



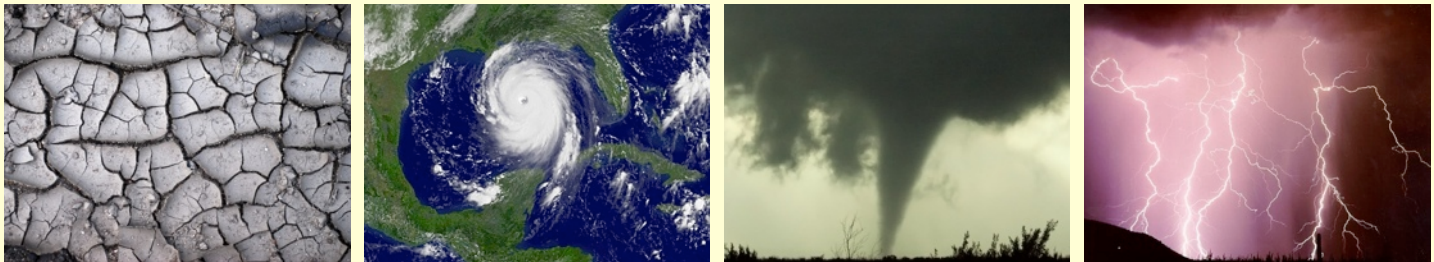
5th Annual Report
May 1, 2012 - March 31, 2013

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The original proposal (Climate Risk Mitigation Program) was submitted under a competitive RFP. After review, NOAA asked OU to revise the proposal with a new title and budget. The revision (Southern Climate Impacts Planning Program (SCIPP)) was the one ultimately funded on award NA08OAR4320886. For the last four years, our annual performance report has been submitted under the title "Southern Climate Impacts Planning Program (SCIPP)" and has been accepted. Please accept the annual report entitled "Southern Climate Impacts Planning Program (SCIPP) for the period 5/1/2012-3/31/2013.



SOUTHERN CLIMATE IMPACTS PLANNING PROGRAM (SCIPP)
REGIONAL INTEGRATED SCIENCES AND ASSESSMENTS PROGRAM

SCIPP Project Team

The Southern Climate Impacts Planning Program team consists of the following investigators, core office staff, research & support staff, summer interns, and graduate students from the University of Oklahoma (OU) and Louisiana State University (LSU). SCIPP's Stakeholder Services Committee (Advisory Committee) is also detailed below. Team personnel are current as of March 31, 2013.

Principal Investigators

Mark Shafer (OU) and Barry Keim (LSU)

Renee Edwards (LSU), Yang Hong (OU), Peter Lamb (OU), Mark Meo (OU), Kevin Robbins (LSU), and May Yuan (OU)

Co-Investigators

Core Office Staff

Program Managers: Margret Boone (OU) and Lynne Carter (LSU); Associate Program Manager: Rachel Riley (OU); Research Associates: Alek Krautmann (OU), Hal Needham (LSU); Undergraduate Student Assistants: Emma Fagan (OU), Charlotte Lunday (OU), Garrett Seale (OU) and Monique Sellers (OU)

Jared Bostic (OU), Kyle Brehe (LSU), Luigi Romolo (LSU), David Sathiaraj (LSU), Ada Shih (OU), and Lacie Webb (OU)

Research & Support Staff

Graduate Students

Laura Becker (LSU), Amanda Billiot (LSU), Jonathan Denham (LSU), Rebekah Jones (LSU), Carly Kovacik (OU), Carrie Pavlowsky (OU), and Zhen Zhang (OU)

Margaret Davidson (NOAA), Jeffrey Gaffney (University of Arkansas), Gregg Garfin (University of Arizona), Marilu Hastings (Cynthia and George Mitchell Foundation), Michael Hayes (National Drought Mitigation Center), Bill Hooke (American Meteorological Society), Rebecca Jennings (Federal Emergency Management Agency), Putnam Reiter (Oklahoma Department of Emergency Management), Bob Rose (Lower Colorado River Authority), David Schlotzhauer (Louisiana Governor's Office of Homeland Security and Emergency Management/NWS Lower Mississippi River Forecast Center), Tracie Sempier (Mississippi-Alabama Sea Grant Consortium), Melissa Stults (University of Michigan), Russ Vose (National Climatic Data Center), Suzanne Van Cooten (NWS Lower Mississippi River Forecast Center), and Tom Wilbanks (Oak Ridge National Laboratory)

Stakeholder Services Committee (SCIPP Advisory Committee)

SCIPP Student Alumni 2012-2013 Graduates

Lu Liu (OU), Anna Trevino (LSU), and Wanyun Shao (LSU)

Renee McPherson (OU), Sascha Petersen (Adaptation International), Cindy Rosenthal (OU), and Kodi Monroe (OU, Sea Grant)

SCIPP Affiliates



New Areas of Focus and Partnerships

Planning for extreme weather and climate events are central to the work of the Southern Climate Impacts Planning Program, though are not our only focus. The following represent the various new areas of focus and partnerships of SCIPP with a brief description of the questions and issues the SCIPP team is working to address. New partnerships are in **bold**.

Climate Adaptation Planning

Key Questions:

What information, research, tools, and other aspects are needed to support scientifically informed planning as related to future climate?

What steps (if any) are communities, state agencies, tribal nations, and federal agencies in the South Central United States taking to be prepared for the impact of a changing climate on weather sensitive components of their operations?

SCIPP was invited to participate with the **Consortium on Climate Risk in the Urban Northeast (CCRUN)** in their special projects to work with **NASA** in preparing their facilities for a changing climate. In particular, SCIPP presented *Thinking Adaptation? Some things you might want to think about* at the Resilience and Adaptation to Climate Risks workshop at the Stennis Space Center area on October 16-18, 2012.

The normal activities of **CCRUN** focus on the region encompassing the Boston-to-Philadelphia corridor. Because some key **NASA** facilities are located outside of **CCRUN's** region, an opportunity presented itself to blend SCIPP's expertise in climate adaptation in the south central and southeastern U.S. with **CCRUN's** efforts to serve stakeholder needs in assessing and imagining risks from climate variability and change.

SCIPP was asked to bring our unique storm surge data set and specialized knowledge to build the region-specific information that could help meet the needs of an important **NASA** facility in the southeast. Dr. Lynne Carter and Hal Needham presented to the Stennis group and participated in the breakout group discussions.

SCIPP is also partnering with the **Department of Interior South-Central Climate Science Center** on a number of tribal workshops focusing on education for tribal nations related to climate change and variability. This partnership is an expansion of previous work SCIPP conducted during its first Inter-Tribal Meeting on Climate Change and Variability in December 2011.

SCIPP Co-Sponsored a *Climate Adaptation Training for Coastal Communities* training course on February 25-27, 2013 in Baton Rouge, LA. This training course focused on providing participants, which included local government officials, coastal managers, and others, with practical information about sea level rise, tropical storm intensity, and other coastal climate adaptation issues. The course was a joint effort between SCIPP, NOAA, **Louisiana Sea Grant**, and the **Louisiana Department of Natural Resources Office of Coastal Management**.

The **City of Biloxi, MS** invited SCIPP researcher Dr. Lynne Carter to present about *Climate Changes - How to Be More Ready* on February 28, 2013. The **City of Biloxi, MS** also recently created a handout that incorporated climate change information from SCIPP. This handout was mailed to Biloxi, MS residents.

Climate Change Fact or Fiction?

Overview
 Significant evidence is now mounting that global warming, due to the increase in the amount of greenhouse gases in the atmosphere, is causing changes in our climate. While some information being shared in the community suggests that increasing temperature and sea level rise will have a negative impact on our quality of life, other information suggests that these changes may have some positive impacts on our quality of life.

Sea Level Rise Visualization Map
 According to the Southern Regional Climate Center, sea level rise is expected to be 1 to 3 feet by 2100. This is based on the most conservative estimates of sea level rise. The map shows the potential for sea level rise in the Biloxi region. The map shows that sea level rise is expected to be 1 to 3 feet by 2100. This is based on the most conservative estimates of sea level rise.

Temperature Changes
 According to the Southern Regional Climate Center, the temperature in the Biloxi region is expected to increase by 1 to 3 degrees Fahrenheit by 2100. This is based on the most conservative estimates of temperature change.

Precipitation
 According to the Southern Regional Climate Center, the amount of precipitation in the Biloxi region is expected to decrease by 1 to 3 inches per year by 2100. This is based on the most conservative estimates of precipitation change.

Frequently Called Numbers
 Area code is 228 unless otherwise noted.

- Animal Control 228-694-1111
- Auto Tag/Program Tag Information 434-8141
- Citizen Services/Information Services 434-8141
- Code Enforcement 434-8141
- Customer Services 434-8141
- Fire Department 434-8141
- Police Department 434-8141
- Public Works 434-8141
- Recycling 434-8141
- Senior Services 434-8141
- Social Services 434-8141
- Utility Services 434-8141
- Water Services 434-8141
- Waste Services 434-8141
- Youth Services 434-8141

Figure 1: Part of City of Biloxi, MS handout on climate change.

SCIPP FACT: The SCIPP region encompasses the most states of any RISA Team. The SCIPP region includes Oklahoma, Texas, Arkansas, Louisiana, Tennessee and Mississippi.

Climate Adaptation Planning



Figure 2: SCIPP Program Manager Dr. Lynne Carter presenting at the Lafourche Parish Coastal Hazards Workshop on January 10, 2013.

SCIPP has reached out to supporting climate education and information needs for a variety of regional entities through climate presentations, discussions, and information sheet development. A few recent examples include working with:

- **Sea Grant Louisiana** with communities, extension agents, teachers, and in public presentations;
- the **National Estuarine Research Reserve (NERRS)** for presentations with Mississippi and Texas regional communities; and educators;

Learning About a Changing Climate presentation at the **NERRS Coastal Resources Center** on July 12, 2012 for the Climate Teacher Workshop sponsored by **NERRS**, the **Mississippi Department of Marine Resources**, and the **University of Southern Mississippi's Center for Science and Mathematics Education**

Learning About a Changing Climate presentation for the Climate Teacher Workshop sponsored by the **Louisiana Sea Grant** in Baton Rouge, LA on July 23, 2012

- the **NOAA Educational Partnership Program** at their Education and Science Forum reaching STEM students and researchers;
- the **Coastal Zone Management program in Louisiana** reaching all of the coastal zone programs in the state;

NOAA Coastal Services Center and the **Coastal Zone Management Program**, Virtual Conference #3: Regional Initiatives and Partnerships to Address Coastal Hazards and Climate Change; *Gulf Coast Climate Information Needs Assessment*, Oct 11, 2012

Partnered with **NOAA Coastal Services Center Coastal Zone Management Program** and **Louisiana Sea Grant** for Climate Adaptation Training Program to present climate science in Louisiana and Adaptation examples on Feb 25 & 26, 2013

Partnered with **NOAA Coastal Services Center** and **MS/AL Sea Grant** for Climate Adaptation Training Program to present climate science in MS/AL and Adaptation examples on Feb 27-Mar 1, 2013

- the NSF funded **CLIPSE program**;
- the **National Caucus of Environmental Legislators** as an invited presentation at their 4th Annual Mississippi River Forum;
- and the **Rand Roundtable**, with an invited presentation entitled: *Exploring Resilience in a Changing World: Bridging the Science of Disaster with a Dialogue about Human Impact*.

SCIPP FACT: The South-Central U.S. experiences the nation's most extensive array of climate-related hazards, including severe storms, flooding, drought, hurricanes, storm surge, heat waves, wildfires, and winter storms.

Drought Management and Mitigation

Key Questions:

What steps (if any) are communities, state agencies, tribal nations, and federal agencies in the South Central United States taking to be prepared for the impact of a continuing drought on sensitive components of their systems?

How can SCIPP utilize relationships with other agencies (NOAA, CLIMAS, NDMC, NIDIS, AASC) to discuss and disseminate drought related materials?

What lessons have been learned from the current drought that can influence future drought decision-making?

SCIPP, in conjunction with the NOAA Regional Climate Services Director for the Southern Region, the National Integrated Drought Information System (NIDIS), the National Drought Mitigation Center (NDMC), and the American Association of State Climatologists (AASC), have hosted a series of forums, workshops, and webinars to address the current drought situation in the southern plains and promote planning and preparation for future drought conditions.

This *Managing Drought in the Southern Plains* initiative brought together various state and local agencies, federal officials, and many others tasked with managing drought conditions. The following forums, workshops, and webinars were held during 2012 and 2013:

Forums and Workshops:

- * Drought Service and Assessment Meeting in Fort Worth, TX on August 23, 2012
- * West Texas Drought Outlook and Assessment Forum in Abilene, TX on November 1, 2012
- * Spring 2013 Southern Great Plains Drought Outlook and Forum in Goodwell, OK on March 7, 2013

Focus Topic Webinars (more than 700 views on YouTube):

- * Water Resources Update (May 10, 2012)
- * Then and Now (June 14, 2012)
- * Southern Plains Drought Update (July 12, 2012)
- * Agriculture and Livestock (August 9, 2012)
- * Public Health (September 13, 2012)
- * What Happened to El Nino? (November 8, 2012)
- * Early Spring Outlook (February 14, 2013)



Along with focus topic webinars, SCIPP started producing a shortened, 5-minute weekly briefing in May 2012. To date, 28 drought briefings are available for viewing on SCIPP’s website and YouTube (with over 1,800 views on YouTube). By shortening these briefings, SCIPP hopes that they will be easier to use as decision makers find the need and opportunity. Likewise, SCIPP provides a weekly newsletter announcing the availability of the webinar for viewing, along with relevant drought graphics from sources such as the U.S. Drought Monitor, the Climate Prediction Center, the U.S. Department of Agriculture, and others.

Figure 3: (Left) West Texas Drought Outlook and Assessment Forum in Abilene, TX and (Right) Spring 2013 Southern Great Plains Drought Outlook and Forum in Goodwell, OK.

Drought Management and Mitigation

Water Reservoir Data and Visualization Tool

Mark Shafer and Margret Boone (OU), Kevin Robbins, Hal Needham, and David Sathiaraj (LSU)

During the Southern Plains drought of 2011, SCIPP identified that water resources information was sparse, distributed and inconsistent. These facts were highlighted in several drought forums and on a webinar series, *Managing Drought in the Southern Plains*. Based upon this finding, SCIPP has pursued a two-pronged approach to addressing this problem. The Southern Regional Climate Center (SRCC) has sought and obtained funding to develop an integrated reservoir database, built upon the Applied Climate Information System (ACIS) framework. The second component is engagement of stakeholders in the region to assess requirements for design of the database and visualization tools.

On October 30, 2012, SCIPP researchers met with the **Oklahoma Water Quantity Forum** to discuss the development of the Water Reservoir Data Visualization Tool, and to solicit input on which water reservoir variables would be most important to display. A list of roughly 10-15 variables were collected, and contained such items as conservation pool (%), total storage, inflow/outflow, and sedimentation. Likewise, collaborative work is ongoing with the **Texas Water Development Board** in Austin, Texas. This group has produced web-tools to depict reservoir levels in the state of Texas. SCIPP researcher Hal Needham met with them in February, 2013, to discuss collaboration on this project. They were very interested, and provided access to computer scripts that they used for their database. This will make it much easier for SCIPP to develop similar products for Texas, Oklahoma, and Louisiana. The objectives of the project include:

CORPS OF ENGINEERS
LITTLE ROCK DISTRICT
LAKE LEVELS @ 7 AM
(CURRENT AND FORECAST)

INDICATED FORECAST ELEVATIONS ARE SUBJECT TO CHANGE

* 21 MAY 2012 / 1031 *

	SEAS/ CONS POOL	7 AM POOL MON 21	7 AM POOL FORECASTS			CREST or EMPTY ELEV DATE
			TUE 22	WED 23	THU 24	
BEAVER	1121.4	1118.79 92% CONS	1118.8 92%	1118.7 92%	1118.7 92%	FC EMPTY %
TABLE ROCK	916.7	913.77 90% CONS	913.7 90%	913.6 89%	913.5 89%	FC EMPTY %
BULL SHOALS	657.0	653.82 87% CONS	653.8 87%	653.8 87%	653.7 87%	FC EMPTY %
3-LAKE SYSTEM % FULL (BEA, TAB, BUL)		0%	0%	0%	0%	
NORFORK	555.0	552.06 92% CONS	552.1 92%	552.1 92%	552.0 91%	FC EMPTY %
4-LAKE SYSTEM % FULL (BEA, TAB, BUL, NOR)		0%	0%	0%	0%	
GREERS FERRY	462.1	460.21 92% CONS	460.1 92%	460.0 92%	460.0 92%	FC EMPTY %
CLEARWATER	498.0	498.47 0% F.C.	498.5 0%	498.5 0%	498.5 0%	FC EMPTY %
BLUE MOUNTAIN	387.0	387.09 0% F.C.	387.1 0%	387.1 0%	387.1 0%	FC EMPTY %
NIMROD	344.9	345.28 1% F.C.	345.3 1%	345.3 1%	345.2 1%	FC EMPTY %
DEQUEEN	437.0	437.21 0% F.C.	437.2 0%	437.2 0%	437.2 0%	FC EMPTY %
GILLHAM	502.0	502.31 0% F.C.	502.3 0%	502.4 0%	502.4 0%	FC EMPTY %
DIERKS	526.0	526.50 1% F.C.	526.5 1%	526.5 1%	526.5 1%	FC EMPTY %
MILLWOOD	259.2	259.61 1% F.C.	259.6 1%	259.5 1%	259.5 1%	FC EMPTY %

Figure 4. Daily reservoir levels from the U.S. Army Corps of Engineers Little Rock District Office (21 May 2010).

for their database. This will make it much easier for SCIPP to develop similar products for Texas, Oklahoma, and Louisiana. The objectives of the project include:

Objective #1: Determine stakeholder requirements for design of an integrated water reservoir database.

- Assess desired characteristics of variables that should be included and their relative priorities;
- Conduct similar assessments across a range of sectors, including water resources managers, recreation and tourism, energy production, fish and wildlife, and agriculture.

Objective #2: Integrate the identified requirements into an operational system.

- Work in tandem with the technical design process to identify key variables and products;
- Test prototype products with focus groups.

Objective #3: Promote use of a new system among sectors most directly impacted by water restrictions.

- Disseminate information through the *Managing Drought in the Southern Plains* webinar series;
- Present information about the system at professional association meetings, such as annual state water conferences;
- Include information in regular publications geared for a wide audience, such as the *Southern Climate Monitor* (SCIPP monthly newsletter).

Planning for Extreme Weather and Climate Events

Key Questions:

How does our diverse region plan long-term for these hazards and how do hazard perceptions vary regionally?

What information sources and tools are used to plan for these hazards, from where is this information obtained, and who provides it?

What tools and information products are needed to more effectively plan for future hazards?

SCIPP is becoming a focal point for regional efforts that bridge climate, resiliency, and hazards. SCIPP personnel have recently been invited to a hazard meetings and because of SCIPP, input to climate adaptation and emergency preparedness are now being discussed as parts of a continuum and coordinated approaches are beginning to be addressed. This is a direct result from SCIPP's Gulf Coast Climate Information Needs Assessment (available on <http://www.southernclimate.org/publications.php>) where hazard managers were introduced to climate issues and information. Many said they had not yet considered longer term planning, but would be willing to in their emergency planning efforts. Likewise, SCIPP is participating as an advisor for a peer-to-peer community-learning network to build resiliency and as a member of a newly developing working group on climate adaptation for the **Natural Hazards Mitigation Association (NHMA)** whose headquarters are located in New Orleans, LA.

The **NHMA** established a working group on Hazards and Climate Change, and SCIPP Program Manager Dr. Lynne Carter is a member. Dr. Carter was also asked to be an Advisor to the **NHMA Resilient Neighbors Network**, currently working with 10 pilot communities.

Similarly, SCIPP was presented with the opportunity to meet with **FEMA Director of Policy and Program Analysis** David Kaufman on November 15, 2012 in Washington, D.C., to discuss possible cooperative approaches to emergency management/hazard and climate adaptation efforts. This was also a great opportunity to share several of SCIPP's data tools.

Because of this highlighted need to enhance community hazards and climate adaptation efforts, SCIPP researcher Alek Krautmann has been diligently reviewing local and state hazard mitigation plans from the states within our region: Oklahoma, Texas, Louisiana, Arkansas, Tennessee, and Mississippi. By reviewing these hazard mitigation plans, SCIPP will provide information regarding the hazards affecting each state and comment on how these hazards may change in the future. Since communities often need to produce hazard mitigation plans with limited resources, the goal of this work is to have scientifically accurate hazard descriptions and climate information that can be readily incorporated into the planning process. SCIPP is presently applying this in a review requested by Oklahoma Emergency Management for their required 3-year update of their state hazard mitigation plan.

SCIPP Investigators Barry Keim and Hal Needham introduced SCIPP's unique SURGEDAT dataset for possible use and collaboration in vulnerability assessments in Houston and Galveston, around New Orleans, and by the **U.S. Department of Energy**.

SURGEDAT was also a focus topic at the **Lake Pontchartrain Basin Foundation** round-table meeting in the summer of 2012. SCIPP researcher Hal Needham met with people concerned about the **New Orleans Flood Protection System**. This round table included people from the U.S. Army Corps, Levee Boards, and Red Cross.

Hal Needham also gave a seminar at **Texas A&M Galveston** in October of 2012. This seminar focused on our storm surge research. The audience was very interested in the information since the group is proposing to build an Ike Dike along the Texas Coast.

SCIPP FACT: Since 2000, all six states within the SCIPP region rank among the top 20 in presidential disaster declarations, according to FEMA.

Planning for Extreme Weather and Climate Events

SCIPP began collaborative work with **Oak Ridge and Pacific Northwest National Laboratories** to research the vulnerability of energy infrastructure to storm surge. SCIPP researchers are working with them to provide data and return period estimates for specific locations.

Similarly, SCIPP is working with the **U.S. Department of Energy** who is also interested in better understanding the vulnerability of energy infrastructure to storm surge. SCIPP researchers are collaborating with them to develop better statistical methodologies for understanding the risk of surge in specific locations.

Because of the success of the *Managing Drought in the Southern Plains* webinar series, and since the six-state SCIPP region encounters many extreme weather and climate events, SCIPP has launched a companion webinar series entitled "Extreme Events and Hazards." But unlike the drought series, which features monthly focus topic webinars and weekly drought briefings, this new series is quarterly, and focuses on a range of extreme weather events. The broader weather extremes series includes an overview of current hazards and developing threats and a focus topic on a relevant issue, such as the upcoming storm season, hurricane outlook, or winter storms. As part of the webinars, SCIPP seeks guest speakers from institutes both in and around our region. These webinars also encourage discussions about hazard issues facing the region and establish contacts/information sources.



Figure 5: Extreme Events and Hazards Webinar Series 3-page PDF summary from December 4, 2012 Flash Flooding Webinar.

The following focus topic webinars were held during 2012 and 2013:

Focus Topic Webinars:

- * Hurricanes (July 26, 2012)
- * Flash Flooding (December 4, 2012)

Climate change is experienced not so much through changes in the means but through the effects of extremes. The 2011 drought and heat wave in Texas and Oklahoma and flooding along the Mississippi River through Arkansas, Tennessee, Mississippi, and Louisiana illustrate how volatile the climate system is and the ways in which extremes shape our region.

To better understand these "tipping points" faced by communities and sectors, SCIPP is undertaking research in collaboration with **Adaptation International**, a private sector firm based in Austin, TX, to quantify what people view as critical thresholds and then to analyze past climate and projections for the frequency with which these thresholds are exceeded. This extends beyond variables such as maximum temperature or rainfall. Participants are asked to describe any ways in which weather impacts their operations which may include variables like humidity and wind speed.

SCIPP FACT: Among the SCIPP states, Oklahoma leads the way with 35 presidential disaster declarations - nine more than any other state.

Research Findings

Hurricane Storm Intensity Most Influential Evacuation Factor Renee Edwards, Louisiana State University

On the eve of Hurricane Rita's landfall, mere weeks after Hurricane Katrina devastated the Gulf Coast in 2005, Governor Blanco (D-La.) sent a loud and clear message to residents who refused to evacuate: if you stay, write your social security number on your arm with indelible ink so rescuers can identify your body.

Gov. Blanco said she hoped to scare residents into evacuating, piling on the fear and stress to drive vulnerable populations out of hazard zones. One of the reasons it worked may be because anxiety influences decision making during hurricanes more than any other emotion, a new study finds.

Researchers at Louisiana State University (LSU) conducted more than 500 phone interviews with residents of nine Louisiana parishes to examine the roles of emotion, knowledge and past experience in preparing, evacuating and relocating as a result of hurricanes. These are decisions and strategies for coping with hurricanes, which are referred to as "hazard adjustments."

"Hurricanes and Decision-Making," examines in depth the relationships between emotion, knowledge and past experience in hazard adjustment.

Authors Edwards, Miller, Grey and Brown determined that the single most influential factor when making decisions regarding hurricanes is the intensity, or strength, of the storm. The higher the category, the more likely residents are to evacuate.

But risk communication has many parts, and the authors set out to find how people made decisions influenced by anxiety, past experience, confidence in hurricane protection systems, hurricane literacy, knowledge of state programs and place attachment.

What they found was that the more anxious a person is about a storm, the more likely they are to evacuate or relocate.

Anxiety, defined as high uncertainty over an outcome and low control over a situation, causes cognitive overload, resulting in poor decision making, meaning people may not make the smartest decisions under stress. But anxiety can also reduce risk-taking, inspiring a "better safe than sorry" approach to hazard mitigation.

Knowledge of state programs and past evacuation experience also significantly influenced decision making. Those who had evacuated before were more likely to evacuate again or relocate in the future.

But not all of the factors had positive effects on a person's decision regarding hazard adjustment.

Place attachment, the idea that people will not plan for, evacuate or relocate despite warnings because of emotional or sympathetic bonds with their home or community, was not found to influence hazard adjustment.

The authors also found that the more confidence a person has in local, state and federal protection systems, such as levees, pumps, etc., the less likely they are to evacuate or relocate. This was especially true for Category 1 and 3 storms.

Literacy also decreased the likelihood of evacuation while not significantly increasing preparation. For example, respondents said they were less likely to evacuate if their home was not listed in a flood zone.

Pilot Study Reveals NWS Flood Information Used by Many

Rachel Riley, University of Oklahoma, and Renee Edwards, Louisiana State University

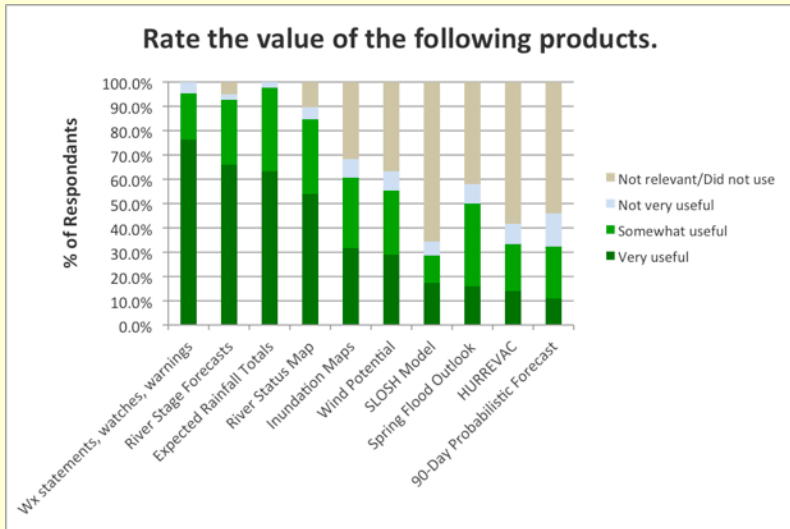


Figure 6: In one part of the survey respondents were asked to rate the value of a variety of NWS hydrologic products, ranging from not relevant/did not use to very useful. The results show that the top-rated products included the expected rainfall totals map, weather statements, watches and warnings, river stage forecasts, and the river status map.

SCIPP partnered with three NWS River Forecast Centers (RFC) and a Weather Forecast Office in our region to develop a survey that seeks to understand, on an event basis, who is using hydrologic information, how it is being used, and whether it is effective. SCIPP piloted the survey in fall 2011 (n = 13) and spring 2012 (n = 70). The results showed that almost all of the respondents (n = 61; 96.8%) used NWS flood information. Most of the respondents (n = 47; 85.5%) said they had enough information to make good decisions, and majorities agreed or strongly agreed that the floods that impacted them were predicted (n = 47; 75.8%) and forecasted with certainty (n = 38; 61.3%). Flood information sources were generally cited as being very helpful or somewhat helpful, and only a few respondents cited having problems with information sources.

This project highlighted the value of a partnership between three NWS RFCs and a university-based research team to understand and improve the effectiveness of NWS communication with its customers. SCIPP's role in the project is now complete; the next step is for the NWS partners to submit the tested and finalized survey to the Office of Management and Budget (OMB) for approval. With OMB approval, the NWS will be able to use this survey on an ad-hoc basis before, during, and after specific flood events so that a comprehensive study of the effectiveness of NWS hydrologic information can be completed in the future.

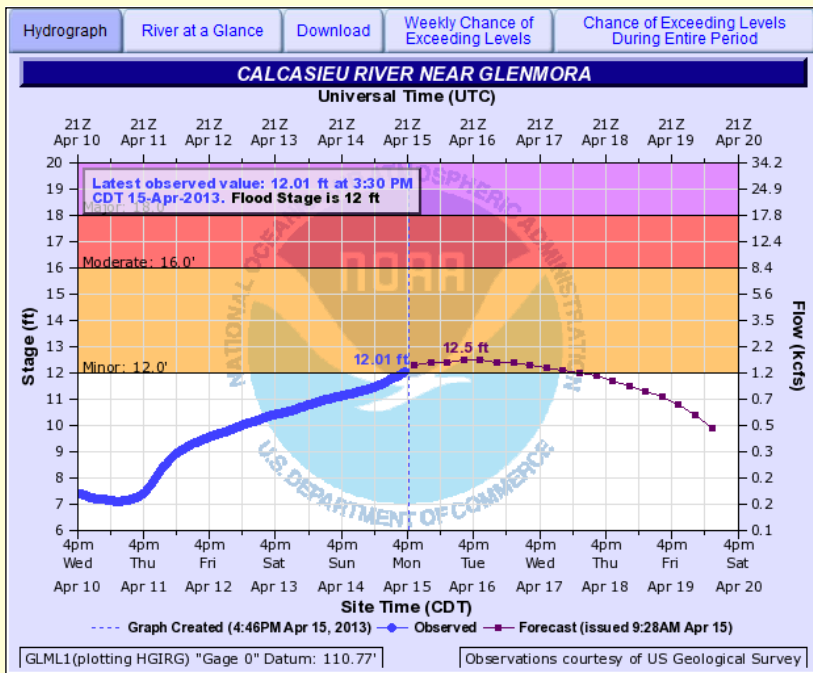


Figure 7: Example of a NWS RFC river stage forecast, one of the highly rated products in the survey.

Remote Sensing Could Help Farmers Manage Crops in Zimbabwe

Xolile Ncube, Visiting Researcher

A visiting scientist from Zimbabwe spent four months working with SCIPP at the University of Oklahoma (OU) and studied drought. Ms. Xolile Ncube works with Christian Care, an organization in Zimbabwe that focuses on implementing conservation farming techniques to mitigate some of the impacts of drought in the country. While at OU, Ncube worked with Dr. Xiangming Xiao at the Earth Observation and Modeling Facility to learn how remote sensing technology such as satellites can be used to understand land use in Zimbabwe and to predict early signs of drought.

Ncube analyzed data from the Moderate Resolution Imaging Spectroradiometer (MODIS) satellite from 2000 to 2012 to understand crop conditions. The data helped her determine the health of crops on an agricultural plot in the Binga District of Zimbabwe. The data was analyzed by three crop growth stages: ascending phase (emergence and green up), plateau phase (peak growth, flowering and seed formation) and descending phase (maturity, senescence and harvesting).

The MODIS data corresponded to the documented maize crop production calendar and Ncube confirmed that three vegetation indices, Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI) and Land Surface Water Index (SWI) are good proxies for understanding the state of vegetation at different crop growth stages.

Ncube's work showed that there is potential for using remote sensing technology as a way to monitor crop growth, especially in rural areas of Zimbabwe where observations are sparse to non-existent. The data will provide her organization with insight into the times in which they should encourage farmers to implement drought management techniques. Ncube plans to take what she learned in the United States and continue the work back home.



Figure 8: Xolile Ncube discusses her work during a University of Oklahoma Department of Geography and Environmental Sustainability seminar.

SCIPP FACT: Maize (corn) is a very important crop in Zimbabwe, both economically and culturally. Farmers are reluctant to switch to other crops, even though maize is ill-suited to the semi-arid region of northwestern Zimbabwe.

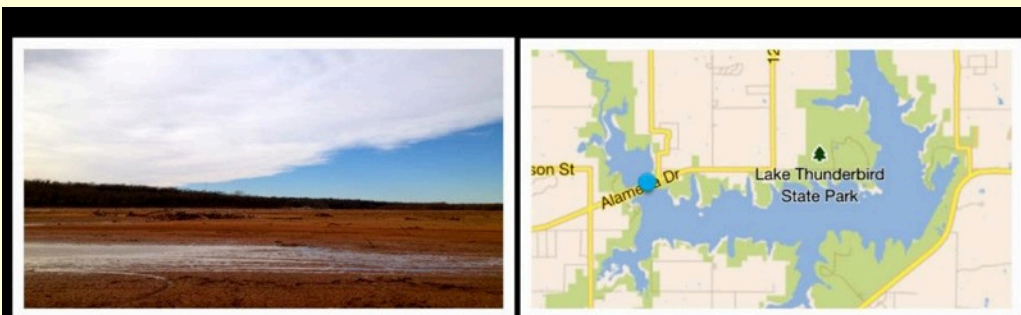
Researcher Uses Story Appraisal Theory to Understand How Individuals Make Sense of Drought

Jonathan Denham, Ph.D. Candidate, Louisiana State University

Story Appraisal Theory (SAT) provides a foundation for understanding the way individuals makes sense out of news stories. Research shows that individuals derive meaning from news stories, and the meaning can lead to implications for themselves and for others. SAT suggests news stories are represented in memory in the form of a “story kernels,” which contain information about the characters and events of a story. Individuals who hear news stories will assess the story kernels to ascertain whether or not the story has implications, which can then lead to an emotional or behavioral response. Story kernels are assessed in terms of pointedness (whether or not the story has a point) plausibility, the believability and likelihood of the events from the story actually happening, and probity (the degree to which individuals believe the story is representative of the particular phenomenon being described in the story). Our current research involves two studies that use SAT to explore the ways individuals generate implications upon reading a news story about drought.

Study 1 involves 192 participants who read a news story about drought in a small Texas town. Participants were asked if the story had any implications “for you personally,” “for others,” and “for society.” Our research team read through hundreds of responses and generated several themes. Of 192 participants, 140 generated at least one implication in response to the news story. For the purposes of this study, the open-ended responses provided by the participants represent the various ways in which people perceive news stories about drought. We identified the following categories: prescription, water importance, help, personal, cost, problem awareness, interdependence, suffering, critique, and miscellaneous. Suffering, help, and critique are associated with higher levels of fear and sympathy.

Study 2 uses the same news story from Study 1. Various participant implications from the 10 categories of responses from Study 1 serve as prompts which participants assess in terms of whether the participants generate a similar implication. Additionally, participants list “as many implications they can think of” that the story has for them personally, for the people of the affected town, for Texas, and for the country as a whole. Participants are provided with numbered dialog boxes, which we believe will encourage clearer more discrete responses, which was a limitation from Study 1. Data are currently being collected for Study 2.



The northwest portion of Lake Thunderbird off Alameda Dr as seen on the map is pictured to the left nearly dry. This is a very shallow (5–10ft) portion of the lake to begin with, but still represents just how low the water is from drought conditions.

Figure 9: One of several drought images produced by SCIPP researchers to share with decision makers to help identify impacts of the ongoing drought.

SCIPP FACT: The 2011-2012 drought forced ranchers to sell herds which had taken a lifetime to develop. Personal sense of loss leads to loss of identity, substance abuse, depression, violence, and in some cases suicide. These were pervasive attributes during the Dust Bowl.

Graduate Student Research

Ocean-Atmosphere Interaction Between the Gulf of Mexico Sea Surface Temperatures and Northern Gulf Coastline

Laura Becker (LSU)

An objective of this research is to establish a connection between ENSO phases and responses in Gulf of Mexico sea surface temperatures if present. Also evaluated are relationships between Gulf of Mexico sea surface temperatures and changes to the sea breeze along the Gulf Coast through the ocean-atmospheric connection. This study will attempt to identify the inland precipitation responses to changing Gulf sea surface temperatures and to assess possible connections between dewpoint temperatures along the Gulf of Mexico coastline and Gulf sea surface temperatures. Station locations and data quality have been a recent focus. Stations too close together or missing large amounts of precipitation or dewpoint temperature data are not used. The study area includes the northern Gulf Coast and inland 200 km of the coastline. The effects of Gulf sea surface temperatures on the Gulf Coast could benefit drought and flood research within the region.

Rights, Regulations and Water: Value Clashes of Groundwater Users in the High Plains Groundwater Conservation District

Carrie Pavlowsky (OU)

By using Multi-Attribute Utility Analysis, the goal of this research is to find the values held by different levels of groundwater conservation district users in order to better understand the inability of groundwater conservation districts ability to protect, preserve and conserve groundwater and also predict a future groundwater scenario dependent on user input.

Literature related to groundwater policy in Texas including history, current policy and predicted climate patterns that affect water availability in the state as well as sustainable development theory will be reviewed within a group theory and Ostrom's institutional analysis framework.

This research will enable decision makers to better understand the importance of stakeholder values and ideology in the progress and success of an organization as well as likely create future groundwater scenarios based on stakeholder values.

Storm Surge

Hal Needham (LSU)

Storm surge data is being analyzed for several research projects. A wind/surge correlation project studies the relationship between storm surge heights and hurricane winds at and before landfall and found that pre-landfall winds, particularly 18 hours before landfall, correlate best with surge heights. The wind/surge relationship data are being used to create a storm surge scale, which will classify storm surge levels on a scale of 1-5, to help coastal stakeholders better understand storm surge risk. Finally, analysis of storm surges on an international revealed that storm surges in the SCIPP region are the second highest in the world.

Ice Storm Frequency Across the United States in Response to changes in the El Niño Southern Oscillation (ENSO), Arctic, and North Atlantic Oscillations

Carly Kovacic (OU)

The goal of this study is to find an association between ice storm frequency and changes in several teleconnection patterns (ENSO, AO, and NAO) in an effort to improve freezing precipitation forecasting across the United States. With such results, this study will also develop a long-term climatology of ice storm occurrence across the United States. This research will benefit a broad range of people including but not limited to weather forecasters, atmospheric scientists, electric utility companies, and the general public. Results yielding any association between ice storm frequency and teleconnection patterns may result in improved seasonal forecasting as well as general global/synoptic scale weather pattern awareness.

SCIPP FACT: Graduate students at Louisiana State University and the University of Oklahoma contribute concentrated, applied research for SCIPP.

Accomplishments

Seasonal Climate Change Workshop

Rachel Riley and Mark Shafer, University of Oklahoma

Federal and state climate scientists, decision makers, and communication experts gathered in Norman, Oklahoma on 27 September 2012 to discuss the ways in which seasonal climate information should be communicated to various audiences. Drought information was the focus of much of the discussion because the Southern Plains had recently experienced a drought of significant magnitude and vast extent. All seasonal climate information was relevant to the workshop, however.

The workshop was organized by SCIPP, the National Integrated Drought Information System (NIDIS), and the NOAA Southern Regional Climate Services Director. Seventeen people participated in total.



Figure 10: A four-pronged approach was used to communicate drought information 2010-2012, including state drought planning, outlook and assessment forums, media engagement, and a Managing Drought in the Southern Plains webinar series.

The purpose of this workshop was to bring together climate scientists, decision makers and communication experts to discuss the methods that were used to communicate drought information in the Southern Plains during 2010-2012 and to determine the areas in which scientists can improve their communication of seasonal climate information. The discussion focused on several topics including tips for managing webinars, useful products, product deficiencies, communication challenges, the role of social media, and several unresolved issues.

The decision makers were interested in the science as long as it is in a format that is easily accessible and that some materials could be used for 5-15 minute briefings with their colleagues. Climate information and products are often used as evidence to a governing board, state agency, or the public for why a particular decision is being made, so it is important that it is displayed and formatted in a way that effectively and accurately communicates the data. Moreover, improving the connection between statistics and impacts will help decision makers better understand what to do with the information. The participants also agreed that building relationships between decision makers, information providers and the media is one of the most effective ways to ensure that scientific information is portrayed appropriately and accurately. Traditional and social media should be viewed as a strategic partner, not an adversary. Climate science information is complex but that should not deter scientists from communicating in a way that is relevant to decision makers and via various media platforms. The information that is communicated through these channels helps society manage the impacts of climate hazards such as droughts, floods, and heat waves.

SCIPP Fact: SCIPP and its partners have communicated drought information to over 500 decision makers in the Southern Plains through webinars, in-person forums, and media outreach since 2011.

SURGEDAT

Barry Keim and Hal Needham, Louisiana State University

The Saffir-Simpson Hurricane Scale measures hurricane wind strength. However, it reveals very little about storm surge, which can be equally if not more devastating. SCIPP researchers Barry Keim and Hal Needham have created SURGEDAT (<http://surge.srcc.lsu.edu>), the world's most comprehensive archive of storm surge data, to provide more context on storm surges. Utilizing 67 sources of data including federal government sources, books, academic journals and more than 3,000 pages from historical newspapers, SURGEDAT initially identified over 200 surges along the U.S. Gulf Coast since 1880. The project has now expanded, incorporating hundreds of sources from all over the world to generate a global dataset and map. The database is not just a useful tool for researchers. Decision makers have also seen many benefits from SURGEDAT. Keim and Needham have been in contact with decision makers along the Gulf Coast including the Houston/Galveston National Weather Service office, the Rice University Houston Ship Channel Project, and the Texas A&M Galveston Ike Dike Project. The latter two of these groups are working on multi-million to multi-billion dollar projects for surge protection, and Keim and Needham are providing valuable climatological perspectives in each of these cases.

During the period May 2012-March 2013, the scope of this dataset was greatly expanded. Most noticeably, ALL high water marks for each storm were identified, not just the peak height. Data available for the east coast was also expanded. These changes enlarged the dataset from around 200 high-water marks to around 7,000 high-water marks. Scripts were also written to create high water profiles of storm surge events. Enough data is available now to create more than 150 of these high-water profiles. This work has generated a lot of interest from various research groups wanting to collaborate. A web-based tool that estimates the 100-year, 50-year, etc. storm surge level for specific locations along the U.S. Gulf and Atlantic Coasts is currently in development.

Amongst the research and collaboration efforts generated by the creation of SURGEDAT, this continually expanding dataset, along with researchers Keim and Needham, have gained generous positive publicity. Listed below are links to various local and national articles and interviews:

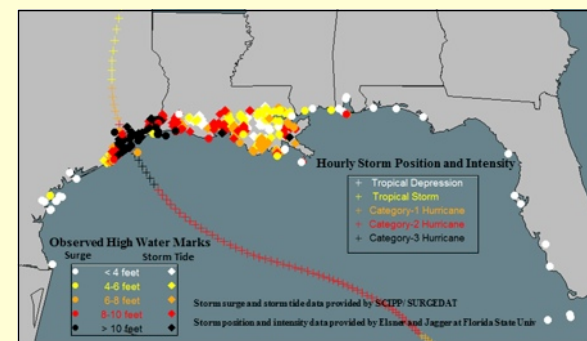
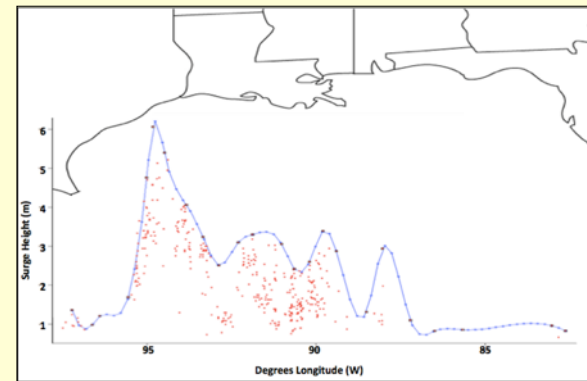


Figure 11 (Top): Hurricane Ike (2008) high-water profile generated by SURGEDAT.
Figure 12 (Bottom): Hurricane Ike (2008) storm surge/storm tide map.

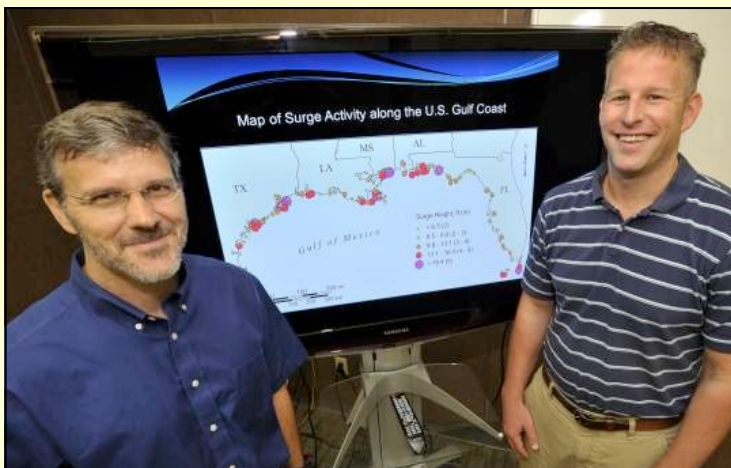


Figure 13: LSU Researchers Barry Keim (left) and Hal Needham (right) demonstrating SURGEDAT. Image courtesy The Advocate newspaper in Baton Rouge, LA.

The Advocate (Newspaper): <http://theadvocate.com/home/3276244-125/student-compiles-storm-surge-data>

LSU Website Headline: http://www.lsu.edu/departments/gold/2012/06/storm_surge_research.shtml

SCIOLOGS: http://www.scilogsg.com/from_the_lab_bench/weathering-the-storm-surge/

GEAUXLSU: <http://www.facebook.com/geauxlsu/posts/465899993437985>

AGU Article: <http://blogs.agu.org/geospace/2012/12/05/20th-century-newspapers-historical-documents-help-improve-hurricane-predictions/>

Times-Picayune: http://www.nola.com/environment/index.ssf/2013/03/pass_christian_miss_magnet_for.html.

National Climate Assessment

Mark Shafer, University of Oklahoma and Lynne Carter, Louisiana State University

SCIPP has been an active contributor to the NCA process. To provide regional context, SCIPP conducted two needs assessments (Oklahoma and the Gulf Coast) and participated in the technical input reports for the Great Plain and Southeast Regions. During this past year, SCIPP has remained involved as Convening Lead Authors on the Great Plains (Mark Shafer) and the Southeast and the Caribbean (Lynne Carter) chapters. Lynne also serves as a Lead Author on the Adaptation chapter and as a member of the FAC for ongoing leadership of the Assessment process. SCIPP has promoted engagement with the NCA process through meetings and webinars throughout the two regions and nationally.

During this process, SCIPP has looked at a vast array of climate-related challenges to the region. In the Southeast, this includes seas level rise; the effects of rising temperatures on public health, natural and built environments, energy, agriculture and forestry; and decreased water availability in the context of population growth and land use change.

Key challenges for the Great Plains revolve around competition for water and its impact on energy production, natural resources, agriculture and development; changes in crop growth cycles due to warming winters and changes in precipitation patterns; the effects of landscape fragmentation on adaptation of species; extreme events impacts on vulnerable communities; and enormous needs for adaptation and planning that dwarf anything the region has previously experienced, including the Dust Bowl.

Reviews of the adaptation literature and examples revealed a path forward. Substantial adaptation planning is occurring in the public and private sectors and at all levels of government, however few measures have been implemented and even those that have appear to be incremental changes. Although there is no “one-size-fits-all” adaptation, there are similarities in approaches that can help support progress and overcome impediments. They also revealed the need for more systematic evaluation of climate change adaptation and the need to examine adaptation in the context of other societal goals, such as sustainable development, disaster risk reduction, or improvements in quality of life.

SCIPP will continue to participate in completion of the 2013 report and in the ongoing assessment process.

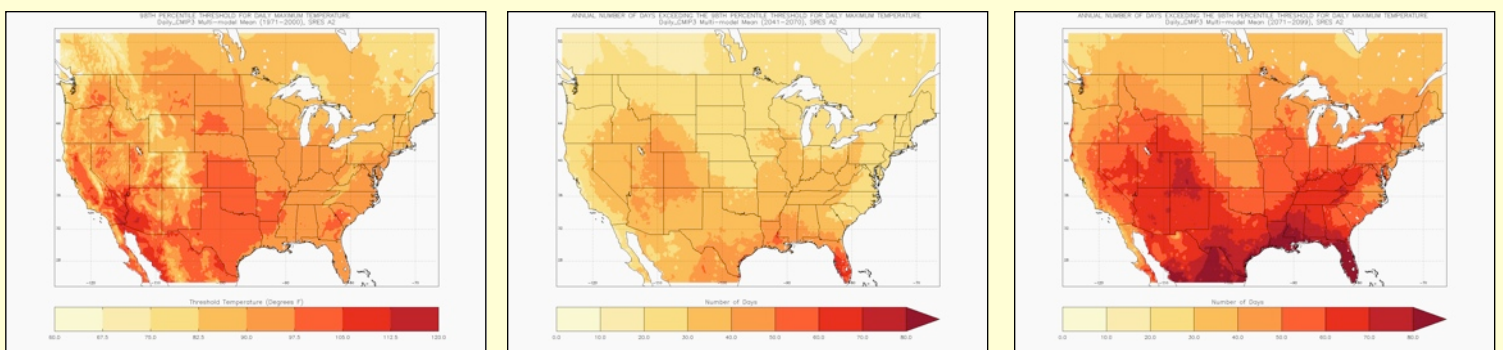


Figure 14: Exceedance maps produced by NCDC for the NCA.

SCIPP Fact: Temperatures along the Western Gulf Coast are expected to exceed 98 degrees (currently about 7 days per year) on more than 40 days per year by mid-century and more than 70 days per year by century’s end.

Field Photos Weekend

Mark Shafer, University of Oklahoma

SCIPP, collaborated with CoCoRaHS to invite participants to create a national picture of our landscape on September 8-10, 2012 and February 16-18, 2013. The goal of these Field Photos Weekends was to get as many observers as possible to take pictures of water bodies, fields, forests, or any other facet of our environment that they believed represented the conditions around them. It could be a picture of their favorite fishing hole, a nearby farmer's field, or a nice secluded spot amongst the trees. All of these landscapes were and are affected by rainfall, or in the case of many places this past year, the lack thereof. So why was SCIPP doing this?

First of all, it was wonderful to be able to appreciate nature's beauty and to be able to see the world around us. But having everyone taking pictures at approximately the same time allowed SCIPP researchers to see this landscape as it relates to the things we measure - how it compares to the amounts of rain that have fallen or if it looks like we might expect according to the U.S. Drought Monitor. Is the land around you as green as the satellite seems to think?

SCIPP hopes this will become a somewhat regular event. So while the weather around participants may seem normal this year, these photos should give everyone a point of reference for what is maybe different next year or in another season. There is no obligation for participants to continue to provide photos in future Field Photo Weekends.

So what made a good picture for a project like this? Photos should tell the story of the field or landscape, anything that the participants felt was representative of the world around them. SCIPP wanted to see what it would look like walking through a field, where some things were in better condition than others. So if the participants saw a dead tree, a bunch of trees that were dropping some leaves, and a heavily watered tree with lush green leaves, we wanted the picture showing the ones dropping leaves.

Photo ideas included:

- A water body, showing how much water it was holding and where the natural bank might be. For example, a farm pond showing the ring of bare soil around it that is usually submerged.
- A tree, showing the health of its leaves. It could be a tree in the front yard, one in a nearby park, or something over in the woods, whatever they think tells the story about how it is faring this year.
- A field, such as a pasture, meadow, or crops. The photo should show whether vegetation is brown or green, if soil is becoming exposed, if seeds are burnt up, or if vines are withering.
- A panorama, or series of pictures from a single spot looking in each direction (north, east, south, and west - and down!). The panorama is a good way to get a "big picture" of the land around the observers, especially if they think they might participate in another Field Photos Weekend in the future.

To create this archive, SCIPP and CoCoRaHS partnered with the Earth Observation and Modeling Facility (EOMF) at OU. EOMF hosts an international field photos archive, satellite imagery, and landscape models. The addition of nearly 1,000 simultaneous images on each of these weekend events expands the "ground truth" data available to researchers studying land use and land cover change. Photos uploaded during both Field Photos Weekend are located at the Earth Observation and Modeling website: <http://www.eomf.ou.edu/photos>.



Figure 13: A few of the photos that were submitted during the Field Photos Weekend.

Presentations

Another major accomplishment of SCIPP is presenting the relevant climate information and studies to our stakeholders and stakeholder communities. Below is a list of all SCIPP presentations conducted over the period May 2012 to March 2013.

- “A Louisiana Hurricane and Storm History.” Presented at the National Hurricane Conference, New Orleans, LA, March 2013 (Keim and Needham).
- “A Comparison Between North American Regional Climate Change Assessment Program Output and Oklahoma Mesonet Observations: Precipitation.” Poster presented at the 12th Annual Student Conference, American Meteorological Society Annual Meeting, January 6-10, 2013, Austin, TX (Fagan, Lunday, McPherson).
- “A Tale of Two Schools: A Cast Study of Two Oklahoma School Districts during Tornado Events.” Poster presented for the Eighth Symposium on Policy and Socio-Economic Research, American Meteorological Society Annual Meeting, January 6-10, 2013 Austin, TX (Silvis, Shafer).
- “Activities at the Louisiana State Climatologist Office of State Climatology.” Presented at the American Association of State Climatologists Conference, Destin, FL, July 2012 (Keim).
- “Adaptation Chapter.” Presented for National Climate Assessment Southeast Chapter Town Hall meeting, Tampa, FL, February 19, 2013 (Carter).
- “Adaptation: The National Perspective.” Presented for New York State Climate Smart Communities Program webinar, October 11, 2012 (Carter).
- “An Analysis of Historical Storm Surge Activity along the U.S. Gulf Coast.” Presented at the Resilience and Adaptation to Climate Risks Workshop: Stennis Space Center, Stennis, MS, October 16, 2012 (Needham).
- “Analysis of Storm Surge Vulnerability along the U.S. Gulf Coast.” Seminar presented to the Engineering Program at Texas A&M University Galveston, October 2012 (Keim and Needham).
- “Building and Analyzing SURGEDAT: The World’s Most Comprehensive Storm Surge Database.” Poster presented at the American Geophysical Union Conference, San Francisco, CA, December 2012 (Keim and Needham).
- “Climate Change and Hurricanes.” Presented to the Ag Leadership Conference, Baton Rouge, LA, December 13, 2013 (Keim).
- “Climate Change - how to be more ready.” Invited public presentation to the City of Biloxi, February 28, 2013 (Carter).
- “Climate Services Partnership Panel.” Presented at the American Association of State Climatologists Annual Meeting, July 10, 2012, Destin, FL (Shafer).
- “Communication climate information: Best Practices.” Presented at the Workshop on Communicating Seasonal Climate Information, Norman, OK, September 27, 2012 (Edwards).
- “Comparing Louisiana Hurricanes Isaac and Katrina to storms of the Past – A Panel Discussion.” Presented at the National Hurricane Conference in New Orleans, LA, March 2013 (Keim, Needham).
- “Coordination with Federal, Tribal, State, and Local Governments.” Panel moderator at the National Drought Forum: The 2012 Drought and U.S. Preparedness for 2013 and Beyond, December 12-13, 2013, Washington, D.C. (Shafer).
- “Gulf Coast Climate Information Needs Assessment.” Presented on virtual conference #3 hosted by NOAA, Coastal Sustainability Center, and the Coastal Zone Management Authority, October 11, 2012 (Carter).
- “Hurricanes.” Presented for a SCIPP webinar on Extreme Events and Hazards, July 26, 2012 (Keim and Needham).
- “Hurricanes in a Changing Climate.” Presented to the Baton Rouge Ham Radio Operators, July 30, 2012 (Keim).
- “Hurricanes in Mexico.” Presented in webinar on Extremes in the Southwest U.S. and Mexico hosted by CLIMAS (RISA Team), September 6, 2012 (Keim and Needham).
- “Managing the 2011 Drought: A Climate Services Partnership.” Poster presented at the American Association of State Climatologists Annual Meeting, July 9, 2012, Destin, FL (Shafer).
- “Managing Drought in the Southern Plains: Discussing Impacts to Promote Planning.” Presented at the 20th Conference on Applied Climatology, American Meteorological Society Annual Meeting, January 6-10, 2013, Austin, TX (Boone, Riley, Shafer). <https://ams.confex.com/ams/93Annual/webprogram/Paper220642.html>
- “Managing the 2011 Drought: A Climate Services Partnership.” Poster presented for the Eighth Symposium on Policy and Socio-Economic Research, American Meteorological Society Annual Meeting, January 6-10, 2013, Austin, TX (Shafer).
- “Planning to Protect: How to be More Ready in a Changing Climate.” Presented as part of the Climate Science and Adaptation Presentation at the Louisiana Sea Grant workshop, La Fourche Parish, LA, January 10, 2013 (Carter).
- “Problems, Policies & Politics: How Science Policy is Made.” Presented to Introduction to Meteorology Science and Policy call, January 23, 2013, National Weather Center, Norman, OK (Shafer).
- “Regional Climate Services in Response to the Southern Plains Drought.” Presented at the Spring 2012 Great Plains Drought Outlook and Assessment Forum, April 26, 2012, Lubbock, TX (Shafer).
- “Southeast and Caribbean (NCA).” Presented National Climate Assessment briefings for the Union of Concerned Scientists, February 11, 2013 (Carter).
- “Southeast and Caribbean and Adaptation National Climate Assessment.” Presented on webinar for Security and Sustainability with Second Nature, March 14, 2013 (Carter).
- “Southern Plains NIDIS.” Presented at the RISA Program Annual Meeting, January 15-17, 2013, La Jolla, CA (Shafer).
- “Storm Surge Return Periods for the United States Gulf Coast.” Presented at the World Environmental and Water Resources Congress in Albuquerque, NM, May 2012 (Needham, Keim, Sathiaraj, Shafer).
- “Storm Surge Return Periods for the U.S. Gulf Coast.” Presented at the ATC-SEI Advances in Hurricane Engineering Conference in Miami, FL, October 2012 (Needham, Keim, Sathiaraj, Shafer).
- “SURGEDAT: The World’s Most Comprehensive Storm Surge Database.” Poster Presented at the American Geophysical Union Conference in San Francisco, CA, December 2012 (Needham, Keim).
- “Surveying flood information users: an academic-federal partnership.” Presented at the Eighth Symposium on Policy and Socio-Economic Research, American Meteorological Society Annual Meeting, January 6-10, 2013, Austin, TX (Riley, Edwards). <https://ams.confex.com/ams/93Annual/webprogram/Paper218408.html>
- “Temporal and Geographic Perspectives on Atlantic Hurricanes.” Presented to the LSU School for the Coast and the Environment, August 24, 2012 (Keim).
- “Thinking Adaptation? Some of the things you might want to think about.” Presented at Resilience and Adaptation to Climate Risks Workshop: Stennis Space Center Area hosted by CCRUN, October 16-18, 2012 (Carter).
- “Winter Storm Management Preferences in Oklahoma: A Pilot Study.” Presented at the Eight Symposium on Policy and Socio-Economic Research, American Meteorological Society Annual Meeting, January 6-10, 2013, Austin, TX (Lunday, Riley). <https://ams.confex.com/ams/93Annual/webprogram/Paper223888.html>

Publications

5 Key Publications

- 1.) Bierbaum, R., J.B. Smith, A. Lee, M. Blair, L. Carter, F. S. Chapin III, P. Fleming, S. Ruffo, M. Stults, S. McNeeley, E. Wasley, L. Verduzco, 2012: *A comprehensive review of climate adaptation in the United States: more than before, but less than needed*. Mitig Adapt Strateg Glob Change. DOI 10.1007/s11027-012-9423-1.
- 2.) Liu, L., Y. Hong, C. Bednarczyk, B. Yong, M. Shafer, R. Riley and J. Hocker, 2012: Hydro-climatological drought analyses and projections using meteorological and hydrological drought indices: A case study in the Blue River Basin, Oklahoma. *Water Resources Management*, **26(10)**, 2761-2779, DOI: 10.1007/s11269-012-0044-y.
- 3.) Needham, H.F., and B.D. Keim, 2012: A Storm Surge Database for the U.S. Gulf Coast. *International Journal of Climatology*, **32**, 14, 2108-2123.
- 4.) Shafer, M. and R. Riley, 2012: Managing Drought in the Southern Plains: A summary of survey responses to the webinar series. Southern Climate Impacts Planning Program, 10 pp. Available online at http://www.southernclimate.org/publications/Webinar_Survey_Summary.pdf
- 5.) White, E., M. Shafer and J. Hocker, 2013: Trends in heavy precipitation in the Southern United States. *Weather* (in press).

Other Publications

- * Riley, R., 2012: *Workshop on communicating seasonal climate information: summary report*. Norman, OK: Southern Climate Impacts Planning Program, 47 pp. Available online at: http://www.southernclimate.org/publications/SeasonalClimate_SummaryReport.pdf.
- * Ingram, K.T., K. Dow, L. Carter, 2012: *Southeast region technical report to the national climate assessment*. US Global Change Research Program. 334 pp. Available online at: http://downloads.usgcrp.gov/NCA/Activities/NCA_SE_Technical_Report_FINAL_7-23-12.pdf
- * Lamb, P.J., D.H. Portis, and A. Zangvil, 2012: Investigation of large-scale atmospheric moisture budget and land surface interactions over U.S. Southern Great Plains including for CLASIC (June 2007). *J. Hydrometeorol*, **13**, 1719-1738.
- * Liu, L., Y. Hong, J. Hocker, M. Shafer, L. Carter, J. Gourley, C. Bednarczyk, B. Yong and P. 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, DOI: 10.1007/s00704-011-0567-9.
- * Needham, H.F. and L. Carter, 2012: *Gulf coast climate needs assessment*. Southern Climate Impacts Planning Program, 20 pp. Available online at: http://www.southernclimate.org/publications/Gulf_Coast_Assessment_Final.pdf
- * Needham, H., D. Brown, and L. Carter, 2012: *Impacts and Adaptation Options in the Gulf Coast*. Science and Impacts Program, Center for Climate and Energy Solutions: Arlington, VA. Available on the Web at: <http://www.c2es.org/publications/gulf-coast-impacts-adaptation-options>.
- * Shafer, M. and R. Riley, 2012: *Managing Drought in the Southern Plains: A summary of survey responses to the webinar series*. Southern Climate Impacts Planning Program, 10 pp. Available online at http://www.southernclimate.org/publications/Webinar_Survey_Summary.pdf
- * Shankman, D., C. Lafon, and B.D. Keim, 2012: Western Range Boundaries of Floodplain Trees in the Southeastern United States. *Geographical Review* 102(1):35-52.
- * Shankman, D., B.D. Keim, T. Nakayama, R. Li, D. Wu, and C. Remington, 2012: Hydroclimatic Analysis of Severe Floods in China's Poyang Lake Region. *Earth Interactions* 16, Article No. 14. DOI: 10.1175/2012EI000455.1.