



## DEPARTMENT *of the* INTERIOR SE CLIMATE SCIENCE CENTER

# ANNUAL REPORT FY12-13

*The question is no longer whether “global” changes in land use and climate will happen. Instead, the question is whether the Earth’s inhabitants will be able to manage such changes in a way that enhances the sustainability of the coupled human and natural systems on which the integrity of life on Earth depends. Detecting and understanding these changes and understanding the day to day and long term priorities that we seek to safeguard will provide a framework for adapting to these global changes: resisting degradation in these systems when possible, fostering resilience to the degree practical, and working toward the transformation of these coupled systems when necessary, to facilitate the transition of these coupled systems to new, sustainable states. - Gerard McMahon, SE CSC Director*

## ACCOMPLISHMENTS

*The Department of the Interior Southeastern Climate Science Center (SE CSC) provides scientific information, tools and techniques that land, water, wildlife and cultural resource managers and other interested parties can apply to anticipate, monitor and adapt to climate and ecologically-driven responses at regional-to-local scales. We are pleased to report on some of our activities in FY2013 that contribute to these objectives.*

- ▶ 10 new science projects totaling \$800K in funding
- ▶ 7 new Global Change Fellows representing six colleges at NC State University
- ▶ Created quarterly review process of science funded projects
- ▶ FY11 & FY12 SE CSC funded research was featured in 16 publications
- ▶ Launched monthly e-newsletter
- ▶ Ecological Society of America Panel accepted on climate science center research with two SE CSC Global Change Fellow panelists
- ▶ New SE CSC logo developed
- ▶ Grand Opening Planned for Jan 2014

## OUR GROWING TEAM

In FY12-13 we made 4 new staff hires. View all staff: [globalchange.ncsu.edu/secsc/staff/](http://globalchange.ncsu.edu/secsc/staff/)



**ARANZAZU LASCURAIN**  
Program Coordinator



**ADAM TERANDO**  
Research Scientist



**ELDA VARELA MINDER**  
Research Associate



**MITCHELL EATON**  
Research Ecologist

## FEATURED PROJECT: IMPACT OF OCEAN WARMING AND ACIDIFICATION ON GROWTH OF REEF-BUILDING CORALS

**PI:** Ilsa B. Kuffner, Ph.D., Research Ecologist, USGS St. Petersburg Coastal and Marine Geology Science Center. Funded in FY 2011



Coral reefs are massive, bio-mineralized structures that protect coastlines by acting as barriers to coastal hazards such as hurricanes, tsunamis, and other assaults. They also provide sand for beaches, support tourism and recreational industries, and provide essential habitat for fisheries. The continuing global degradation of coral reef ecosystems is well documented, and declines in coral populations are largely a result of ocean warming via coral bleaching and disease mortality. Land-use change is an additional, localized stressor on many reefs in close proximity to centers of human population. Another emerging threat to reefs resulting from global change is ocean acidification, a term used to describe the changes in chemistry that are occurring as the oceans absorb near a third of anthropogenically produced carbon dioxide.

**RESULTS:** Eight coral cores from three species were obtained from Flat Cays on St. Thomas, and Steven Cay and Hurricane Hole in St. John. So far, laboratory analyses have been conducted on one of the coral cores, a colony of the massive coral *Siderastrea siderea* collected in Coral Bay, St. John (see [Reich et al. 2013](#)). Strontium-to-calcium ratios (Sr/Ca) were measured over an approximately 44-year-long record, and indicate that terrestrial inputs of sediment and freshwater can disrupt the chemical balance and subsequently complicate the utility of Sr/Ca in reconstructing historical sea-surface temperature (SST). The influence of the terrestrial fingerprint on local seawater chemistry makes utilizing Sr/Ca as a SST proxy in near-shore environments in the USVI difficult, but conducting additional trace metal analyses (e.g., barium, yttrium) could render these samples highly valuable to disentangle the effects of climate and land-use change.

Read more about this project and other SE CSC funded research at [globalchange.ncsu.edu/secsc/projects/](http://globalchange.ncsu.edu/secsc/projects/)

## SDM TRAINING AT NCTC

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The SE Climate Science Center took nine graduate students and four of its staff to the National Conservation Training Center (NCTC) for a week-long training in Structured Decision Making (SDM). The course, which took place August 19-23 in Shepherdstown, WV, was an intensive introductory course to gain the basics in the use of SDM to help structure conservation management problems. As land management options have narrowed and issues become more complex, many managers are turning to processes that examine and evaluate a problem in a more structured way. Managers and administrators are seeking objective, replicable, and explicit ways to assess choices and the probable outcomes of those choices in order to make better decisions under uncertainty. Key SDM concepts include making decisions based on clearly articulated fundamental objectives, dealing explicitly with uncertainty, and responding transparently to legal mandates and public preferences or values in decision making; thus, SDM integrates science and policy explicitly.

This professional development opportunity will provide our SE CSC community with a deeper understanding of the use of SDM to approach difficult and complex problems in natural resource stewardship under climate change and how to arrive at an optimized decision given competing values and uncertainty. The newly trained cohort will continue to work with SDM and apply it to SE CSC funded projects throughout the coming academic year.

For more information on SDM, visit the NCTC resources page at: [nctc.fws.gov/courses/SDM/home.html](http://nctc.fws.gov/courses/SDM/home.html)

## GLOBAL CHANGE FELLOWS

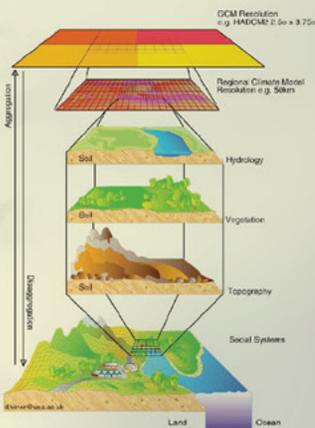
The SE Climate Science Center selected seven NC State University graduate students to serve as Global Change Fellows for the 2013-14 academic year. The Global Change Fellowship is a program designed to provide financial, scientific, and professional development support for graduate students who are interested in multidisciplinary research related to climate and global change. Congratulations to these exemplary students of change. Read more about their research at [globalchange.ncsu.edu/global-change-fellows/](http://globalchange.ncsu.edu/global-change-fellows/)

## RESEARCHER SPOTLIGHT

Adrienne Wootten, Ph.D. student and GCF Alumnus, sits down to answer some questions about her graduate research and share her perspective on global change.

### What are you currently working on?

While trained as a meteorologist and statistician in my undergraduate career, my work has moved progressively toward applied climatology, climate change, and downscaling. Downscaling is a powerful tool, if used appropriately, to aid local decision making about climate change and seasonal forecasting across multiple sensors. My current work involves synthesizing the climate information available for ecological modeling and decision making in the Southeast. The uncertainty in these datasets is also of interest to me.



In fact, there are many remaining questions about the propagation of error and uncertainty from the global climate models, through the process of downscaling, and into the modeling of impacts. Uncertainty is an important factor in structured decision making, but also with regards to discussing climate change with the public. As such, I am hopeful that my Ph.D. work and future career will consider new ways to assess and represent uncertainty from climate modeling and impact assessments with regards to the needs of different applications. *Continue reading at* [globalchange.ncsu.edu/adrienne-wootten/](http://globalchange.ncsu.edu/adrienne-wootten/)



### STEVEN GRODSKY

Steve is helping to understand the potential environmental consequences of harvesting wood biomass for use in green energy production.



### MICHAEL JUST

Michael is investigating how climate interacts with fire to regulate wetland vegetation in longleaf pine landscapes.



### AYSE KARANCI

Ayse will be exploring the impacts of sea level rise and vulnerability on coastal landforms.



### JENNIFER NIEMUTH

Jennifer is studying the physiologic basis of cold stun in sea turtles to better understand their susceptibility to climate change and to predict future cold stuns events.



### KARA SMITH

Kara is focusing on criteria for combining multiple downscaled climate model datasets to produce metrics that can be used in ecological models and related management decisions.



### TYSON WEPPRICH

Tyson is researching how insects will respond to climate change and urbanization.



### DAVID ZIETLOW

David is studying energy and water balances of contrasting forest types in the lower North Carolina coastal plain with a focus on the effects of land use and climate change on evapotranspiration.

## SE CSC FY13 PROJECTS

The SE Climate Science Center announced its FY2013 climate science research funds. The ten funded studies, plus one that will be conducted jointly with the Northeast CSC, will focus on how climate change will affect natural resources, and management actions that can be taken to help offset such change. Please visit: [globalchange.ncsu.edu/secsc/projects/](http://globalchange.ncsu.edu/secsc/projects/)

### NEW FY13 PROJECTS

**Development of a SECAS Conservation Decision Guidance Library.** - Nils Peterson and Fred Cabbage, NCSU

**Understanding Conservation Management Decisions in the Face of Sea-Level Rise Along the U.S. Atlantic Coast.**  
- Damian Shea, NCSU

**Developing Multi-Model Ensemble Projections of Ecologically Relevant Climate Variables for Puerto Rico and the US Caribbean.** - Ryan Boyles, NCSU

**Evaluation and Downscaling of CMIP5 Climate Simulations for the Southeast US.** - Phil Mote, Oregon State University; and John Abatzoglou, University of Idaho

**Tree Eaters: Predicting the Response of Herbivores to the Integrated Effects of Urban and Global Change.**  
- Rob Dunn, NCSU

**Measuring Effects of Restoration and Ecological Change on Bird Populations in the GOM: A Strategy for Monitoring Bird Populations and Habitats as Indicators of Ecosystem Function and Health.** - Mitch Eaton, SE CSC

**Application of Structured Decision Making for Delivery of Instream Flow Ecology For Water Governance Decisions in the Southeastern U.S.** - Elise Irwin, AL USGS Cooperative F&W Research Unit; and Rachel Pawlitz, SE Ecological Science Center

**An Adaptive Landscape Planning and Decision Framework for Gopher Tortoise (*Gopherus polyphemus*) Conservation.**  
- Clint Moore, University of Georgia

**Dynamic Reserve Design in the Face of Climate Change and Urbanization.** - Stephanie S. Romanach, USGS Southeast Ecological Science Center

**Structured Decision-Making to Facilitate Multi-Stakeholder Coastal Conservation and Restoration under Climate Change Uncertainties: Case Study on Barrier Islands of the Northern Gulf of Mexico.** - Gregory D. Steyer, USGS National Wetlands Research Center



### GERARD MCMAHON

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**NC STATE UNIVERSITY**