SOUTH CENTRAL CLIMATE SCIENCE CENTER

2015 Annual Report

March 1, 2015 - February 29, 2016

This year's highlights:

- Broadened partnerships and collaborations with agencies, Tribes, municipalities, and others across the region
- Advanced research on drought impacts and eco-hydrology in the Red River and Rio Grande Basins
- Hosted a research planning workshop, an undergraduate internship, and multiple Tribal trainings
- Received the DOI Environmental Achievement Award for increasing the Tribal capacity for adaptation




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.

Personnel and Funding

Ecosystem Modeling in the South-Central United States

Dr. Manoj Kc (right) joined the South Central CSC as a post-doctoral research associate shared with Dr. Yiqi Luo's EcoLab <http://ecolab.ou.edu> within the Department of MicroBiology and Plant Biology at the University of Oklahoma. Manoj completed his doctoral work at Auburn University by developing his own rainfall-runoff model to understand and estimate travel times of overland flows. His interest lies in the ecologic and hydrologic impacts of climate change. Manoj spent a year working with the SC-CSC to create a synthesis report on the state of the science of ecosystem modeling in the south central US. The report additionally identifies approaches for coupling these models with other models to better represent ecosystem dynamics as affected by climate change and human activities, and hence gain more reliable predictions of future ecosystem functions and service. The report will be used to understand the needs of the impacts modeling community and help establish the future scientific priorities of the SC-CSC.

Consortium Researchers and Students

Associated:	Faculty, PIs, Affiliates	Staff	Post-docs	Grad Students	Undergrad Students
University of Oklahoma	21	4	3	4	5
Texas Tech University	21	4		16	
Louisiana State University	17			4	
Chickasaw Nation	1	2			2
Choctaw Nation of Oklahoma	3				2
Oklahoma State University	4		2	2	
NOAA's GFDL	3				

To formalize the relationship with researchers conducting non USGS-funded yet CSC-relevant work in the region, the SC-CSC began an "Affiliate Program" in May 2014. In 2015, the "Affiliate Program" added new members both from within the consortium and from partner institutions such as Adaptation International, NOAA's Storm Prediction Center, and Texas A&M University.

South Central CSC Base Funding

Across the first four grant years, the non-federal members of the SC-CSC consortium expended $2,735,219 of the budgeted amount of $2,780,087 (98.4%).

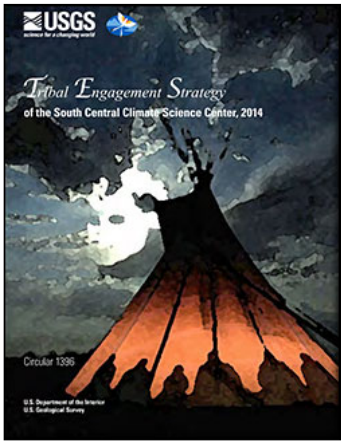
Year 1-4:	Received	Expended	Percent Expended
University of Oklahoma	$1,127,688	$1,127,657	99.9%
Texas Tech University	$501,050	$471,493	94.1%
Louisiana State University	$375,779	$375,779	100.0%
Chickasaw Nation	$441,298	$439,945	99.7%
Choctaw Nation of Oklahoma	$0	$0	--
Oklahoma State University	$334,272	$320,345	95.8%

Department of Interior Environmental Achievement Award

The South Center Climate Science Center is the recipient of the Department of Interior 2015 Environmental Achievement Award, a prestigious award for "Climate Science and Partnerships—Increasing the Tribal Capacity for Climate Change Adaptation."

"We are particularly honored to receive this important award since it reflects well on our commitment to work closely with our Tribal colleagues on jointly enhancing our ability to adapt to climate change," said Berrien Moore, director of the National Weather Center and dean of the OU Atmospheric and Geographic Sciences.

The South Central Climate Science Center received the award as a result of its partnerships with other agencies to develop programs for building tribal capabilities and conducting climate science research. The Center is a consortium codirected by the U.S. Geological Survey and the University of Oklahoma. Consortium members include OU, the Chickasaw Nation, the Choctaw Nation of Oklahoma, NOAA's Geophysical Fluid Dynamics Lab, Louisiana State University, Oklahoma State University and Texas Tech University.



"Our team had a vision to bring the climate science capacity to our many tribal partners. The vision entails relationship building, educational experiences for youth, tribal environmental and cultural staff, and working on climate-related matters with tribes. It is such an honor to not only be able to bring this vision to fruition with our tribal partners, but to also be recognized by the Department of Interior," said Kim Winton, director of the South Central Climate Science Center.

Primary achievements of the South Central Climate Science Center are the tribal engagement strategy (left) and capacity building. The vision was to develop climate science programs, vulnerability assessments and adaptation plans with tribes to ensure that the Department of Interior has the tools to meet their trust responsibilities to the Tribes. The five-stage process starts with relationship building and ultimately builds capacity in the Tribes to conduct their own climate science research.

"The Chickasaw Nation and Choctaw Nation of Oklahoma, as our full partners in the South Central Climate Science Center, have been amazing to work with. This award only underscores the value of universities respectfully collaborating with these and other Nations to serve the public good," said Renee McPherson, co-director of the South Central Climate Science Center.

The overarching success of this program is evident by the development of five new Bureau of Indian Affairs Tribal Liaisons to be placed in other Department of Interior Climate Science Centers. These positions will enable the Bureau of Indian Affairs and the Climate Science Centers to assist Tribes nationally with their climate responses.

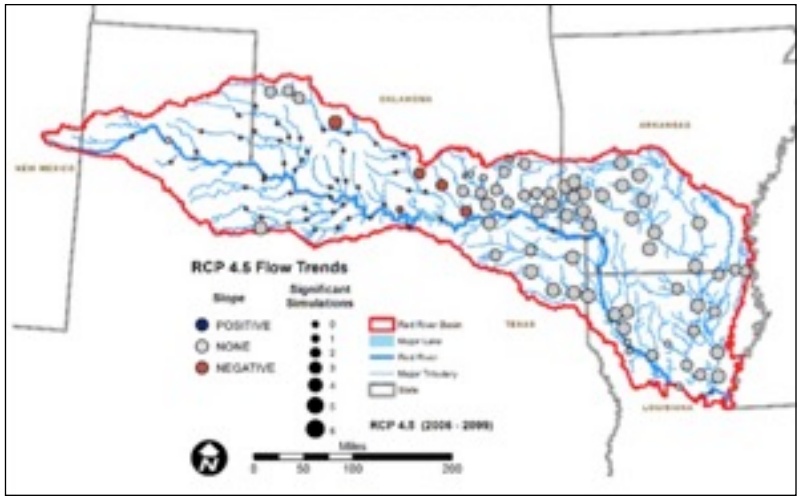
Originally published by Jana Smith: <http://www.eurekalert.org/pub_releases/2015-11/uoo-scc111915.php>

Consortium Research Projects

Predicting the Impacts of Climate Change on the Red River Basin
PI - Wayne Kellogg; CN

Led by Wayne Kellogg, Engineer with the Chickasaw Nation, researchers at the University of Oklahoma and the Choctaw and Chickasaw Nations partnered up to develop projections of water availability in the Red River Basin under future climate conditions. The Basin has recently experienced both severe drought and exceptional flooding, both of which cause impacts to industry, agriculture, tourism, and the environment. Scientists, water managers, and other stakeholders are interested in knowing what is store for the future of the Basin.

Climate change at the global scale does not necessarily represent changes that take place at the local or regional scale. Further uncertainty exists in defining future greenhouse gas emission scenarios. Using temperature and precipitation performance metrics, three global climate models (GCMs) were selected, with three emission scenarios applied, and three downscaling techniques used, resulting in 27 climate simulations through the year 2099. These simulations were fed into a rainfall-runoff model developed specially for this project, the results of which were used as input into RiverWare Water for determining impact to flows (right), lake levels, and water availability. In addition to providing flow and lake level projections, the project researchers made recommendations on choice of GCMs and downscaling methods and reflected on the uncertainties involved in climate change research for hydrologic applications.



Examining the Effects of Climate on Animal Populations and Movement
Postdoc - Julia Earl; OSU

Ecological models projecting shifts in species distributions with climate change are starting to incorporate animal movement, but they assume that these movements will not be altered by climate change. Dr. Julia Earl, a postdoctoral researcher at Oklahoma State University, (below left) is testing this assumption by looking at the relationship between long distance movement characteristics and temperature. She is currently analyzing high resolution movement data from GPS satellite transmitters for seven terrestrial vertebrate species across North America, including gray wolves, bison, white-tailed deer, and lesser prairie-chickens. Preliminary analyses indicate that animals display straighter movements when temperatures are warmer than normal.

Julia has also been working on a project with Dr. Sam Fuhlendorf to perform a meta-analysis on the vital rates of lesser prairie-chickens in order to compare the predictive ability of temperature and precipitation means and extremes. Their preliminary results show that individual characteristics and geographic variables are better than climate variables for predicting variables such as clutch size, nest success, and survival. This may due to lack of precision in climate estimates relative to study sites. Alternatively, relationships between climate variables and vital rates may be constrained by local adaptation, and as such may be better estimated by examining different regions separately rather than throughout the geographic distribution.

Consortium Research Projects

Improving Resilience for the Rio Grande Coupled Human-Natural System
PIs - Jack Friedman, Jennifer Koch, Jadwiga Ziolkowska; OU

Understanding how to manage scarce water during drought is one of the great challenges we face as a society associated with climate change. The Rio Grande River Basin presents one of the biggest challenges, in this regard. The Rio Grande - running through Colorado, New Mexico, and Texas and Mexico - has, traditionally, been managed by different sets of laws, rules governing water rights, and water authorities that control the use of water. From cities like Albuquerque and El Paso, to agricultural/ranching uses, to recreational uses, the human demands for water vary greatly across the Basin. This research team is seeking to understand how these different factors affect 10 different sections ("reaches") of the Rio Grande - from Colorado to the Gulf of Mexico - in order to identify how different management strategies and human uses of the River can be better coordinated. In particular, the project will provide stakeholders a tool that will allow them to understand the costs and benefits of their decisions. Overall, the results of this research will help stakeholders improve the drought resilience of water, environment, and people throughout the Rio Grande River Basin.

Socio-ecological Assessment of Ecosystem Services
PIs - Caryn Vaughn & Antonio Castro; OU & ISU

Dr. Caryn Vaughn, Professor at the University of Oklahoma, and Dr. Antonio Castro, Research Assistant Professor at Idaho State University, used an ecosystem services framework to examine how different water management/environmental flow scenarios in the Kiamichi River watershed (left) affect the delivery of ecosystem services, and thus contribute to the wellbeing of people living both in and outside the watershed. The Kiamichi River watershed in southeastern Oklahoma is at the center of intense conflict over water ownership and use. Missing from these disputes are the needs of the watershed's rich animal and plant life, including three federally endangered freshwater mussels. The research team's approach involved mapping the spatial delivery of a selection of watershed services, and then exploring the tradeoffs between their biophysical, socio-cultural and economic values. This project has resulted in publications in the *Journal of the American Water Resources Association* and the *Journal of Water Resources Management and Planning*, as well as a book chapter in *Biodiversity in Ecosystems - Linking Structure and Function*.

Dendrotempestology: Understanding Hurricanes and Tree Growth
Grad Student - Clay Tucker; LSU

Clay Tucker at Louisiana State University completed his master's thesis, focusing on identifying the occurrence of hurricanes using the dendrochronology of pine trees in Grand Bay National Estuarine Research Reserve, Mississippi. High winds defoliate trees of their leaves, and storm surge adds an unusual amount of saltwater to the water table, thus increasing water evaporation and mineral accumulation in the soil. Coastal trees must repair the damage done by hurricanes and thus grow less in the tree trunk the following year. In this field photo (right), the coastal (top) cross section is much older than the inland (bottom) cross-section but is smaller due to stunted growth from near-saltwater conditions. Through the analysis of tree rings, Clay was able to reconstruct the history of the environment around his study site. Clay is continuing to pursue his doctorate at LSU and will analyze the combined effects of hurricanes, sea-level rise, and prescribed fires on the ability of these coastal species to adapt to climate change.

Consortium Research Projects

Quantifying Future Precipitation for Stakeholder Planning
PIs - Jung-Hee Ryu & Barry Keim; TTU & LSU

Regional stakeholders, planners, and decision-makers require reliable, unbiased information to build community resilience in the face of climate variability, natural disasters, and extreme climate events. This information becomes even more important under a changing climate, as past conditions no longer serve as a reliable guide to the future. This project's goal is to improve the understanding of basic climate science to meet regional stakeholder needs by quantifying uncertainty in precipitation variability and drought as a result of natural variability and human-induced change. Specifically, the research team aims to resolve the atmospheric and oceanic processes that bring moisture and precipitation in the region and rigorously test the latest generation of global climate models to identify those capable of simulating the complex dynamics of precipitation across the south-central US. This analysis aims to narrow the range of uncertainty in future projections for precipitation and drought across the south-central US, improving the relevance and reliability of climate projections for stakeholder planning. The project will focus on examining the physical processes and mechanisms by which moisture is transported into the region and drought risk is enhanced.

Results of the basic science analysis will be applied by the Southern Regional Climate Center (SRCC) to explore stakeholder informational needs related to precipitation variability, long-term forecasts, and climate projections. Lessons learned during these applications will be used to improve the value of climate science analyses provided by the SC-CSC and SRCC to ecological and human systems management throughout the region and to develop products that fulfill regional needs for actionable climate information.

Black Bear Range Expansion in Altered Habitats
Grad Student - Emily Artz; OSU

American black bears are recolonizing parts of eastern Oklahoma that they have not occupied since the late 1800s. When bear populations expand into human-dominated areas, they often incorporate anthropogenic food sources into their diet. Changing climates will likely alter the available sources of hard and soft mast (nuts and berries) that black bears depend on in their natural diet. It is therefore important to establish how black bears adapt to depleted foods and how this will affect their relationship with humans.

For her master's thesis at Oklahoma State University, Emily Artz (right) developed a novel experimental approach to examine black bears' preference for natural versus anthropogenic foods. She designed feeders which were filled with either natural foods (acorns or blueberries) or anthropogenic foods (corn) and deployed them as pairs suspended from tree branches. The bears manipulate the feeders to obtain a food reward that is partitioned in edible gelatin capsules to standardize size and caloric content. Emily calculated which food the bears preferred when both were equally available, based on how much of each food type remained after a bear interaction.

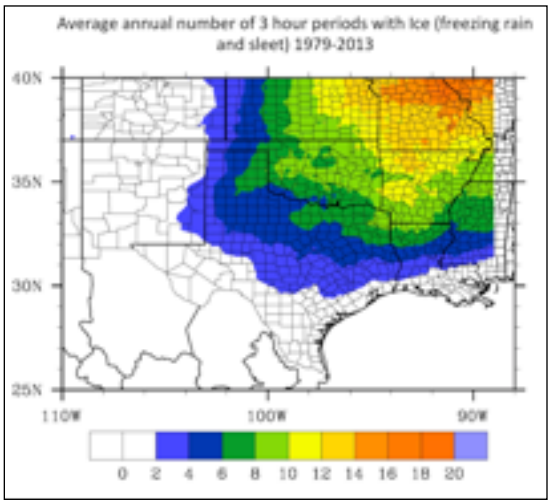
The bears interacted more often with feeders containing corn, removed more corn, and spent more time manipulating feeders for corn, suggesting willingness to expend more effort to obtain corn than native foods when both are equally available. Although this means that bears are able to adapt their food preferences when their natural foods are depleted, an increased dependence on anthropogenic food sources as climate change and urban development degrade their natural habitat will bring them into more frequent conflict with humans.

Consortium Research Projects

Trends in Weather Extremes for Transportation Safety & Infrastructure
PIs - Renee McPherson & Esther Mullens; OU

Extreme weather conditions produce substantial strain on numerous facets of the transportation system, with impacts on infrastructure, maintenance and safety. The diversity of topographic and climatic variations, as well as severe weather and climate extremes, produces thermal and moisture variability that challenge the longevity of existing infrastructure in this region. As a result, the Southern Plains Transportation Center has identified the area of "climate-adaptive surface transportation" as a research priority.

To aid in this endeavor, Dr. Esther Mullens, a postdoctoral researcher at the University of Oklahoma, (above right) is working under the guidance of Dr. Renee McPherson to develop regionally specific and spatially extensive datasets that substantially expand climatologies of multiple weather hazards. The initial stage of this project identified existing meteorological data that extend over the entire south-central US, are high-resolution in time and space, and can provide value-added output that is management-relevant. This ongoing study will benefit transportation research and operations, ranging from traffic safety and risk to infrastructure sensitivities, as well as present future climatic extremes and their trends.



Icy precipitation encompasses freezing precipitation such as freezing rain and sleet. While observational information on icy precipitation is spatially coarse, computer algorithms have been developed operationally to aid forecasters in determining expected precipitation types. Esther used three such algorithms, in combination with data from the North American Regional Reanalysis, to create a spatial analysis for icy precipitation (left). This dataset extends from 1979-2013, has a minimum time interval of three hours, and will be the highest- resolution long-duration information currently available. Additionally, using a very high-resolution temperature dataset, Esther has been able to construct freeze-thaw maps and time series from 1948-2012. This work also will evaluate the magnitude and trends of temperature ranges during freeze-thaw, and probabilities of freeze thaw temporally proximal to precipitation.

The prospect of increased climate variability and future changes in extremes will have substantial impacts on the transportation sector, and so it is increasingly recognized that climate model data is a potentially useful resource to incorporate in infrastructure planning and hazard risk assessment. Numerous climate projections are presently available; however, not all are able to provide accurate future projections on the regional scale. This data will be used to check, validate and optimize future projections of climate models for the region.

In addition to the previously stated benefits, this study aims to develop collaboration between weather and climate researchers, and the transportation community. It is hoped that the developed datasets can be applied to existing and future projects that aim to anticipate and reduce risk, improve resiliency and cost-effectiveness, and foster additional cross-disciplinary partnerships. To that end, the research team has developed a brief online survey that seeks information from the transportation community on their climate-data needs, including the types of ways that data products and resources can best be disseminated.

Adapted from the Southern Plains Transportation Center Spring 2015 Newsletter:
<http://www.sptc.org/publications/>

Consortium Grant Funding

In April 2014, the USGS issued a request for proposals for FY15 science funding, resulting in eight funded proposals for the SC-CSC region:

Online Climate Change Impacts Course
Aparna Bamzai (OU), PI – 2 years, $144,132

Training for Native Tribes of Louisiana and New Mexico on Understanding Climate in a Changing World
Kristine DeLong (LSU), PI – 2 years, $86,180

Uncertainty Analysis of New Statistically Downscaled Climate Projections for the South Central U.S
Carlos Gaitan (OU) & Keith Dixon (NOAA-GFDL), PIs – 2 years, $293,917

Soil Moisture-Based Drought Monitoring for the South Central Region
Tyson Ochsner (OSU), PI – 3 years, $235,272

Regional Graduate Student, Post-Doc, And Early Career Researcher Training II
Derek Rosendahl (OU), PI – 1 year, $58,917

Quantifying Future Precipitation in the South Central Region for Stakeholder Planning
Jung-Hee Ryu (TTU) & Barry Keim (LSU), PIs – 2 years, $288,268

Changing Fire Regimes and Management Strategies
Mark Shafer (OU), PI – 2 years, $158,252

Very High-Resolution Dynamic Downscaling of Regional Climate for Long-term Hydrologic Planning along the Red River Valley System
Ming Xue (OU), PI – 2 years, $127,099

In May 2015, the USGS issued a targeted request for proposals for supplementary drought funding, resulting in two funded proposals for the SC-CSC region (one consortium-led and one USGS-led). The following consortium-led drought grant was selected for funding by USGS:

Improving Resilience for the Rio Grande Coupled Human-Natural System
Jack Friedman, Jennifer Koch, Jadwiga Ziolkowska (OU), PIs – 2 years, $751,572

Additionally, the USGS directly funded the following projects:

Climate Variability, Snowpack and Streamflow in the Rio Grande headwaters
David Gutzler (UNM), PI – 1 year, $60,277

Ecosystem Modeling in the South Central US: A Synthesis of Current Models toward the Developments of Coupled Models
Yiqi Luo (OU), PI – 1 year, $92,915

Tribal Capacity Building Project
Renee McPherson (OU), PI – 1 year, $86,704

Utilizing the collaborative infrastructure created by the SC-CSC consortium, additional proposals were developed for solicitations from other agencies. Selected submitted proposals include the following:

REU Site: Real-World Research Experiences at the National Weather Center
Aparna Bamzai & Renee McPherson (OU), co-Is – Funded, 5 years, $169,023 + annual funding, National Science Foundation

Collaborative Research: Assessing North-South Gulf of Mexico Surface Ocean Variability Since the Little Ice Age
Kristine DeLong (LSU), co-PI – In Review, 2 years, $471,712, National Science Foundation

Relative effects of climate averages, variability and extremes on population vital rates
Sam Fuhlendorf (OSU) & Jill Trepanier (LSU), co-PIs – Pre-proposal In Review, National Science Foundation

Poverty Traps and Mangrove Ecosystem Services in Coastal Tanzania
Victor Rivera-Monroy (LSU), PI – Funded, 2 years, $500,000, National Science Foundation

LTER: Multi-scale climate variability and the future of the Great Plains Shortgrass Biome
John Zak (TTU), PI – Pre-proposal In Review, National Science Foundation

Practical Approaches for Enhancing Benefits of Reduced DTRsoil to Dryland Cotton Production Though Alteration of Bed Design
John Zak (TTU), PI – Funded, 1 year, $23,057, Cotton, Inc.

Tribal Planning for Drought Vulnerability Assessments
The Chickasaw Nation – Funded, 1 year, $78,526, Bureau of Indian Affairs

Tribal Engagement Plan

The SC-CSC's Tribal Engagement Plan was released on September 22, 2014, as USGS Circular 1396 and describes how we will engage and facilitate partnerships with the 68 federally recognized Tribes within our region. The Tribal Engagement Plan emphasizes the collaborative nature of science and outlines concrete steps that the SC-CSC intends to take, such as including Tribal leaders in an advisory capacity, offering trainings for Tribal staff, and engaging with Tribal educators. In addition, the Tribal Engagement Plan details a strategy for ensuring that researchers engage with Tribes in culturally appropriate ways. In 2015, the SC-CSC continued to fulfill the commitments outline in the Tribal Engagement Plan, particularly through regional and national inter-agency and inter-Tribal coordination and leveraging of resources.

Tribal Youth Programs

Tribal youth programs are an important step in developing relationships, diversifying the climate-related fields, and building capacity in the next generation of Tribal staff. In 2015, the SC−CSC conducted eight Tribal youth programs with partners including the NOAA National Severe Storms Laboratory and the National Drought Mitigation Center. The SC-CSC has developed protocols for conducting climate-related activities with youth such as "Greenhouse Gas in a Bottle," "Ocean Acidification Effects on Sea Shells," (right), "Water Banking," and "Understanding Fire Climatology."

Tribal Capacity Building

The SC-CSC is facilitating Tribal stakeholder capacity-building in climate-related areas while also training climate researchers to conduct ethical research and to develop positive Tribal relationships. In 2015, the SC−CSC partnered on seven trainings for Tribal staff and drafted a "Working in Indian Country" guidebook for researchers that will be released in 2016.

The SC−CSC partnered with the National Conservation Training Center and the Choctaw Nation of Oklahoma to host two "Vulnerability Assessment" trainings for Tribal staff in OK and NM (left). The training was designed to guide Tribal conservation and resource management practitioners in two essential elements in the design of climate adaptation plans: (1) identifying which species or habitats are likely to be most strongly affected by projected changes; and (2) understanding why these resources are likely to be vulnerable. Vulnerability assessments are a critical tool in undertaking any climate change planning or implementation.

In addition, the SC-CSC coordinated an inter-agency curriculum working group focused on developing organized, consistent, and intentional climate-related trainings for Tribes and Native scientists. This working group is beginning by mapping the climate training needs of Tribes and Native scientists to determine the ideal order, frequency, venues, and agency leadership for offerings. Other agencies participating in this effort include the US Fish and Wildlife Service, the US Dept. of Agriculture, the US Army Corps of Engineers, the Environmental Protection Agency, and multiple groups from the National Oceanic and Atmospheric Administration.

Building Collaborations and Partnerships

2015 SC-CSC Annual Research Workshop

The SC-CSC invited approximately 60 federal and university researchers and land management representatives to participate in a research workshop on November 19-20, 2015 in Fort Worth, Texas. The workshop featured a keynote talk by Dr. Kristine DeLong from Louisiana State University on "Coastal Impacts and Paleoclimate." The primary focus of the workshop was for researchers and resource management professionals to discuss inter-disciplinary and inter-institutional climate-related research topics and develop teams in preparation for future solicitations. The format of the workshop focused on working in intense inter-disciplinary, inter-institutional small groups (left) to develop proposal topic outlines related to climate challenges within the south-central US. Groups networked and sketched out some basic research questions based on the intersection of their interests. Participants brought 10 ideas to the workshop and generated an additional 16 potential project topics on the first day. By consensus, participants narrowed down the topics to the top 12 for continued discussion at the workshop. Several of these ideas are currently under development as proposals.

Science by the Glass: Bringing Science to the Public

SC-CSC investigators at Texas Tech University started a new *Science By The Glass* event series. *Science by the Glass* events are informal discussions hosted in a local pub that bring together members of the community with faculty and students to discuss topics related to science, climate, and society. A speaker presents on a controversial issue related to climate science, and the audience is invited to discuss afterwards. Topics in 2015 included national parks, the dust bowl, fracking, the Syrian refugee crisis, and endangered species. Videos of these events are available on YouTube: <https://www.youtube.com/channel/UC0Ik7t5eOtbzuOB0ikPoXGQ>

Katrina and Rita: A Decade of Research and Response

On August 29, 2005, Hurricane Katrina made landfall near the Louisiana-Mississippi border, wreaking havoc along the U.S. Gulf Coast. The storm's wind and storm surge, and the subsequent flooding of New Orleans and surrounding cities, left over 1,800 people dead and caused over $100 billion in damage. The following month, Hurricane Rita struck southwest Louisiana, dealing a double-blow to the state, the coast and the nation. In commemoration of the storms' 10th anniversary, Louisiana State University hosted *Katrina and Rita: A Decade of Research and Response*, a coordinated collection of events and activities that highlighted the research that came out of the storms. LSU researchers have generated more than 175 published papers, presentations, and other materials based on research relating to Katrina, Rita and post-hurricane recovery. SC-CSC investigators Dr. Barry Keim and Dr. Robert Twilley presented at the symposium.

Society of Environmental Journalists' Annual Meeting

The SC-CSC helped bring the annual meeting of the Society of Environmental Journalists to Norman, OK, in 2015. The theme of the meeting was "Weather, Water, Energy: News in **Every** Neighborhood," and SC-CSC staff hosted panel discussions, led field trips, and gave talks. The SC-CSC also hosted a graduate student poster session (right) during the banquet reception. After the conference concluded, journalist attendees from all across the nation wrote about SC-CSC research and climate-related issues of regional importance.

Communicating Science

Regaining Ground: Louisiana's Vanishing Wetlands

Researchers at Louisiana State University contributed to Regaining Ground, a short documentary film produced by Rhonda Chan Soo that highlights pioneering approaches to saving Louisiana's vanishing wetlands. Efforts to build a more resilient New Orleans are being undermined by land loss due to subsidence, storm surge, canal dredging from oil companies, and sea-level rise due to climate change. As wetlands erode in Louisiana, the security of coastal communities erodes with them. Featured in the film is SC-CSC investigator Dr. Victor Rivera-Monroy (right) discussing LSU's blue carbon monitoring of black mangroves. The short film is available on YouTube: <https://www.youtube.com/watch?v=fyVdaWrPqLQ>

Global Weirding: Climate, Politics, and Religion

Dr. Katharine Hayhoe (left), Associate Professor at Texas Tech University and an SC-CSC investigator, collaborated with KTTZ, a public television station based in Lubbock, Texas, to crowdfund a new series of web videos titled *Global Weirding*. Katharine will host two seasons of ten episodes each that will focus on exploring the arguments, science, religion, culture, and psychology at the intersection of politics and climate change. The first season of the series will debut in the fall of 2016.

New Massive Online Open Course: Managing for a Changing Climate

Staff and faculty from the SC-CSC at the University of Oklahoma are developing an online, interactive course designed to provide integrative understanding of the components of the climate system, including the range of natural climate variability and external drivers of climate change, and the impacts of a changing climate on multiple sectors such as the economy, policy, ecosystems, and indigenous populations. The course content will be framed around understanding the United Nations Framework Convention on Climate Change deliberations to help students apply their knowledge and practice negotiation skills needed for nations, peoples, and businesses to mitigate and adapt to the future.

The course will serve enrolled undergraduate students at the university for-credit, but will also be freely available for anyone worldwide to join in the online content and discussion. Natural resources managers, Tribal environmental professionals, students at other CSC and LCC institutions, and anyone from the general public can register to participate using just a web browser and internet connection. An interactive learning community with multimedia-rich content and dynamic social tools will connect learners and teachers in an unparalleled learning environment. Guest instructors from the SC-CSC network have offered their expertise through professionally-produced videos on targeted course topics (right).

The new course will debut in the Fall 2016 semester online: <http://janux.ou.edu>

Selected publications

Castro, A.J., M. García-Llorente, **C. Vaughn**, J.P. Julian, 2016. Willingness to pay for ecosystem services among stakeholder groups in a South-Central U.S. watershed with regional conflict. *Journal of Water Resources Management and Planning*, 05016006.

Castro, A.J., **C. Vaughn,** J.P. Julian, M. García-Llorente, 2016. Social demand of ecosystem services and implications in watershed management. *Journal of the American Water Resources Association*, 1-13.

Castro, A.J., **C. Vaughn,** J.P. Julian, M. García-Llorente, K.N. Bowman, 2015. Social perception and supply of ecosystem services: a watershed approach for carbon related ecosystem services. In: J.A Blanco, Y.H. Lo (editors), *Biodiversity in Ecosystems – Linking Structure and Function*, Universidad Publica de Navarra, Spain.

DeLong, K.L., 2015. Corals – Sclerochronology. In: R.W. Jack, J.W. Thompson (editors), *Encyclopedia of Scientific Dating Methods*, Springer, Netherlands.

Dixon, K., **J. Lanzante**, M. Nath, **K. Hayhoe**, **A. Stoner**, A. Radhakrishnan, V. Balaji, **C. Gaitán**, 2015. Evaluating the stationarity assumption in statistically downscaled climate projections: is past performance an indicator of future results? *Climatic Change*, doi:10.1007/s10584-016-1598-0

Earl, J.E., S. Fuhlendorf, In review. Relative importance of climate means and extremes to population vital rates: a case study on the threatened lesser prairie-chicken. *PLoS One*.

Earl, J.E., R.D. Semlitsch, 2015. Importance of forestry practices relative to microhabitat and microclimate changes for juvenile pond-breeding amphibians. *Forest Ecology and Management,* 357: 151-160.

Kuster, E. L., C.E. Lunday, **R.A. McPherson**, 2015. A Comparison of North American Regional Climate Change Assessment Program Output and Oklahoma Mesonet Observations: Precipitation and Temperature. *The Geographical Bulletin*, 56(2), 102.

Meenakshi, J., M. Bhat, **V. H. Rivera-Monroy**, E. Castañeda-Moya, M. Simard, **R.R.Twilley**, In Review. The role of economic, policy, and ecological factors in estimating the value of carbon stocks in Everglades mangrove forests, South Florida, USA. *Environmental Science and Policy.*

Qiao, L., C. Zou, R. Will, E. Stebler, 2015. Calibration of SWAT model for woody plant encroachment using paired experimental watershed data. *Journal of Hydrology*, 523:231-239.

Rohli, R.V., N. Bushra, **N. Lam**, L. Zou, V. Mihunov, M.A. Reams, J.E. Argote, In Review. Drought indices as drought predictors in the south-central United States. *Natural Hazards*.

Rovai, A.S., P. Riul , **R.R. Twilley**, E. Castañeda-Moya, **V.H. Rivera-Monroy**, A.A. William, M. Simard , M. Cifuentes-Jara, R.R. Lewis, S. Crooks, P.A. Horta, Y. Schaeffer-Novelli, G.Cintrón, M. Pozo-Cajas, P.R. Pagliosa, 2016. Scaling mangrove aboveground biomass from site-level to continental-scale. *Global Ecology and Biogeography,* 25(3): 286-298.

Ryu, J-H., **K. Hayhoe**, 2015. Regional and large-scale influences on seasonal to interdecadal variability in Caribbean surface air temperature in CMIP5 simulations. *Climate Dynamics*, 45(1), 455-475.

Swain, S., **K. Hayhoe**, 2015. Projected changes in drought and wet conditions over North America. *Climate Dynamics*, 44(9), 2737-2750.

Swaminathan, R., M. Sridharan, G. Dobbie, **K. Hayhoe**, 2015. Modeling Ice Storm Climatology. *AI 2015: Advances in Artificial Intelligence*, 9457, 539-553.

Van Gestel, N., N. Dhungana. D.T. Tissue, **J.C. Zak**, 2016. Seasonal microbial and nutrient responses during a 5−year reduction in the daily temperature range of soil in a Chihuahuan Desert ecosystem. *Oecologia*, 180: 265-277.

Xue, X., K. Zhang, Y. Hong, J.J. Gourley, **W. Kellogg**, **R.A. McPherson**, Z. Wan, B.N. Austin, 2015. New multisite cascading calibration approach for hydrological models: Case study in the Red River Basin using the VIC model. *Journal of Hydrologic Engineering*.

Activities Planned for 2016

- Conduct a systematic update to our consortium website layout and content;
- Add a new communications specialist to more fully translate SC-CSC research to stakeholders;
- Advance research on drought impacts and eco-hydrology in the Red River and Rio Grande Basins through holistic model integration and the use of coupled human-natural systems methods;
- Develop a research team focused on extreme weather events and their impacts;
- Continue to strategically develop large-scale inter-institutional and inter-disciplinary regional proposals to establish a broader funding base;
- Evaluate global climate model projections across the region, evaluate statistical downscaling methods, and develop best practices for impacts researchers and resource managers on how to apply the output from these data sources in partnership with other regional and national efforts;
- Educate and train management partners and support Tribal engagement across the region, including training the new Bureau of Indian Affairs' Tribal liaisons, hosting Tribal workshops and student conferences, and pursuing funding opportunities in collaboration with Tribal partners;
- Enhance collaborations with Tribes and Tribal organizations in New Mexico;
- Link students across the region by leading an undergraduate summer internship for under-represented minorities and launching an online open course on managing for climate impacts; and
- Work with our colleagues at the US Geological Survey on the new administration transition period.

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

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