

RESEARCH

Focusing on the fundamentals: Ecology, Conservation and Biodiversity

Understanding what's at stake for our state, our country and our planet, Carolina continues to build its leadership in these three critical environmental areas

The combined discipline of ecology, conservation and biodiversity is a growing area of excellence at The University of North Carolina at Chapel Hill. In 2003, recognizing that ecology is critically important to understanding and addressing environmental issues, the Carolina Environmental Program formally aligned

with the university's successful Ecology Curriculum. This move has enabled the CEP to more broadly explore ecology's relationship to land conservation and the preservation of biodiversity.

UNC-Chapel Hill's leadership in ecology, conservation and biodiversity is evident in many corners of the campus.

Carolina is home to the North Carolina Botanical Garden, an award-winning, internationally respected biodiversity and conservation garden. The garden includes the N.C. Herbarium, a museum collection of 700,000 plant specimens that documents biodiversity of the flora of North Carolina and the Southeast. It is also one of eight founding gardens of a nationwide network to hold a Noah's Ark-like collection of germplasm diversity (like a gene bank, but for plants), and represents the southeastern U.S. in an international germplasm project. UNC was the first garden in the country to enact policies to restrict the distribution of invasive species that impact natural areas and reduce native biodiversity, and was the model for an international



North Carolina Botanical Garden

North Carolina Botanical Garden personnel in the field. Garden Director Peter White is one of UNC's leading ecology, conservation and biodiversity faculty.

series of voluntary codes of conduct for groups involved in the importation and distribution of plants in horticulture.

Peter White directs the Botanical Garden. White, a conservation biologist and plant ecologist who teaches conservation biology to graduate and undergraduate students, also chairs the

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North Carolina Botanical Garden

Controlled burning is important in the management of many fire-dependent ecosystems, such as North Carolina's beloved longleaf pine forests. Here, North Carolina Botanical Garden personnel use this important management tool in the Garden's Mason Farm Biological Reserve

RESEARCH

UNC's Safe Drinking Water Symposium Brings Professionals and Scholars Together

By Timothy Cox, CEP Spring 2006 Public Affairs Intern

Scholars, water resources executives and policy-makers from across the United States and beyond gathered at UNC's William and Ida Friday Center for Continuing Education on March 16 and 17, 2006 for "Safe Drinking Water: Where Science Meets Policy," a symposium presented by UNC's Carolina Environmental Program. The symposium was part of an ongoing effort at UNC to bring its immense water resources expertise to bear on the growing challenges involved with providing safe, reliable and plentiful drinking water for the people of North Carolina, the nation and beyond.

The two-day symposium was divided into three tracks that looked at water and human health issues in developing countries, little-known pollutants that are raising human health concerns, and water supply management and protection of watersheds. The symposium also highlighted international research in these areas.

Dr. Jamie Bartram, coordinator of water, sanitation and health for the World Health Organization, Benjamin Grumbles, assistant administrator for the Office of Water at the U.S. Environmental Protection Agency, and other internationally recognized scholars and practitioners from both public and private sectors presented research and led discussions. Students and faculty from various research universities and representatives from the Center for Watershed Protection and California's Department of Water Resources also participated.

CEP Director Doug Crawford-Brown believes that, with partnership of these experts, Carolina can continue its legacy of bringing safe and plentiful drinking water to people around the globe.

"The 'Safe Drinking Water' symposium accomplished exactly what we wanted: linking Carolina

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Jamie Bartram



Benjamin Grumbles

Carolina Environmental Program

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PHILANTHROPY

Dominion Power makes gift to the environment at UNC

Dominion Power has provided a \$78,101 grant to the CEP to fund the first year of what is expected to be a multi-year ecological research project on the Roanoke River. Led by Principal Investigator Robert Peet, chair of the Ecology Curriculum, the project will monitor the establishment and survival of tree seedlings in the floodplain of the Roanoke River basin.

The project will provide research, public service and educational benefits for North Carolina, and will foster a cooperative partnership between the stakeholders and researchers involved with the state's lower Roanoke Basin. Stakeholders include the N.C. Department of Environment and Natural Resources, The Nature Conservancy, the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service, as well as Dominion North Carolina Power.

"The goal of this project is to understand how seedling recruitment and survival respond to the operations of the upstream dams," said Peet. "From

our previous research we are convinced that the shift from short, high-intensity flooding to lower but much longer flooding that resulted from construction of upstream dams has had a major impact on tree regeneration. What is not yet known is the degree to which Dominion's dam operations impact tree regeneration and whether modest changes in those operations might significantly improve forest health."

The project team includes UNC undergraduate and graduate students, providing important field research opportunities and experiences for these students. This project is an extension of UNC's commitment to develop field sites and supply environmental service projects in counties throughout North Carolina.

Jim Thornton, technical consultant for Dominion Virginia Power, explained that Dominion is required by the Federal Energy Regulatory Commission to determine if its dam operations are impacting the bottomland hardwood forests in the lower Roanoke River. If impacts are documented, Dominion will take steps to reduce those impacts. This research project will be important in that it will assess the potential need for changes in dam operations, and will set the stage for subsequent evaluation of the consequences of implementing those changes.

"By partnering with UNC-Chapel Hill to perform these studies, Dominion ensures continuity of researchers who have previously studied the lower Roanoke ecosystems," said Thornton. "We also are excited to provide an opportunity to help develop a new generation of researchers by funding students to complete



On the Roanoke, a cypress tree dwarfs the staff of The Nature Conservancy

significant and meaningful research while obtaining advanced science degrees."

"We are gratified to have the support of Dominion Power for this important project," Peet stated. "We hope that our partnership will provide a model for how other corporations and researchers can team up to assess and modify important management policies in careful and ongoing fashion." ■



Wild turkeys roam the banks of the Roanoke River

FIELD SITES

New director named for Highlands Biological Station

Station, which includes CEP's Highlands Field Site for undergraduates, provides hands-on experience addressing ecology, conservation and biodiversity issues

By Tim Cox, CEP Spring 2006 Public Affairs Intern



James Costa

Dr. James Costa, who was previously the H. F. and Katherine P. Robinson Professor of Biology at Western Carolina University, has been named the new executive director of the Highlands Biological Station, a unit of the University of North Carolina System, and the new director of the CEP's Highlands Field Site.

The fall-only undergraduate site is based at the Station.

The Highlands area is known for its diversity of plant and animal life, and also faces increasing pressure from residential and commercial development and recreational usage. These factors make the Highlands Biological Station and Highlands Field Site a unique location for the study of biological conservation, ecology and biodiversity — a growing area of excellence at Carolina (see page 1).

UNC Vice President for Research and Sponsored Programs Russ Lea called Costa "a naturalist in every sense of the word. He has demonstrated expertise at all

levels, from macro to micro. That is the type of individual we need to lead a station like this."

Costa, who was a post-doctoral fellow in population genetics and molecular evolution at Harvard University and remains an associate research scientist there, has taught classes in entomology at the Highlands Biological Station every other summer since 1999. He is the author of *The Other Insect Societies*, recently published by Harvard University Press.

Costa was appointed executive director in February 2006 and immediately began working with CEP Director Doug Crawford-Brown and other CEP staff to plan for the 2006 Highlands Field Site program, underway now.

"I have long hoped that the university campuses could help the region find the delicate balance needed between development and conservation, while training students to work with communities in finding that balance, and Jim is the person to lead that charge," Crawford-Brown said.

Costa and Crawford-Brown are developing a new vision for the site, focusing on the interplay of develop-

ment and conservation pressures facing the site's service area. Their vision includes an internship and an in-depth Capstone group research project that students complete while at the field site.

"The Capstone will be a multi-layer landscape analysis of land use on the Highlands plateau and environs," Costa noted. "We want to look at the historical data and the current situation and project where development is going in the area."

This information will help set conservation priorities and, ideally, help inform policy and management decisions. Costa expects students will examine aspects of the history, ecology and biogeography of the site to better understand the processes that have shaped the biodiversity of the region and what tools can be used to help safeguard that biodiversity.

Costa adds that the field site will evolve. "I will work, with the folks from UNC, to forge a productive relationship between the Highlands Biological Station and the Carolina Environmental Program and its Highlands Field Site." ■

O U T R E A C H

Outreach programs give NC educators tools, knowledge to teach environmental topics

Partnership, grant provide opportunities to help teachers engage students in addressing pressing environmental issues

In June, the CEP's Environmental Resource Program (ERP) teamed up with the U.S. Environmental Protection Agency's Office of Air Quality Planning and Standards and its Office of Research and Development to sponsor an Environmental Science Institute.

Twenty North Carolina educators participated in the three-day Institute, which was held at the EPA's facility in Research Triangle Park. The group included K-12 classroom teachers and environmental educators from the N.C. Department of the Environment and Natural Resources and other organizations.

ERP staff members led workshops and hands-on activities on the link between air pollution and children's health, how environmental health risks compare to other risks we might experience in life, and how pollution moves through soil to contaminate groundwater. ERP also described cutting-edge UNC research on how to clean up groundwater pollution. EPA experts shared information on air quality issues and emerging research, and led participants through an activity to answer the question: "How big is your ecological footprint?" The teachers learned how EPA manages air quality and tested for ozone using coffee filters, corn starch, potassium iodide and water. They used different methods to collect particulate matter and observed and analyzed lichens as air quality indicators. The group also toured the EPA's new "green building," which was designed to incorporate environmentally friendly materials and systems.

"This program has shown the synergies our organizations can achieve by working together. Sharing cutting-edge environmental information with educators helps them to raise awareness around our state."

ERP Director Kathleen Gray



Students from the NC Museum of Life and Science Youth Partners program (left and bottom) and from Orange High School (center) pilot test activities to be used in CEP's environmental science workshop.



Participants called the program "fabulous, interesting, and stimulating," and many said they found the activities valuable and easily transferable to teach students of all ages and learning styles about these important topics.

Donna Rogers, an EPA environmental protection specialist and environmental education coordinator who helped organize the Institute, said, "This program gave participants an opportunity to better understand environmental issues and participate in inquiry-based activities. The Institute demonstrates how EPA's partnership with UNC's Environmental Resource Program promotes environmental education so effectively: teaching teachers, who then teach students, who grow up to become environmental stewards."

ERP Director Kathleen Gray agrees, and said that the ERP and EPA hope to sponsor more joint activities in the future. "This program has shown the synergies our organizations can achieve by working together. Sharing cutting-edge environmental information with educators helps them to raise awareness around our state. As a result, we will ultimately have a more informed citizenry and more informed leaders for the future."

The Environmental Science Institute was funded by the Carolina Environmental Program and the EPA, as well as UNC's HOPE Partnership and its Superfund Basic Research Program.

The Z. Smith Reynolds Foundation has awarded a one-year, \$35,000 grant to the Environmental Resource Program and the Civic Education Consortium of the

UNC School of Government. The grant is to develop a program to train approximately 25 high school science and social studies teachers from around the state in an innovative, cross-curricular approach to teaching about local government through the lens of one of our most pressing environmental issues: global climate change.

The program will prepare educators to teach students about the science behind climate change and carbon reduction, as well as explaining how local government works. If subsequent funding allows, ERP and CEC will assist teachers in supporting students as these young adults meet with politicians in their communities to educate them on this important environmental issue. The teacher training workshop will be conducted in summer 2007. ■

Safe Drinking Water Symposium – continued from page 1



Phil Singer

faculty to the major decision-makers in the state, nation and world, and defining where we face the greatest challenges in translating sound science into effective policy on water quality and quantity.

"Our water program, which includes faculty in a number of departments and professional schools, is considered one of the best in North America," Crawford-Brown noted. "We feel, therefore, that UNC is a natural host

for this type of symposium, and that the event's focus on issues such as water and human health in developing countries will help participants find solutions to these critical challenges."

Dr. Phil Singer, Daniel A. Okun Distinguished Professor of Environmental Engineering and director of the UNC Drinking Water Research Center, co-led the symposium with Crawford-Brown and Environmental Finance Center Director Jeff Hughes. Singer, who also presented, was pleased with the outcome. "It was a wonderful opportunity to hear scientists talk about the policy implications of their work, and to observe how

policy-makers are using the science available to them."

"Safe Drinking Water: Where Science Meets Policy" was sponsored by UNC's Carolina Environmental Program, the School of Public Health Department of Environmental Sciences and Engineering-based Drinking Water Research Center, and the School of Government-based Environmental Finance Center; and was made possible in part by support from AWWA Research Foundation (AwwaRF); California Department of Water Resources; Educational Foundation of America; Dr. Chen-Yu Yen and Gannett Fleming, Inc.; and Hazen & Sawyer, P.C. ■

Hail to the Class of 2006! The 2006 CEP Graduation



▲ UNC Department of Public Policy Chair and Lambeth Distinguished Professor of Public Policy Pete Andrews congratulates students and parents.

▼ The CEP unit commencement was held on Miller Hall Lawn



▼ Graduates listen to the unit commencement speech by Environmental Defense Regional Director Jane Preyer



▲ Proud CEP graduate Allison Carr (right).



Focusing on the fundamentals – continued from page 1

nation's largest biological inventory project in the Great Smoky Mountains National Park.

"North Carolina is richly endowed with biodiversity that is both part of our cultural and environmental identity and which supports how – and how long – we live," White noted. "It is very much a part of tourism in our state, and it is an important part of our economy since horticultural activities have replaced tobacco as one of North Carolina's leading agricultural economic values. The underpinning of environmental quality and sustainability is biological diversity."

Multidisciplinary Research

Across the UNC campus, researchers are pursuing a wide range of projects. Several are focused on our ecosystems, which include wetlands that purify drinking water and systems that add oxygen to the atmosphere, buffer society from disease, and provide other vital natural services that we depend on to live. One interdisciplinary team is studying how dams built on rivers influence downstream ecosystems, and how to manage water flow over those dams to maintain the biodiversity downstream (for related

story, see Dominion gift article on page 2).

Others are exploring how human settlement patterns affect the services that ecosystems provide, and how we can preserve these systems to maintain these natural services, rather than having to build services to replace what we've lost. Yet another group is studying human impacts on estuarine systems in coastal areas.

A UNC investigator is working with Fort Bragg on how the military can manage the landscape there to promote the well-being of rare and endangered species. And Carolina investigators are partnering with the NC Department of the Environment and Natural Resources and several conservation groups through *One North Carolina Naturally* to conserve a million acres in ways that preserve natural services. UNC's scope reaches internationally as well, with investigators traveling to South America, Africa, Thailand and other sites to explore the interaction between humans and the natural landscape.

Robert Peet, chair of the UNC Ecology Curriculum, is involved with the Carolina Vegetation Survey, where biologists across the Carolinas are collectively documenting how vegetation varies across the landscape of the state, and working with state officials to help guide conservation and restoration efforts.

Graduate and Undergraduate Education

For more than three decades, UNC has offered a distinctive graduate program in Ecology for master's and doctoral candidates that emphasizes multidisciplinary exploration of the interactions between humans and natural systems and demonstrates the value of integrated approaches to solving current and future environmental problems in North Carolina, the U.S. and the world.

Several years ago, the CEP added Ecology, Conservation and Biodiversity as a concentration for undergraduate Environmental Science and Environmental Studies majors. Like the graduate program, this interdisciplinary concentration fosters an understanding and appreciation of ecological systems and demonstrates the value of ecological approaches to solve environmental challenges. In addition, the CEP's



▲ An aerial photo of the Roanoke Rapids Dam on the Roanoke River. UNC ecology, conservation and biodiversity faculty have partnered with Dominion Resources and Duke Energy to study ecosystems in river basins with dams maintained by these companies.

Highlands Field Site focuses specifically on this area (see article about new director, page 2). The interdisciplinary faculty for both the graduate and undergraduate programs spans 11 departments across the UNC campus.

UNC senior Andrew Roe participated in the CEP's Highlands Field Site in 2004. "It was an incredible opportunity to study the unique ecology and history of a part of North Carolina that I love. Our natural heritage is incredibly important and increasingly under threat. I think an understanding of natural processes and interactions should be a basic requirement for everyone."

Peet agrees. "Ecology, conservation and biodiversity are disciplines fundamental to any forward-thinking action on environmental issues. You must know how the system works, and the processes that are going on, in order to begin to solve the problem."

CEP Director Doug Crawford-Brown believes that the issue of how land is going to be conserved in the face of increasing development pressures is one of the major environmental issues facing North Carolina and this country. "UNC-Chapel Hill has a long history of dealing with ecological issues, but we now need to harness these resources so we can build our expertise in this area to better serve our state and our country." ■



Robert Peet

"The world is rapidly changing — through climate change, invasive species, pollution and habitat degradation. We are experiencing an unprecedented loss of the earth's biodiversity... As our knowledge about biodiversity — genes, species, populations, ecosystems — increases, we can better understand how to ensure its continued existence."

Meghan McKnight, doctoral candidate in the Ecology Curriculum

PHILANTHROPY

CEP board gets new member

The Carolina Environmental Program is pleased to welcome North Carolina Representative **Pricey Taylor Harrison** to its Board of Visitors. We appreciate our board members' willingness to volunteer their time to serve the CEP and UNC-Chapel Hill.

Representative Harrison, of Guilford County, was elected to the N.C. House of Representatives in 2004 to represent the 57th District. In the Legislature, she

has been a champion of environmental issues. She sponsored legislation to create tax credits for energy-efficient housing, renewable energy, and alternative fuel initiatives; supported the creation of a legislative study commission on global warming and climate change; and supported legislation requiring lower emissions for cars and the elimination of mercury in our schools and retail products. She successfully pursued

ratification of legislation ensuring that North Carolinians have safe and healthy drinking water, as well as a 12-month moratorium on giant mega-landfills.

Representative Harrison is a graduate of Duke University and the UNC-Chapel Hill School of Law. She has dedicated more than 30 years of her life to making North Carolina a better place to live. She has worked to protect our state and its natural resources as a member

of the Legislative Study Commission on Smart Growth and has served on the boards of such organizations as N.C. Environmental Defense, Save Our State (now Sustainable North Carolina), and the Southern Environmental Law Center. Speaker Jim Black appointed Representative Harrison to the Environmental Review Commission, and she is chair of the House Environment and Natural Resources Committee. ■

PHILANTHROPY

Carolina Environmental Program Honor Roll 2005/2006

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Recent CEP Events

Leading ecological economist, author speaks at Carolina



Robert Costanza

Dr. Robert Costanza, whose research focuses on the inter-relation of the Earth's ecology and the worldwide economy, presented a lecture on "Ecological Economics: Creating a Sustainable and Desirable Future," at UNC-Chapel Hill on April 11, 2006.

The free event, which included a reception, was part of the Carolina Environmental Program's 2005-2006 Environmental Seminar Series. Costanza, a noted author, is the Gund Professor of Ecological Economics and director of the Gund Institute of Ecological Economics at the University of Vermont, and was previously director of the University of Maryland Institute for Ecological Economics. He is co-founder and past president of the International Society of Ecological Economics and was chief editor of the society's journal, *Ecological Economics*, from its founding until 2002. He also is past president of the International Society for Ecosystem Health.

Green building expert gives keynote at UNC's Earth Day Celebration

Greg Kats, a "green building" expert, was the keynote speaker at UNC's annual Earth Day celebration on April 19, 2006. His talk was titled "Climate Change, Energy Policy and National Competitiveness... Where



Greg Kats

Are We Going?" Students and other members of the UNC community came to hear Kats speak and to meet him at the following reception. Kats is a principal of Capital E, a clean energy technology consult-

ing firm for Fortune 500 and public sector clients, and a senior adviser to Cherokee Investment Partners of Raleigh, N.C. He is a former director of financing for energy efficiency and renewable energy at the U.S. Department of Energy and is an author of *Green Office Buildings: A Practical Guide to Development*. He is a 1981 English graduate of UNC and was a Morehead Scholar at Carolina. He also holds advanced degrees from Stanford and Princeton Universities.

Environmental Defense regional director, UNC graduate speaks at 2006 CEP commencement reception

On May 14, 2006, about thirty Environmental Science, Environmental Studies and Environmental Health Science graduates and their families were honored at a CEP commencement reception (see photos on page 4). The featured speaker was Jane Preyer, '76, '91, regional director for Environmental Defense, an environmental nonprofit that finds "innovative, practical ways to

Upcoming CEP events

2007 UNC Earth Day Speech:



Fred Krupp, President, Environmental Defense, April 18, 2007, 7 p.m., Sonja Haynes Stone Center for Black Culture and History Auditorium.

CEP Annual Commencement Reception:

May 13, 2007, 1:00 p.m., Miller Hall Lawn, speaker t.b.d.

solve the most urgent environmental problems." Preyer told the graduates she feels environmental challenges are the most important and timely issues facing us, and that one of the best ways to make an impact is through working to find solutions to these challenges. ■



Jane Preyer

Carolina Environmental Program

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