DEPARTMENT of the INTERIOR
SE CLIMATE SCIENCE CENTER

SOUTHEAST CLIMATE SCIENCE CENTER
ANNUAL REPORT 2014

Highlights of Activities

- The SE CSC held its Grand Opening on January 22. Congressman David Price was present in addition to the university's Chancellor, congressional staffers, the media, and members of the federal advisory committee for the climate science center network.
- A new university director, Dr. Ryan Boyles, was named in July.
- Five new Global Change Fellows were funded representing four NCSU colleges.
- 26 SE CSC funded publications.
- Launched the Global Change Monitoring Portal.
- Tribal representative appointed to the Science Advisory Committee.
- SE CSC researcher, Adam Terando, briefed Sec. of the Interior Jewell on sea level rise at historic Jamestown.
- SE CSC staff made presentations at two tribal summit meetings.
- Sponsored two documentary screenings, Shored Up and Chasing Ice, with Q&A with expert panels.
- SE CSC staff and researchers made presentations at the Ecological Society of America and American Geophysical Union conferences.
- Launched a series of science communication workshops.

SE CSC GRAND OPENING, AYSE KARANCI, PHD STUDENT, SPEAKING WITH CONGRESSMAN PRICE. CREDIT: NC STATE UNIVERSITY COMMUNICATIONS

WHO'S NEW AT THE SE CSC?

COLIN SHEA is a post-doc working with Mitch Eaton on eastern hares and structured decision-making. He came from the USGS Coop Unit at Tennessee Technical University. He is studying population dynamics of the New England Cottontail.

CHANDRA GHIRI is a senior researcher and is on detail from the EROS/USGS lab. He uses geospatial analysis to map mangroves in the Gulf of Mexico and is currently working on a project to map farm land across the globe.

CARI FURINESS is a research associate taking the lead on the Global Change Monitoring Portal and other programmatic activities for the SE CSC.

MISSION STATEMENT

The mission of the Southeast Climate Science Center (SE CSC) is to provide science, tools, and resources for resource managers and others to adapt to climate change. We do this by funding actionable science.

FROM RYAN BOYLES, UNIVERSITY DIRECTOR

The SE CSC combines my interests in applied climate sciences connected to decisions that conservation and resource managers actually face. It's an exciting and challenging time to be a part of these national, regional, and local discussions. As the new University Director for the SE CSC, I'm privileged to continue working with the large team of specialists and faculty at North Carolina State University (NCSU) in addition to the tremendous expertise across federal and university partners. I'm particularly excited about the SE CSC's maturing graduate training program and the diversity of students and topics that connect to the center's mission to develop actionable science.

ACTIONABLE SCIENCE

How is science planning and funding carried out at the SE CSC?

Our annual science funding comes from extensive meetings and discussions with the Science Advisory Committee, which is made up of members of the Landscape Cooperation Cooperatives and other federal agency members. These then become part of the annual RFP. The SE CSC will develop a new science plan beginning in early 2017.

The SE CSC operates under six science themes:

- Theme 1: Climate and Other Appropriate Projections to Use for Resource Management
- Theme 2: Land Use and Land-Cover Change Projections
- Theme 3: Impacts of Climate Change on Water Resources
- Theme 4: Ecological Research and Modeling
- Theme 5: Coastal and Near-shore Marine Environments
- Theme 6: Impacts of Climate Change on Cultural-Heritage Resources

> Learn more at: globalchange.ncsu.edu/secsc

FY 2014 Projects

GLOBAL CHANGE MONITORING PORTAL

Provides scientists and the general public with access to programs that monitor the effects of global change processes, such as climate and land use change, on important air, land, and water resources. This is a public service project intended to support decision making by providing comprehensive "one stop" access to information about hundreds of monitoring programs in North Carolina and throughout the Southeast.

ACTIONABLE SCIENCE: DECISION ANALYSIS AND SCIENCE COMMUNICATION

Provides research opportunities to students and staff working with the SE CSC with a focus on decision analysis and science communication. Research activities will occur primarily within the framework of existing SE CSC-funded projects. Student research will support project activities associated with the development and use of science-based information to make climate adaptation management decisions.

FORESTS OF THE FUTURE

Twelve warming chambers were pumped with warm air to simulate predicted environmental changes. Researchers monitored population dynamics, species composition, phenology and behavior of ants and other arthropods occupying these experimental chambers. The project should give scientists a good overview of how shifts in temperature may change a forest – from the microbial level up.

Find more of our projects at: globalchange.ncsu.edu/secsc/projects/

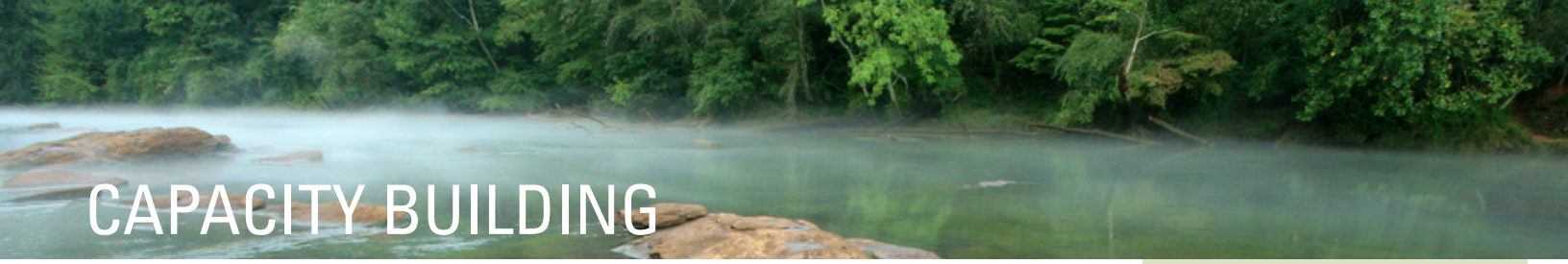
Actionable Science Spotlight

Actionable science provides data, analyses, projections, or tools that can support decisions regarding the management of the risks and impacts of climate change. It is ideally co-produced by scientists and decision makers and creates rigorous and accessible products to meet the needs of stakeholders.

SEA LEVEL RISE AND WILDLIFE REFUGES

What happens to the value of coastal habitat and wildlife as shorelines continue to be lost to rising sea levels and increasingly frequent extreme weather events? This question is particularly important for coastal National Wildlife Refuge managers serving on the front line of global change impacts to our nation's natural resources. Their job is made increasingly difficult by factors such as complex and interacting biological and physical systems coupled with human systems, as well as a limited availability of conservation resources.

To help understand and address these problems, a research team is working together with managers on a project, Understanding Conservation Management Decisions in the Face of Sea-Level Rise Along the U.S. Atlantic Coast, funded by the Northeast and Southeast Climate Science Centers. *> Learn more at:* bit.ly/Sealevelrise



CAPACITY BUILDING

2014 Fellows

ADAM DALE

Research area: Determining the effects of gloomy scale pest fitness and abundance on red maple street trees. Cities create unique habitats that many herbivorous pests thrive in, but the reasons behind this are not well understood. I hope to uncover mechanisms behind increased pest abundance in cities and reduced tree health so that management strategies can be developed to preserve urban forests and maximize the services they provide.

MICHAELA FOSTER

Research area: Restoration of longleaf pine ecosystems in the Southeast as a case study to uncover how different agencies manage the same resource across the landscape and at differing scales. This analysis will provide insight into the institutional context in which management decisions are being made, including understanding limitations and constraints agencies are operating under in addition to identifying opportunities to improve management.

LILIANA VELASQUEZ MONTOYA

Research area: The application of mathematical models and multidimensional geospatial techniques to enhance the understanding of morphological evolution of barrier islands. Through this line of research I'm exploring the effects of extreme weather events and sea level rise in highly dynamic coastal regions under increasing pressure from climate change and human activities.

NITIN SINGH

Research area: Understanding the effects of climate variability on water and carbon cycling in the headwaters of the Southern Appalachians. I'm exploring streamflow generation processes and how they are modulated by landscape heterogeneity and inter-annual climate variability.

MARKETA ZIMOVA

Research area: Understanding the effects of global anthropogenic change on animal populations and their potential adaptation to novel stressors. Specifically, I'm studying the impacts of decreased duration of snow cover due to climate change on snowshoe hares and how they are likely to respond to future warming. I use field data and population modeling to quantify the negative consequences of climate change on species– with the ultimate goal of providing recommendations for effective biodiversity conservation and management planning.

> "The SE CSC fellowship provided me with several contacts, great networking opportunities, and taught me a great deal about climate science and the way scientific research works in the USGS."
>
> — Global Change Fellow

How are we creating capacity for conducting and applying actionable science?

- A Science Communication workshop was developed with the expertise of Susan Hassol (Director of Climate Communication.org), and faculty from the NCSU Department of Communication. This training was open to global change fellows and federal agency partners, including the NC State Climate Office and a member of the NC Science Advisory Panel.

- A science video training workshop was led by Karen McKee. The goal was to demystify the video-making process and teach the basics of planning, shooting, editing, and publishing a short science video.

- We continued our commitment to annual Structured Decision Making training at the National Conservation Training Center held each August for Global Change Fellows, other federal staff partners, post-docs and faculty.

- We held two public documentary film screenings with expert panels, to delve into topics such as receding glaciers, sea level rise and coastal community impacts.

CAPACITY BUILDING

Top SE CSC publications

- Terando A.J., Costanza J., Belyea C., Dunn R.R., McKerrow A., et al. 2014. The Southern Megalopolis: Using the Past to Predict the Future of Urban Sprawl in the Southeast U.S. PLoS ONE 9(7): e102261. doi: 10.1371/journal.pone.0102261

- Dale, A., Frank, S.D. 2014. Urban warming trumps natural enemy regulation of herbivorous pests. Ecological Applications 24:1596–1607. http://dx.doi.org/10.1890/13-1961.1

- Wooten, A., K. Smith, R. Boyles, A. Terando et al, 2014. Downscaled Climate Projections for the Southeast U.S., Evaluation and use for ecological applications. http://pubs.usgs.gov/of/2014/1190/

- Botero, C. A., F.J. Weissing, J. Wright, D. R. Rubenstein, 2014. Evolutionary tipping points in the capacity to adapt to environmental change PNAS.

For a full listing of our publications, visit our database at globalchange.ncsu.edu/secsc/.

GLOBAL CHANGE FELLOW SPOTLIGHT

Michael Just

What are you currently working on?

My dissertation work falls under the broad classification of fire ecology. Wildfires are more than just chaotic destruction. They also promote healthy habitats with diverse plant and animal life in certain ecosystems. Fire is one of a number of reoccurring disturbances (e.g. flooding, hurricanes, etc.) that shape ecosystems on earth. Specifically, I study the relationship between fire, vegetation, and microclimate in savanna ecosystems. What makes this relationship interesting is that it is not linear, but instead results in a feedback, where fire influences what plants can grow and plants, in turn, influence the behavior of fire (e.g. by modulating microclimate). This relationship can be strong, but should not be considered absolute. To date scientists are still studying this feedback to determine the conditions that let fires beget healthy landscapes, instead of disrupting them. For example, changes in fire frequency might unsettle this feedback and even seemingly small changes might change the integrity of the ecosystem. I am examining this feedback's capacity to withstand possible future global climate changes and predict its continued ability to maintain ecosystem characteristics. In my free time I've been working on other projects even more directly related to humans, such as exploring the biogeography of human diseases. > *Read more at bit.ly/michaelJust*

> "Ultimately, the transition from flammable to inflammable maintains distinct ecosystems and the species and processes they harbor. If we know more about why fires stop where they do, we can make more informed decisions about management issues."
>
> — Global Change Fellow Michael Just

PARTNERSHIPS

What are we doing to engage and collaborate with partner organizations and those beyond the CSC network?

- Partnering with the United Southern and Eastern Tribes to better understand tribal needs with respect to climate adaptation. The SE CSC has presented to their Natural Resources Committee for the past 3 years. The SE CSC has also provided letters of support for BIA climate funding.
- Established a monthly speaker series, The Triangle Climate and Landscape Brown Bag, with the USDA Climate Hub, South Atlantic LCC and the State Climate Office. > Read more at bit.ly/climatebrownbags
- The SE CSC led an effort to convene a working group for the southeast region at the National Adaptation Forum (St. Louis, 2015). This will lead to a white paper of collaboration opportunities, plus an enhanced understanding of additional partners in the SE.
- Partnering with the Carolina's Integrated Sciences and Assessments (CISA) [a NOAA RISA program] with their bi-annual Carolina's Climate Resilience Conference. The SE CSC will provide planning and programmatic assistance for the conference in 2016.
- SE CSC staff led a poster session at 2014 AGU focused on ways to communicate and demonstrate intersections of federal agency collaboration.

Partnership Spotlight

A recently completed project, *Connectivity for Climate Change in the SE United States*, shows how input from the Landscape Conservation Cooperatives (LCCs) was essential to crafting a co-produced research project that would deliver usable science for conservation management and planning.

> "The need for practical, actionable climate science is so large that we must coordinate closely with partners to be sure every science investment is useful and unique."
>
> — Sarah Ryker, USGS Deputy Associate Director for Climate & Land Use Change

BACKGROUND

Climate change is already affecting biodiversity, in particular shifting the ranges of species as they move to cooler places; and connectivity has been identified as a focal element of conservation by most state and federal agencies, conservation NGOs, and scientists.

With input from the South Atlantic, Gulf Coastal Plains and Ozark, and Peninsular Florida LCCs, the project focused on three species (black bear, Rafinesque's big-eared bat, and the timber rattlesnake) and one habitat type where planning on future connectivity could focus. The objective of the project was to identify key connections in the southeastern U.S. that would provide a template for reconnecting landscapes in face of a changing climate. The project undertook three questions: 1) When connecting landscapes, can we do better at conservation when we consider the potential effects of climate change? 2) How will connectivity after climate change differ for species that vary in their dispersal ability, habitat affinity, and home range sizes? 3) How can we connect landscapes in the face of rapid urbanization and climate change? *Learn more at: bit.ly/wildlifecorridors*.

ConservationCorridor.org was also created as part of this project to deliver current research and news on connectivity in a changing climate.

LOOKING AHEAD

SNEAK PEEK INTO 2015 AT THE SE CSC:

- The inaugural Global Change Symposium @ NCSU in late summer 2015
- Co-hosting a French Ameri-Can Climate talk in late summer 2015
- New cohort of 12 Global Change Fellows
- The launch of a factsheet series for a selection of our science projects
- Climate workshop for journalists and broadcast meteorologists in October 2015
- A new Climate Change and Conservation course starting fall 2015
- A SE Downscaling Resource Page (data projections, reports, resources)
- Planning for a new, five-year science plan
- Video interview of our Global Change Fellows
- Final programmatic evaluation of SE CSC

> See a complete listing of events and activities: globalchange.ncsu.edu/upcoming-events/

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