smith Reynolds Foundation to the CEP and its partners in the NC Department of Environment and Natural Resources. Funds from the Progress Energy gift will also be used to knit together several current CEP projects involving watershed development practices, flow of microbes and nutrients into the Neuse River, and health effects – including projects associated with the Ecology of Infectious Diseases grant (see above). The goal is to create a full research and outreach program at Carolina focused on the future of development in watersheds.

"Progress Energy is not just a power company: we are a family of people who live and work in the communities we serve. We strive to be good corporate citizens, but we also have a personal interest in educating our youth and being good stewards of the environment," said Bill Cavanaugh, chairman and CEO of Progress Energy. "We are pleased to support the Carolina Environmental Program and look forward to the rewarding results these projects will yield."

"We're especially appreciative of this gift from Progress Energy because it allows us to greatly expand the outreach aspects of our research programs," said CEP Director Doug Crawford-Brown. "By providing this funding, Progress Energy is ensuring that the citizens and decision-makers of North Carolina have access to state-of-the-art information needed to ensure clean and plentiful supplies of water, and to develop a statewide plan for land and water conservation that will keep North Carolina a special place." ■

RESEARCH

Taking environmental modeling to the next level

Worldwide community of environmental modelers, based at CEP, comes together to share knowledge, issues and ideas

If the old adage "two heads are better than one" is true, imagine what 600 heads can come up with! That's the concept behind the Community Modeling and Analysis System (CMAS): bringing together the environmental modeling community's diverse, complementary talents and resources to set new standards for quality in science and in the development and application of these environmental models.

CMAS was created in 2001 through funding by the U.S. Environmental Protection Agency. The worldwide network is based at the Carolina Environmental Program, under the direction of Dr. Adel Hanna and his colleagues in the Environmental Modeling and Policy Development (EMPD) group. Hanna and the EMPD group worked with the EPA for more than a decade to develop a state-of-the-science, open-source air quality model called "Models-3." When the EPA decided to create the CMAS Center to centralize support for scientists and communities around the world to learn about and apply Models-3 to better understand environmental issues, they chose the EMPD based on their longstanding partnership and intricate knowledge of Models-3.

"The CMAS Center brings together more than 600 researchers, developers and users of Models-3 from around the world to share information on model development and application and to improve environmental decision making and address the challenges of environmental protection," Hanna explained. "We serve as a bridge between various segments of the community, so people doing complementary work can benefit from each others' experience. We also foster the growth of the developer and user communities, and serve as a clearinghouse for information, so a researcher in Alabama can say, 'You did a simulation of North Carolina air quality – I can use that data for my analysis.'"

Another objective of CMAS, Hanna noted, is to become a hub for education and training. The Center hosts several training sessions each year to educate community members on using air quality modeling and analyzing data. Much of this training is done in conjunction with an annual CMAS conference, held each fall in Research Triangle Park. Last fall's meeting drew more than 150 participants from around the world, including scientists, regulatory personnel working on air pollution problems for different states, professors, and consultants in air pollution firms. Participants shared perspectives and ideas for the development and linking of models for meteorology, emissions, air quality, hydrology and environmental and health effects.

The CMAS Center is guided by an External Advisory Committee with members from industry, academia, government, research and other stakeholder groups to give a voice to all segments of the community. Besides CMAS Director Hanna, several EMPD staff members coordinate outreach, applications support, software development and modeling research for the Center. The North Carolina Department of Environment and Natural Resources, as well as environmental agencies from other states, also play key roles in CMAS.

A group of environmental modelers discuss their work at the 2003 CMAS conference. UNC Professor of Environmental Sciences and Engineering Harvey Jeffries (center) is a world authority on atmospheric chemistry and air quality modeling and assessment. CEP Research Associate Zac Adelman (far right) helped organize the conference.

The CEP's EMPD is in the third year of a five-year cooperative agreement to run CMAS. "Being part of the Carolina Environmental Program is a great benefit for the CMAS Center," Hanna said. "It gives us an opportunity to take advantage of the tremendous resources of the university. Through connections with the UNC faculty, we can reach out to more users and expand into other disciplines like risk assessment, health exposure and the use of these models for other types of applications."

"CMAS provides a superb, one-stop-shop for the community of state, regional, federal, university and international users of EPA's Models-3/CMAQ air quality modeling projects," said Dr. Paul Gilman, EPA Assistant Administrator for Research and Development. "Their vital role in providing technical support, peer review and community-based enhancements further strengthens the use and value of these models for the regulatory and research communities worldwide."

Membership in CMAS is free and is open to all interested parties. Register online at *www.cmascenter.org* to receive newsletters and invitations to the CMAS annual conference and classes. ■

FIELD SITES AND OUTREACH

CEP opens its Morehead City Field Site

On October 11, 2003, the Carolina Environmental Program formally opened its Morehead City Field Site. The site, based at UNC's Institute of Marine Sciences in Morehead City, hosted an inaugural class of five students during the fall 2003 semester. Undergraduate courses, field trips and internships at the site focus upon marine, coastal and near-coastal issues such as wetlands, shellfish and fisheries issues, water quality and resources, and others. ■

◄ UNC Institute of Marine Sciences Director John Wells (left) with Duke University Marine Laboratory (Beaufort, North Carolina) Director Mike Orbach at the event.

► CEP Morehead City Field Site student Juliana Miller (left), IMS/CEP Assistant Professor and Morehead City Field Site Director Rachel Noble (center), and The Honorable Jean Preston, member of the North Carolina House of Representatives, 13th District at the event.

Mark Scribbins Photography

▲ Tom Malone, director of the Horn Point Environmental Laboratory at the University of Maryland Center for Environmental Science, speaks at the Morehead City Field Site opening event, UNC Institute of Marine Sciences, Morehead City, North Carolina, October 11, 2003.

EDUCATION

UNC-Chapel Hill emphasizes sustainability across campus

CEP's new sustainability seminar series gives students an inside view into work of university, community

Last fall, the Carolina Environmental Program launched a seminar series to highlight sustainability initiatives underway across the Carolina campus.

The series, "Sustainable UNC," drew 18 undergraduate students and other members of the university community to learn about efforts at UNC-Chapel Hill that contribute to the long-term viability and vitality of the campus as a natural and built environment. Each week, university faculty and staff leading key sustainability initiatives discussed the university's efforts in areas such as waste reduction and recycling, historic preservation, building design and construction, landscaping and tree protection, storm water management, energy, transportation, purchasing and long-term planning.

Elizabeth Shay, a CEP research associate and Ph.D. candidate in City and Regional Planning, designed and led the one-credit seminar series. "This is such a timely topic because UNC has taken a strong stand on being sustainable," she said. "The university has hired a sustainability coordinator and several other managers. With all of these professionals on campus, it made sense to gather them together to discuss their work and how it fits together."

This spring, 30 participants registered for "Sustainable Communities," a follow-up seminar series that is bringing local leaders in land-use planning and neighborhood design, land conservation, transportation, green building and other areas to campus to tell students about their efforts to promote sustainability.

James Carnahan, a Carrboro resident and a designer and community advocate, speaks on urban design and livable communities at the January 23, 2004 meeting of the spring 2004 "Sustainable Communities" seminar series.

UNC-Chapel Hill has made sustainability a campus-wide priority. As the university's sustainability coordinator, Cindy Shea guides and facilitates these interdisciplinary programs. In recognition of its efforts, in 2003 the university was one of five North Carolina-based companies and organizations named as a recipient of Save Our State's North Carolina Sustainable Business Awards. UNC's award recognized the university's efforts to develop and implement sustainable policies, practices and curricula.

> **"Sustainability means that, in order to improve people's lives, we have to think about the economy, social equity and the environment, now and in the future."**
>
> *Elizabeth Shay*

"Interest and involvement in sustainability is growing rapidly across all areas of the campus," said Shea. "Acting today, without compromising tomorrow, makes good business and environmental sense."

UNC's national recognition in sustainability also extends to the Kenan-Flagler Business School. In 2003, Kenan-Flagler was recognized as one of six cutting-edge business schools that are preparing future executives with solid training in environmental and social impact management. This recognition came from the Aspen Institute and the World Resources Institute in the report, *Beyond Grey Pinstripes 2003: Preparing MBAs for Social and Environmental Stewardship.*

Monica Touesnard is executive director of the Center for Sustainable Enterprise at the business school. "At Kenan-Flagler, we want our future leaders to not only understand and assume responsibility for their organization's impacts, but also to seek out growth opportunities based on addressing today's most pressing social and environmental challenges. The Sustainable Enterprise Concentration at Kenan-Flagler equips students with a unique perspective and skill set enabling them to proactively address these issues." ■

Ecology of Infectious Diseases award
continued from page 1

environmental events such as habitat destruction, biological invasion and pollution affect the emergence of viral, parasitic and bacterial diseases in humans and animals. In particular, these development patterns may lead to gastrointestinal diseases related to viruses and bacteria.

Research under this grant is a collaboration between the CEP, the UNC Institute for Marine Sciences (IMS) in Morehead City and a faculty member, Jim Bowen, at UNC-Charlotte. In addition, as part of the overall project, the group is collaborating with other UNC-Chapel Hill and IMS researchers to link this work to watershed policy and watershed hydrology.

"Our work under the NSF grant starts once the nutrients have entered the river, and goes through determining what the eutrofication and the health impact will be," Crawford-Brown explained. "Then, we're linking in with other researchers who focus on what the development in the watershed does to the production of nutrients as they flow into the river. Ultimately, our goal is to create a suite of modeling tools that will allow North Carolina and other states to plan future development in watersheds in ways that won't increase eutrofication and decrease health."

Rachel Noble, a CEP/IMS faculty member, is one of the researchers involved in the grant. "One of the main research questions is what the implications of eutrofication are on the persistence of the pathogens in the water. My lab uses a variety of molecular methods to identify and quantify the pathogens in the system."

Crawford-Brown hopes this prestigious grant will be the first of several the CEP will receive to study the ecology of infectious disease, one of the "hot new areas" for environmental research. Already, he says, this grant is changing the landscape for research at Carolina.

"It is allowing us to create a whole new area of study called 'Environmental Change and Human Health' that brings together the CEP, the School of Medicine and the School of Public Health to collaborate both in research and in undergraduate and graduate education in this groundbreaking area. The NSF/NIH grant is the cornerstone of this important collaboration." ■

FIELD SITES AND OUTREACH

CEP field site finds new home at England's prestigious University of Cambridge

CEP's research links provide fortuitous opportunity for Carolina students to delve into carbon budgets and other hot environmental issues

The summer portion of the Carolina Environmental Program's European field site has moved to one of the world's most tradition-rich universities to be at the hub of the newest focus in international energy policy and environmental assessment.

After three years in Salzburg, Austria, the Summer Program in International Environmental Assessment and Energy Policy has moved to the University of Cambridge in Cambridge, England, a leading thought center for the cutting-edge policy of carbon budgeting. A larger exchange program will remain in Salzburg.

The University of Cambridge

CEP Director Doug Crawford-Brown, a physicist specializing in environmental risk assessment and its applications in environmental policy, directs the summer program. The move came as a result of a project he is working on with the European Union to look at carbon budgets as a way to reduce carbon dioxide emitted into the atmosphere.

Carbon dioxide is produced by cars, planes and other forms of transportation, by industry, and through commercial/residential use. An excess of carbon dioxide in the atmosphere can cause climate change – large increases in temperature that disrupt our ecosystems and cause heat waves and other significant changes in weather patterns. In carbon budgeting, every individual in a country is assigned a certain amount of carbon dioxide that he or she can release. Countries or municipalities can allocate this budget any way they want, and a market is established to trade excess capacity – with the overall goal being to set a ceiling for the total amount of carbon dioxide being released into the atmosphere.

In its inaugural five-week program this summer, CEP faculty at the Cambridge Field Site will provide Carolina and Cambridge undergraduates with intensive training in the scientific analysis of environmental impacts of energy use, on the relationship between human needs and energy production, and on energy policy in an international and global context. The program combines UNC-Chapel Hill's long history of advanced research and teaching in environmental assessment and policy with the rich, historical setting of Cambridge, England to look at how energy use and environmental impacts have been related over the past 1,000 years. It also focuses on development of a carbon budget for both the United Kingdom and the United States.

In daily classes, students will learn methods of environmental assessment within the framework of energy policy in the UK, EU and United States. For their Capstone (group research) project, they will work in small teams to address an environmental problem of current interest within the UK and EU – analyzing the issue, proposing solutions, assessing the ability of those solutions to meet specified goals, and justifying which solution meets those goals most effectively.

Crawford-Brown is working with colleagues at the EU to determine how to effectively set these carbon budgets. "By moving the CEP field site to Cambridge, we are putting the issue of carbon budgets at the center of the field site's activities," he explained. "England – particularly Cambridge and Oxford – is the hotbed for this important issue. Our students will have the opportunity to work in the area of international environmental policy, to explore how environmental policy is done in England and contrast that to the United States, to see how what is being done in the UK and EU can be applied in the United States, and to learn how things like climate change negotiations occur. They will also gain a specific set of tools for building and running models of releases from industry and transportation and determining their impact on environmental quality." ■

OUTREACH

Two grants help bring teacher training in water quality to Eastern North Carolina

CEP Science Educator Michele Kloda (standing) brings hands-on environmental training to North Carolina teachers.

What's in the Water? is an innovative teacher training workshop that explores water quality issues in North Carolina and shows teachers how they can relate environmental research taking place at UNC to the NC science curriculum. The workshop was developed and is presented by the UNC-Chapel Hill Superfund Basic Research Program's (SBRP) Outreach Core, which is led by the Environmental Resource Program (ERP), a unit of the CEP. The Outreach Core received funding for the workshop from the National Institute for Environmental Health Sciences, the primary funder of SBRPs nationally.

Now, grants to the CEP from two private foundations are helping to bring this hands-on training to educators in North Carolina's eastern, underserved counties – teachers who would not otherwise have the resources to attend this informative program.

A grant from the Weyerhaeuser Company Foundation allows ERP Science Educator Michele Kloda to travel to Washington County to conduct *What's in the Water?* for ten middle and high school teachers from Washington County and surrounding northeastern counties. Weyerhaeuser's grant also funds the purchase of *Investigating Groundwater* science classroom modules – filled with equipment to actually perform related experiments – for each participating teacher. The workshop, which is aligned with the state science curriculum, addresses some of the water quality issues facing this region.

"The Weyerhaeuser grant has given us a wonderful opportunity to work with school districts in communities currently facing issues with water quality," Kloda said. "It's great to be able to meet directly with teachers

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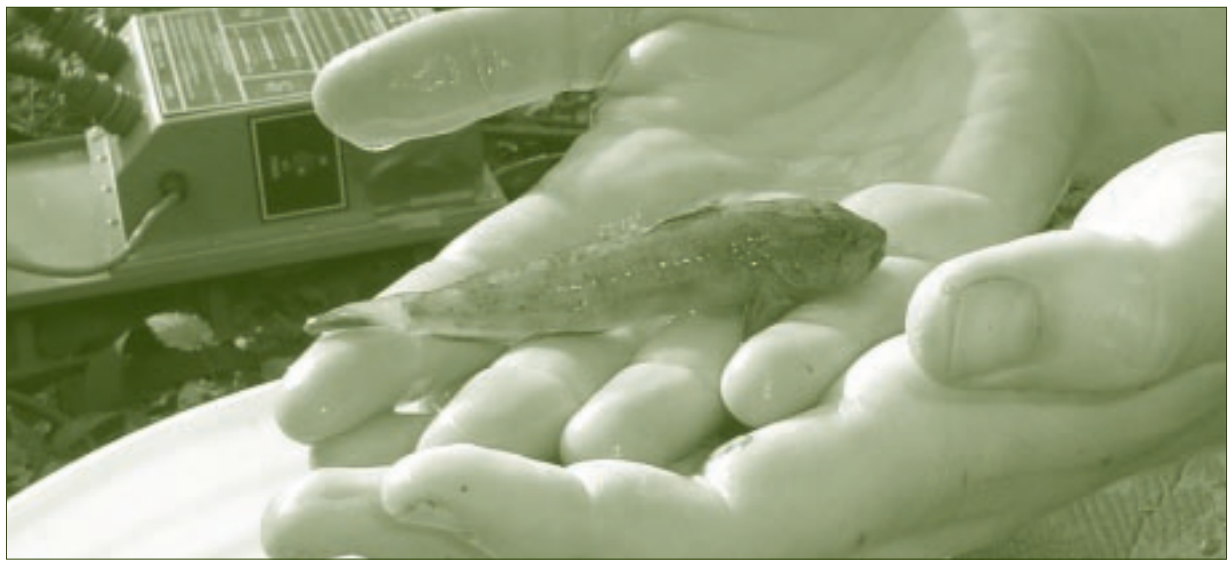
EDUCATION

What Fish Think, and Adventure Tourism

Ecology grad students delve into diverse issues



Brad Lamphere holding a mottled sculpin.

Brandie Fariss (right) on a field research visit to the Peruvian Andes.

Last summer, UNC's Ecology Curriculum formally aligned with the CEP, a move that has brought new opportunities for undergraduates and graduate students. We caught up with two doctoral students in Ecology to hear about their research:

The Fish Psychologist

Brad Lamphere wants to get inside fishes' heads, so he'll know what they're thinking. He wants to find out how much they move around in streams, and why they do it.

The self-proclaimed "fish psychologist" uses a technique called "mark-recapture" – he tattoos a number on each fish before releasing it, so that when he catches it again, he can see where it has moved and if it has grown.

Lamphere is studying the mottled sculpin, the most common fish in the Nantahala River and other cold-water streams in the North Carolina mountains. "The sculpin is an indicator of how well the stream is doing," he explained. "They are very happy in streams that are clean and don't have a lot of sediment or pollution, and they don't do well in streams that have been affected by development or pollution.

"If we get a better idea of how much these fish and other critters move around, we will be able to do a better job of assessing how much impact pollution or environmental changes have on them. As a result, we can do a better job of protecting them and focusing our resources in the right places."

Already, Lamphere has debunked the myth of the sculpin as "the ultimate couch potato fish" – previous studies had said that they rarely move around. "I've shown that they actually move as much as ten times as much as anyone has seen in previous work. If sculpin are moving more than people think, other fish probably are as well."

People and Parks

With an interest in highland landscapes and conservation, Brandie Fariss came to Carolina planning to look at people and parks issues in a mountainous region – she just wasn't sure where. Her advisor suggested the Peruvian Andes, and Fariss took several trips there to check it out. What she found was the Huascarán Biosphere Reserve, an area near the equator that encompasses the highest tropical mountain range in the world and has nearly 250,000 inhabitants relying on its resources for their livelihoods. Biosphere reserves are protected areas designed with the multiple and sometimes conflicting objectives of conservation and poverty alleviation – objectives commonly referred to as "conservation with development."

The Huascarán Biosphere Reserve is rich in biodiversity, with lots of unique and endangered species worthy of conservation. At the same time, the people who live there increasingly participate in the region's booming tourism industry. Reserve policy has encouraged tourism development as a means to alleviate poverty, and the past decade has seen a huge increase in the number of adventure tourists – mountaineers, climbers and trekkers – flocking to the area.

Fariss uses interdisciplinary tools to study the effects of the tourism industry on land use and indigenous resource management in the reserve. "What I'm interested in finding out is: Can you have conservation with development? If so, what types of development are conducive to the conservation objectives of biosphere reserves? What are the effects of the tourism industry on the way that people use and manage communal resources in this highland setting – and is adventure tourism sustainable and complimentary to the reserve's conservation objectives?"

For instance, she explained, tourists hire local people as *arrieros*, a lucrative job that brings a daily wage five times that of other wage earning opportunities available in the region. Arriero work involves the use of pack animals such as donkeys or horses to carry mountaineering gear to base camp. These animals are not native to the Andes. The opportunity to earn a good wage creates the incentive for local residents to buy more livestock ill-suited to the Andean landscape, which increases the number and changes the type of animals pastured in the core of the reserve. The goal of Brandie's research is to understand the ways in which tourism relates to the land use practices of local inhabitants and to determine how this use can be managed to ensure the conservation of a unique highland treasure. ■

Teacher training grants - Eastern North Carolina

continued from previous page

to provide not only educational materials, but also content information and follow-up support to help them make this subject come alive for their students."

Last fall, the ERP was also part of a collaborative team that received a grant of $40,000 from the Z. Smith Reynolds Foundation to present a three-day institute on water quality in eastern North Carolina. The project is a partnership between UNC, NC State University's The Science House and Elizabeth City State University's Math/Science Education Network Office.

The institute will be held this July at Elizabeth City State University (ECSU). It will include many aspects of *What's in the Water?*, plus presentations by local water quality experts who can connect the science to local issues. Middle and high school teachers from six surrounding counties are encouraged to attend. Teachers will receive science classroom modules and other resources, as well as stipends. In addition to gaining knowledge for themselves, participants will learn to train fellow teachers back at their schools.

ERP Associate Director Kathleen Gray is the principal investigator leading the Reynolds grant. "The beauty of this project," she said, "is that three strong environmental science education units are partnering to bring resources to an underserved portion of our state, and we're also building capacity in that region by giving participants the skills and confidence to share what they've learned with other teachers in their schools."

For more information on *What's in the Water?* or the summer teacher training at ECSU, contact Michele Kloda at mkloda@email.unc.edu or (919) 843-5735. ■