SOUTH CENTRAL CLIMATE SCIENCE CENTER

2012 Annual Report

March 1, 2012 - February 28, 2013

This year's highlights:

- Conducted start-up activities and hired personnel
- Hosted a research planning workshop and six roll-out meetings
- Sponsored and hosted meetings for related professional networks and organizations
- Developed and submitted multiple proposals for USGS and external funding
- Promoted collaboration with the tribes




Helping to solve real problems in a variable and changing climate

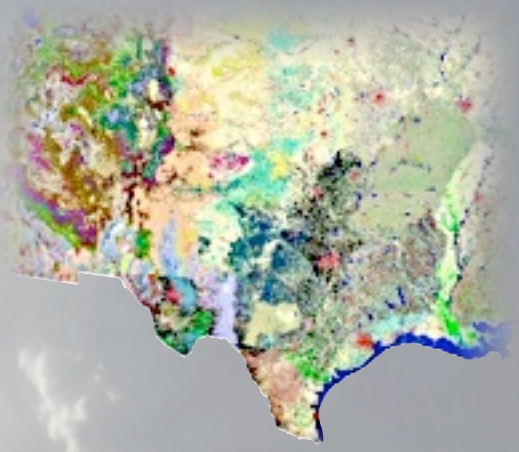
The South Central Climate Science Center is one of eight regional Climate Science Centers that are managed by the U.S. Geological Survey (USGS). Established in 2012, the South Central Climate Science Center is a research collaboration between the USGS, University of Oklahoma, Texas Tech University, Chickasaw Nation, Choctaw Nation of Oklahoma, Oklahoma State University, Louisiana State University, and the Geophysical Fluid Dynamics Laboratory of the National Oceanic and Atmospheric Administration. The South Central Climate Science Center collaborates with a wide range of Landscape Conservation Cooperatives, tribes, state and Federal agencies, universities, and non-governmental organizations.

Our research

The USGS Climate Science Centers are working across regions of the United States to develop and bring critical science results to managers and stakeholders concerning impacts of climate variability, trends, and extremes with the goal of developing strategies to minimize economic, sociological, and ecological consequences. Priority science activities include measurement, modeling, and decision support that are related to the impacts of climate on natural and cultural resources.

Our region

Water, energy, agriculture, native peoples, and rapidly growing metropolitan areas intersect with a highly variable and changing climate to frame many of the risks, challenges, and opportunities for natural and cultural resources in the south-central United States. National parks, scenic waterways, tribal and trust lands, and other protected areas are prevalent across the region. Spatial and temporal changes in the south-central climate are linked to changes in biodiversity; key wildlife habitats; wetlands quality and extent; stream sedimentation and flow; range and density of heritage and invasive species; cultural and natural landscapes; water quality; pathogen outbreaks; and health of ecosystem services. Changes in the region also result from other stressors; hence responses to climate change must be examined in combination with land cover/use change, habitat fragmentation, increasing population, pollution, invasive species, increasing demand for natural resources, and other stressors.



The south-central U.S. encompasses 20 ecoregions, resulting from a significant gradient in annual average precipitation, from 60 inches in coastal areas to 6 inches in the deserts.

Photograph by Derek Rosendahl, University of Oklahoma

Overview

The South Central Climate Science Center (SC-CSC) was funded by the U.S. Geological Survey on March 1, 2012. This University of Oklahoma-led Consortium includes Texas Tech, Oklahoma State, and Louisiana State universities, Chickasaw Nation, Choctaw Nation of Oklahoma, and NOAA's Geophysical Fluid Dynamics Lab. During 2012, we focused on start-up activities and grant development to build research and outreach capacity.

South Central CSC start-up

Start-up activities for the SC-CSC during 2012 included hiring staff and students, moving to our permanent office (right) located at the University of Oklahoma (OU), planning and hosting meetings, and conducting the first annual research workshop.

First permanent South Central CSC Director

In August 2012, Dr. Kimberly Winton (left) was selected as the first permanent director of the SC-CSC. Dr. Winton has a bachelor's degree in zoology and a master's degree in agronomy from Oklahoma State University, and she received her doctorate in agronomy from the University of Arkansas. She has extensive experience in the agri-chemical industry and served as the Director of the USGS Oklahoma Water Science Center for ten years. A native of Oklahoma, Dr. Winton brings a strong understanding of the region's needs and challenges as well as a considerable background in conducting stakeholder-driven science.

Developing our web presence

In 2012, the SC-CSC launched both a stand-alone website (http://southcentralclimate.org) and a Facebook page in order to communicate our presence and accomplishments to the public. The stand-alone website serves as a permanent repository of contact information and resources while the Facebook page allows us to highlight special events or new publications by our researchers as they occur. The Facebook page currently has 140 followers from both within the U.S. and abroad, and the most popular post was seen by ~500 people.

In addition to our web presence, the SC-CSC also commissioned a new logo (below) to help promote the concept of a cohesive consortium.

SOUTH CENTRAL
CLIMATE SCIENCE CENTER

South Central CSC meetings

The SC-CSC's "roll-out" meetings connected with ~200 stakeholders and started developing relationships with organizations and individuals across the region. Each meeting introduced participants to the Climate Science Center enterprise, provided an overview of one of their local Landscape Conservation Cooperatives, and covered key climate challenges for the south-central U.S. and northern Mexico.

The meetings were held at the following locations (dates): Norman, OK (Mar. 7, 2012), Lubbock, TX (Mar. 19, 2012), Albuquerque, NM (Apr. 17, 2012), Tulsa, OK (Apr. 26, 2012), Galveston, TX (Jun. 12, 2012), and Las Cruces, NM (Nov. 24, 2012).

We hosted both the annual meeting of all Climate Science Center Directors on June 27-28, 2012, and the Gulf Coast Prairie Landscape Conservation Cooperative Steering Committee meeting on June 26-28, 2012, in Norman, OK.

First Annual South Central CSC Research Workshop

On November 29-30, 2012, the SC-CSC held its first research workshop, hosted by the NOAA National Climatic Data Center and National Weather Service in Fort Worth, TX. The meeting provided an opportunity to identify near- and longer-term, high-priority SC-CSC research topics in preparation for both the FY13 USGS proposal solicitation and external sources of funding. The three breakout session topics were: (1) regional physical climate variability and trends; (2) ecosystems and landscapes; and (3) human dimensions, with the cross-cutting theme of precipitation variability. A total of 59 members of the SC-CSC Consortium attended as well as 21 Federal, state, or non-CSC university representatives.

Conference leadership

The SC-CSC actively participated in several national conferences, including the Society of Environmental Journalists (SEJ) Conference in Lubbock, TX, during October 2012. As a result of SC-CSC and OU follow-up discussions, the 2015 SEJ Conference is anticipated to be hosted by OU in October 2015.

Tribal outreach

April Taylor (below), the tribal liaison for the SC-CSC, presented at and attended meetings of the Oklahoma Tribal Conservation Advisory Council, the Tribal Environmental Coalition of Oklahoma, and the Inter-Tribal Environmental Council. Additional education and outreach was performed through the Norman Public Schools' Native American Science Club, the OU Chapter of the American Indian Science and Engineering Society, and at the Chickasaw Nation Environmental Health and Safety Expo.

General public outreach

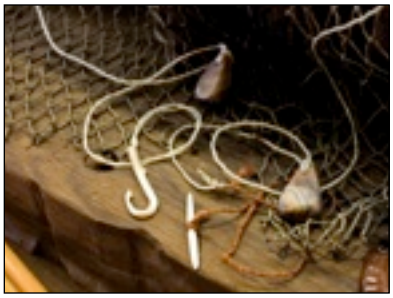
The SC-CSC educated the general public through events such as the Sam Noble Museum's Science in Action Day (right), the National Weather Center's GIS Day, and the University of Oklahoma's Geography Day.

Short course on downscaling

In the summer of 2012, Dr. Katharine Hayhoe (left) of Texas Tech University taught two week-long short courses to a total of 42 faculty and federal employees (USFWS, USDA) entitled "Introduction to Climate Science and Downscaling Methods." Initial response to the course was overwhelmingly positive, and we are exploring opportunities to offer the course materials on-line.

Chickasaw and Choctaw Nations' water projects

The Chickasaw Nation and Choctaw Nation of Oklahoma continue their work on understanding the influence of climate variability and change on water resources. The tribes partnered with the Army Corps of Engineers to examine sustainable river flows, with the Bureau of Reclamation, the Arbuckle Master Conservancy District, and the City of Sulphur on a water pipeline feasibility study, and with the City of Ada and the Environmental Protection Agency's Kerr Lab on a pilot project to study artificial aquifer recharge in the Arbuckle-Simpson aquifer. The tribes also collaborated with environmental consultants from Intera Incorporated to develop a document on water conservation best practices for central Oklahoma that examined aggressive strategies for reducing future water use.. In addition, the Chickasaw Nation Environmental Health and Safety Department is working with their GIS Department to develop an Interactive Water Map which will be used in the development of a Tribal Water Plan.



Studying climate, weather, and society

With the University of Oklahoma Center for Risk, Crisis and Resilience, Dr. Hank Jenkins-Smith is conducting an on-going national study on climate, weather, and society. His team collected a national survey that asked climate related questions (May 2012) and implemented a new severe weather and climate survey (September/October 2012). The team is currently in the process of analyzing the data and synthesizing the results.

Personnel and funding

During the period of March 1, 2012 through February 28, 2013, the SC-CSC Consortium invoiced for $412,287 of the budgeted amount of $706,054. Delays in the hiring of faculty, staff, and students resulted in departures from the budgeted expenditures for salary, fringe benefits, tuition, and the associated indirect costs.

Associated:	Faculty	Staff	Students
University of Oklahoma	11	3	5
Texas Tech University	14	5	12
Louisiana State University	7		1
Chickasaw Nation		2	
Choctaw Nation of Oklahoma		2	
Oklahoma State University	19	1	4
NOAA's GFDL		6	

Grant funding

On March 15, 2012, the USGS issued a request for proposals for FY12 science funding, resulting in seven funded proposals for the SC-CSC region (four Consortium-led and three USGS-led). The following Consortium-led grants were funded by USGS through the annual supplemental research funding call for FY12:

Expert workshop to build CSC expertise in understanding the social and communication dimensions of climate change
Dennis Patterson (TTU), PI – 1 year, $50,000

Evaluating the assumption of stationarity in statistical downscaling applications
Katharine Hayhoe (TTU), PI – 1 year, $50,000

Inter-tribal workshops on climate variability and change
Laurel Smith (OU), PI –18 months, $55,407

Terrestrial connectivity across the south-central U.S.: Implications for sustainability of wildlife populations & communities
Kristen Baum (OSU), PI – 2 years, $203,918

On January 9, 2013, the USGS issued a request for proposals for FY13/FY14 science funding. The SC-CSC Consortium submitted multiple Statements of Interest, resulting in eight invitations to submit full proposals. Final decisions for this supplemental research funding call have not been announced as of May 28, 2013.

Utilizing the collaborative infrastructure created by the SC-CSC Consortium, additional proposals were developed and submitted to other agencies, including the U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, and the National Science Foundation. Several SC-CSC members provided extensive leadership on a successful NSF EPSCoR Research Infrastructure Improvement proposal titled *Adapting Socio-ecological Systems to Increased Climate Variability*. The fully funded project will be $25 million over 5 years, with a substantial investment in social and natural sciences infrastructure for climate-society research.

Selected funded SC-CSC related grants include the following:

Resilience and Vulnerability of Beef Cattle Production in the Southern Great Plains Under Changing Climate, Land Use and Markets
David Engle (OSU), PI – 5 years, $9,567,330 from the U.S. Department of Agriculture

Adapting socio-ecological systems to increased climate variability
Renee McPherson (OU) and Duncan Wilson (OSU), Science Leads – 5 years, $20,000,000 from National Science Foundation and $5,000,000 from the Oklahoma State Regents for Higher Education

Utilization of regional climate science programs in reservoir and watershed impact assessments
Renee McPherson (OU), PI – 1 year, $43,364 from the U.S. Army Corps of Engineers

Water decisions for Sustainability in the Arbuckle-Simpson Aquifer
Renee McPherson (OU), PI – 2 years, $91,926 from NOAA's Climate Program Office

Managing Fuels while Enhancing Prairie Chicken Habitat
Eric Thacker (OSU), PI – 2 years, $274,218 from the Joint Fire Science Program

Selected SC-CSC related grants in review include the following:

Implications of Climate Change on Native Rangeland Grazing Environments throughout the Great Plains
Brady Allred (OSU), PI – 5 years, $990,961 from the U.S. Department of Agriculture

CNH: Understanding Gross System Uncertainty using Cross Model Ensembling Techniques to Predict Long Run Land Use Changes under Shifting Climate Conditions
Michael Farmer (TTU), PI – 4 years, $1,049,684 from National Science Foundation

Flood Hazards Management under Climate Change and Urbanization through the Design of Resilient Coastal Urban Ecosystems
Katharine Hayhoe (TTU), PI – 4 years, $290,000 from National Science Foundation

Sea-level rise and coastal sustainability: A cross-site comparison of non-linearity in wetland persistence and feasible social adaptations
Victor Rivera-Monroy (LSU), PI – 4 years, $639,000 from National Science Foundation [as part of $2,000,000 grant led by WHOI]

Forecasting the effects of mangrove expansion on water and biogeochemical cycling in subtropical and tropical wetlands under global climate change
Victor Rivera-Monroy (LSU), PI – 4 years, $283,000 from National Science Foundation [as part of $4,000,000 grant led by UVA]

Global Indigenous Research Alliance
Chie Sakakibara (OU), PI – 5 years, $749,971 from National Science Foundation

A Novel Approach to Desert Grassland Restoration in the Southwestern United States for Healthy River Systems: Linking Soil Microbial Dynamics and Plant Growth
John Zak (TTU), PI – 3 years, $800,000 from Keck Foundation

Selected publications

Albanese, Gene, and Craig Davis. 2012. "Broad-scale relationships between shorebirds and landscapes in the Southern Great Plains." *The Auk* 130.

Boone, K. Margret, Renee McPherson, Michael Richman, and David Karoly. 2012. "Spatial coherence of rainfall variations using the Oklahoma Mesonet." *International Journal of Climatology* 32: 843-853.

Farfán, Luis, Eurico D'Sa, Kam-biu Liu, and Víctor Rivera-Monroy. "Tropical cyclone impacts on coastal regions: The case of the Yucatán and the Baja California Peninsulas, Mexico." *Estuaries and Coasts*. In Review.

Goebbert, Kevin, Hank Jenkins-Smith, Kim Klockow, Matthew Nowlin, and Carol Silva. 2012. "Weather, Climate and Worldviews: The Sources and Consequences of Public Perceptions of Changes in Local Weather Patterns." *Weather, Climate and Society* 4(2): 132-144.

Liu, Lu, Yang Hong, James Hocker, Mark Shafer, Lynne Carter, Jonathan Gourley, Christopher Bednarczyk, Bin Yong, and Pradeep Adhikari. 2012. "Analyzing projected changes and trends of temperature and precipitation in the southern USA from 16 downscaled global climate models." *Theoretical and Applied Climatology* 109(3-4): 345-360.

Long, James, Nathan Nibbelink, Kevin McAbee, and Julie Stahli. 2012. "Assessment of freshwater fish assemblages and their habitats in the National Park Service system of the southeastern United States." *Fisheries* 37: 212-225.

McGranahan, Devan, David Engle, Samuel Fuhlendorf, James Miller, and Diane Debinski. 2012. "An invasive cool-season grass complicates prescribed fire management in a native warm-season grassland." *Natural Areas Journal* 32: 208–214.

Miller, James, Lois Morton, David Engle, Diane Debinski, and Ryan Harr. 2012. "Nature reserves as catalysts for landscape change." *Frontiers in Ecology and the Environment* 10: 144-152.

Moritz, Max, Marc-André Parisien, Enric Batllori, Meg Krawchuk, Jeff Van Dorn, David J. Ganz, and Katharine Hayhoe. 2012. "Climate change and disruptions to global fire activity." *Ecosphere* 3:49.

Pourmokhtarian, Afshin, Charles Driscoll, John Campbell, and Katharine Hayhoe. 2012. "Modeling potential hydrochemical responses to climate change and increasing CO2 at the Hubbard Brook Experimental Forest using a dynamic biogeochemical model (PnET-BGC)." *Water Resources Research* 48(7): W07514.

Ramesh, Rasika, Kerry Griffis-Kyle, Gad Perry, and Michael Farmer. 2012. "Urban amphibians of the Texas Panhandle: Baseline inventory and habitat associations in a drought year." *Reptiles & Amphibians* 19.4: 243–253.

Rivera-Monroy, Víctor, Luis Farfán, Eurico D'Sa, José Reyes Díaz-Gallegos, Rodrigo Vargas, Leticia Gomez-Mendoza, Ernesto Caetano, René Price, Oscar Escolero, Robert Twilley, Evelyn Gaiser, Héctor Hernandez-Arana, María Liceaga-Correa, Jorge Herrera-Silveira, David Valdez, and Robert Waide. "The Large Spatial Footprint of Hurricane Impacts on the Yucatan Peninsula Coastal Region (Mexico): Implications for Coastal Management." *Ocean and Coastal Management*. In Review.

Spooner, Daniel, Caryn Vaughn, and Heather Galbraith. 2012. "Species traits and environmental conditions govern the relationship between biodiversity effects across trophic levels." *Oecologia* 168:533-548.

Strovas, Jenny, and Tom Arsuffi. "Identifying Patterns in Environmental Education and Stewardship Programs Across Texas: A Database and Survey Approach." *Journal of Environmental Education*. In Review.

Swain, Sharmistha, Brian Wardlow, Sunil Narumalani, Donald Rundquist, and Michael Hayes. 2013. "Relationships between vegetation indices and root zone soil moisture under maize and soybean canopies in the US Corn Belt: a comparative study using a close-range sensing approach." *International Journal of Remote Sensing* 34(8): 2814-2828.

Williams, Ryan, Stephen Hallgren, and Gail Wilson. 2012. "Frequency of prescribed burning in an upland oak forest determines soil and litter properties and alters the soil microbial community." *Forest Ecology and Management*. 265: 241-247.

Wuebbles, Donald, Gerald Meehl, Katharine Hayhoe, Thomas Karl, Kenneth Kunkel, Benjamin Santer, Michael Wehner, Brian Colle, Erich Fischer, Rong Fu, Alex Goodman, Emily Janssen, Viatcheslav Kharin, Huikyo Lee, Wenhong Li, Lindsey Long, Seth Olsen, Zaitao Pan, Anji Seth, Justin Sheffield, and Liqiang Sun. 2013. "CMIP5 Climate Model Analyses: Climate Extremes in the United States." *Bulletin of the American Meteorological Society.* In Press.

Activities planned for 2013

Downscaling, data, and dissemination

With the hiring of post-docs in 2013, the SC-CSC will develop methods, tools, and datasets to examine the impacts of climate change on landscapes. New post-doc Carlos Gaitan (right) will develop and test statistical downscaling techniques for the region, producing an ensemble of downscaled global climate model (GCM) output for our research teams. A future post-doc will analyze results for our region from a suite of GCMs, assessing the ability of the models to represent our regional climate variability. Work with the Center for the Analysis and Prediction of Storms on dynamical downscaling should be initiated by summer 2013, building a proof-of-concept for very-high-resolution climate modeling to resolve convective precipitation and land cover features. We will work with the USGS to infuse our datasets into ScienceBase as well as develop data management and dissemination infrastructure to enable translation of science to management.

Multi-disciplinary and multi-institutional grant development

Spurred by the successful EPSCoR proposal, the SC-CSC will develop additional research teams across disciplines and institutions. Monthly meetings with the Landscape Conservation Cooperatives should lead to better coordination among funding entities and opportunities for actionable science. Basic science, especially that focused on the nature-society nexus, also is a priority as we look toward NSF's recent investments in Science, Engineering and Education for Sustainability programs.

Continue to work on key goals

- Collaborate regionally and nationally to develop a strategy for conducting socio-ecological systems research on local, regional, and national scales.
- Hire additional faculty, staff, and students to keep building capacity within the region.
- Support climate impacts meetings across the region, including hosting the Spring 2013 gathering of the American Indian and Alaska Native Climate Change Working Group.
- Develop linkages between students both amongst the region as well as across the national CSC network.
- Initiate a webinar series and a regular newsletter to disseminate key findings to stakeholders and the public.
- Establish data management best practices for the region and begin to develop a central data portal.

Visit our website at http://southcentralclimate.org/

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