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Clemson University

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# ICE Research News

A Publication of the **Institute of Computational Ecology**

## Introducing the Institute of Computational Ecology

Clemson University trustees acknowledged a paradigm shift to data-intensive science by approving the renaming of Clemson's Institute of Applied Ecology to the **Institute of Computational Ecology (ICE)**.

The name change is intended to better reflect the big-data focus of the institute's research, education and economic development initiatives, while underscoring strong interdisciplinary connections to Clemson's Public Service Activities (PSA), College of Agriculture, Forestry and Life Sciences (CAFLS), College of Engineering and Science (CES), and the Restoration Institute (CURI). The institute program structure will remain the same.

"The institute leads cyberinfrastructure and computing programs that enable improved understanding and management of both natural and built environments," said Eidson, institute director. "Being known as the Institute of Computational Ecology better reflects the institute's leadership in developing, piloting and packaging innovative technology solutions, and this will provide a clear picture to potential fellows, partners and funding agencies of the

interdisciplinary threads that drive the institute's work."

ICE is developing a Fellows Program, which will be open to all interested faculty who participate and remain active in the institute's research and education programs. Details will be announced soon.

Major ICE programs include the Intelligent River® Research Enterprise and the EPA-designated Center for Watershed Excellence (CWE), which recently had its MOU renewed by U.S EPA Region 4 and S.C. DHEC for another five years. The evolving project teams of Intelligent River® Research Enterprise develop forward thinking applications and remote data acquisition systems that transmit a constant flow of real-time environmental data to more decision makers at a lower cost. The Intelligent River® Research Enterprise has been one of the most significant catalysts for the shift toward data-intensive science with the rapid development and deployment of wireless sensor networking technology, coupled with tremendous advances in data storage, data processing and data visualization technologies. Visit the new ICE website at [www.clemson.edu/computationalecology](http://www.clemson.edu/computationalecology).

## Intelligent River® Team Hosts EPA Water Chief

U.S. EPA Water Chief Nancy Stoner visited Clemson University in May to meet with the Intelligent River® project team and discuss the innovative technology and applications. Clemson was one of three universities chosen for the visit, which is meant to support and inform EPA's Technology Innovation Blueprint initiative to identify water sector market opportunities. S.C. DHEC Director Catherine Templeton attended the event along with S.C. DHEC Bureau of Water and state legislature representatives. After an open-attendee presentation and luncheon, the visit concluded at the Calhoun Field Laboratory for a field demonstration of the Intelligent River® component of the Hunnicutt Creek Restoration Project.

"EPA is committed to fostering the use of innovation and technology to advance our common goal of clean and safe water," Stoner said. "We need to discover new ways forward to meet today's demands and tomorrow's challenges, and projects like Clemson's Intelligent River® help address these critical issues."

In 2011, the National Science Foundation's Major Research Instrumentation program awarded the university \$3 million to design, develop and deploy a basinwide network of computerized sensors to monitor water quality along the Savannah River and provide real-time data at a scale that until now was cost-prohibitive. For more project information, visit [www.clemson.edu/public/ecology/savannah/index.html](http://www.clemson.edu/public/ecology/savannah/index.html).



U.S. EPA Water Chief Nancy Stoner examines a MoteStack.



Dr. Cal Sawyer discusses the Hunnicutt Creek project.

Photos by: Craig Mahaffey, Clemson University

## Clemson Center for Watershed Excellence Recognized for Success and Renewal

CENTER for  
WATERSHED  
EXCELLENCE



U.S. EPA Region 4 and S.C. DHEC renewed Clemson's Center for Watershed Excellence (CWE) for another five years, recognizing its work to help protect and improve water quality in South Carolina. Clemson's is the first of 10 Southeast centers to be renewed.

Created by EPA's Region 4 Water Protection Division, the Centers of Excellence for Watershed Management Program utilizes the diverse talents and expertise of colleges and universities to provide hands-on, practical products and services so that communities can better identify watershed problems and develop viable solutions. A recognized Center must demonstrate technical expertise in identifying and addressing watershed needs; involve its academic community in watershed planning, protection and restoration; be self-sustaining; and partner with other institutions.

CWE is part of the Institute of Computational Ecology and has been instrumental in developing the biennial S.C. Water Resources Conference, fostering regional stormwater education consortiums through its Carolina Clear waterway protection and pollution prevention program, demonstrating the utility of green infrastructure practices to reduce stormwater runoff in Aiken, and promoting the use of Intelligent River® technology, which provides real-time remote data acquisition at the river-basin scale. CWE's 2012 annual report is available on the center website at [www.clemson.edu/watershedcenter](http://www.clemson.edu/watershedcenter).

### Funds Approved for Aiken Hydrological Evaluation Project

The Aiken City Council approved \$367,000 for the Hydrological Evaluation of the Sand River Headwaters Stormwater Infrastructure Project proposed by ICE. The hydrological investigation builds on the Sand River Headwaters Green Infrastructure project and provides continued steps to better understand the urban watershed boundaries and sources of stormwater discharge. The results would help prioritize future strategic green infrastructure installations.

The objective of the green infrastructure project was to reduce the impact of stormwater by implementing natural treatment systems such as parkway bioswales and pervious pavement in select locations of downtown Aiken. The final research report is available on the project website at [www.clemson.edu/watershedcenter/aiken\\_green](http://www.clemson.edu/watershedcenter/aiken_green).



**Intelligent Farm™**  
*from observational to operational™*



### Intelligent Farm™ Receives Wells Fargo Award

Wells Fargo Foundation has awarded \$100,000 through its Clean Technology and Innovation Grant Program to support the Intelligent Farm™, a project of the Intelligent River® Research Enterprise. The Wells Fargo program fosters innovative clean technologies and supports the growth of green jobs. The Intelligent Farm™ uses computers, satellites, field sensors and communication towers to provide real-time information that can improve farmers' decision-making and enhance farm prosperity, environmental sustainability and food security.

The goal of the Intelligent Farm™ research is to provide the latest technological tools to growers and consultants, such as Clemson Extension agents and specialists, who can make better-informed decisions on where and how much water and fertilizer are needed. Previous research on targeted applications has shown a 15 percent savings of water, and a 25 percent energy savings, leading to increased farm profits. Nitrogen, an essential fertilizer, poses a special challenge. Industrially produced nitrogen fertilizer is both costly to farmers and to the environment if overused. Sensor-based, site-specific application at a variable rate can reduce nitrogen use by 47 percent, say Intelligent Farm™ researchers.

Intelligent Farm™ co-principal investigator Ahmad Khalilian is a pioneer in the precision agriculture program for Clemson. Khalilian developed the concept of variable-rate nematicide application based on soil type. Using global positioning systems (GPS) linked to soil conductivity meters, this technology enables farmers to apply nematicides only where needed. The destructive microscopic worms cause more than \$300 million in cotton crop losses each year.

[www.clemson.edu/computationalecology](http://www.clemson.edu/computationalecology)

## Become a Contributor to the 2014 S.C. Water Resources Conference

The 2014 S.C. Water Resources Conference (SCWRC) will be held October 15 and 16 at the Columbia Metropolitan Convention Center. ***Nine contributors from the 2012 event have pledged their support for 2014.*** The purpose of the SCWRC is to provide an integrated forum for discussion of water policies, research projects and water management in order to prepare for and meet the growing challenge of providing water resources to sustain and grow South Carolina's economy, while preserving our natural resources.

Each of the past three conferences brought together over 300 participants from colleges and universities; municipal water authorities and entities; environmental engineering, consulting and law firms; state and federal agencies; nonprofit organizations; economic development associations; utility companies and land trusts. The 2012 plenary speakers included S.C. Commerce Department Secretary Robert Hitt; S.C. DHEC Director Catherine Templeton; S.C. DNR Director Col. Alvin Taylor; and a legislative panel moderated by Sen. Paul Campbell featuring Sen. Vincent Sheheen, Sen. Phil Leventis, Rep. David Hiott, Rep. Nelson Hardwick and Rep. Don Bowen.

The 2012 Major Contributors included Clemson University Restoration Institute, Duke Energy, Santee Cooper, Charleston Water System, Greenville Water, YSI and the SC Energy Office. Supporting contributors included Clemson University Strom Thurmond Institute, Coastal Carolina University's Waccamaw Watershed Academy, College of Charleston Environmental Studies Graduate Program, SC DHEC Bureau of Water, SC Sea Grant Consortium, SCANA and U.S. Geological Society.

Contributor levels for the 2014 event, along with past proceedings, plenary presentations, video interviews and media coverage are available on the conference website at **[www.scwaterconference.org](http://www.scwaterconference.org)**. The first call for abstracts will be announced at the end of January 2014.



## Carolina Clear Highlights

**AWARDS:** The Ashley Cooper Stormwater Education Consortium was a recipient of the Captain Pride Award at the Community Pride, Inc. of Charleston County's 47th Annual Awards Luncheon in May. The Captain Pride Award is given to the top 10 individuals, businesses, governments or civic organizations that have undertaken tasks that have significantly improved the environment.

**H2OWNERSHIP:** *An Introduction to Porous Pavement* is the newest release in the H2Ownership series. The series features educational fact sheets about water resource and stormwater topics including: *Shorescaping Freshwater Shorelines; Illicit Discharges and Water Pollution; Floating Wetlands - Container Gardens For Your Pond; and Resident Canada Geese.* Find the H2Ownership series online at **[www.clemson.edu/extension/hgic/water/resources\\_stormwater](http://www.clemson.edu/extension/hgic/water/resources_stormwater)**.

Carolina Clear is a stormwater education and awareness program of Clemson's Restoration Institute and Center for Watershed Excellence, delivered in

partnership with Clemson Extension. The program provides compliance-appropriate outreach and involvement opportunities in partnership with more than three dozen South Carolina communities and statewide non-profits, government agencies and outreach partners. The program seeks to strategically identify target pollutants and behaviors, and the best method of outreach delivery, to achieve sustainable behavior change to benefit water resource protection.

The past year's program activities have included homeowner and professional stormwater solutions workshops, permit and regulatory change presentations, and the operation of watershed-based camps providing youth with education about the state's unique water resources. To learn more about Carolina Clear, visit **[www.clemson.edu/carolinaclear](http://www.clemson.edu/carolinaclear)**.



# Linking Land Use, Water, Energy and Climate Change

The **Institute of Computational Ecology (ICE)** is applications-driven, bringing together an entrepreneurial and interdisciplinary faculty with an applied focus to develop, pilot and package innovative solutions for sustainable natural resources. Major programs include the EPA-designated Center for Watershed Excellence and the Intelligent River® Research Enterprise. ICE is affiliated with two SmartState Program™ Centers of Economic Excellence: the Sustainable Development Center and the Urban Ecology and Restoration Center.

ICE supports Clemson University's sustainable environment focus area by expanding opportunities for faculty and students to participate in statewide watershed management programs. The institute designation formalizes the efforts of the faculty who are driving transformative science and technology in the areas of river basin-scale ecology, green infrastructure, ecological restoration and sustainable natural resources.

The ICE offices on campus are located at 230 Kappa Street in the Strom Thurmond Institute building. In July of 2012, ICE opened a second office location and laboratory at Edisto Research & Education Center in Blackville to assist faculty in developing the Intelligent Farm™ and its associated technologies. ICE news, project details and other information is available on the website at [www.clemson.edu/computationalecology](http://www.clemson.edu/computationalecology).



Graduate student Jeremy Pike installs a MoteStack at the Hunnicutt Creek stream restoration project site on campus.



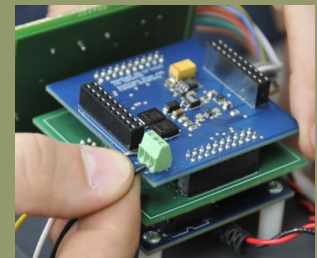
EPA Campus Visit: EPA Water Chief Nancy Stoner sits with DHEC Dir. Catherine Templeton and EPA Region 4 Water Protection Div. Dir. Jim Giattina.



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## Project Highlights

Intelligent River® NSF MRI Savannah River Deployment  
Intelligent River® Viewing Room Opening  
Aiken Hydrological Evaluation  
2014 S.C. Water Resources Conference



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