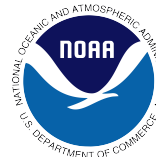


# **SOUTHERN CLIMATE IMPACTS PLANNING PROGRAM (SCIPP) REGIONAL INTEGRATED SCIENCES AND ASSESSMENTS PROGRAM**

3rd Annual Report

May 1, 2010 - April 30, 2011



## **REPORT HIGHLIGHTS**

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April 30, 2011

## 1. 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 April 30, 2011.

### Principal Investigators

Mark Shafer (OU) and Barry Keim (LSU)

### Co-Investigators

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

### Core Office Staff

Program Managers: Lynne Carter (LSU) and James Hocker (OU); Research Associates: Hal Needham (LSU) and Rachel Riley (OU); Undergraduate Student Assistant: Charlotte Lunday (OU)

### Research & Support Staff

Stdrovia Blackburn (OU), Jared Bostic (OU), Kyle Brehe (LSU), Gary McManus (OU), Billy McPherson (OU), Luigi Romolo (LSU), David Sathiaraj (LSU), Ada Shih (OU), and Himanshu Shrivastava (OU)

### Graduate Students

Somer Erickson (OU), Robert Gottlieb (OU), Lu Liu (OU), Michael Roberts (LSU), Wanyun Shao (LSU), Jamie Smith (OU), and Anna Trevino (LSU)

### 2010 Summer Interns

Robert Gottlieb (OU), Carly Kovacik (NC State), Alek Krautmann (OU), and Esther White (OU)

### Stakeholder Services Committee (SCIPP Advisory Committee)

David Bennett (Delta Farm Press), Gregg Garfin (University of Arizona), Marilu Hastings (Energy Foundation), Michael Hayes (National Drought Mitigation Center), Bill Hooke (American Meteorological Society), Rebecca Jennings (Federal Emergency Management Agency), Shirley Laska (University of New Orleans), Putnam Reiter (Oklahoma Department of Emergency Management), Bob Rose (Lower Colorado River Authority), Tracie Sempier (Mississippi-Alabama Sea Grant Consortium), Melissa Stults (ICLEI), Russ Vose (National Climatic Data Center), Suzanne Van Cooten (National Severe Storms Lab), and Tom Wilbanks (Oak Ridge National Laboratory)

### Former SCIPP Investigators

David Brown (Regional Climate Services Director, Southern Region), Ken Crawford (Vice Administrator, Korean Meteorological Administration), Dan O'Hair (Dean, College of Communications & Information Studies, University of Kentucky)

### SCIPP Student Alumni

Heather Campbell (OU), Hal Needham (LSU), and Amanda Schroeder (OU)

### SCIPP Affiliates

Jeff Basara (OU), Kim Klockow (OU), Renee McPherson (OU), and Kodi Monroe (OU, Sea Grant)

## 2. Current Areas of Focus

Extreme weather and climate events are central to the work of the Southern Climate Impacts Planning Program, though are not the only focus. The following represent the various thematic focuses of SCIPP with a brief description of the questions and issues the SCIPP team is working to address (Note: these are presented in order of priority).

### PLANNING FOR EXTREME WEATHER AND CLIMATE EVENTS

The issues and questions:

- *How frequently have different historical hazardous weather events occurred across the South Central United States and where do they occur most commonly?*
- *Have extreme event frequencies changed over time?*
- *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?*
- *Where do gaps in information availability and accessibility exist?*
- *What tools and information products are needed to more effectively plan for future hazards?*
- *How does the public perceive information it receives during hazardous weather events, and how is the information acted upon?*
- *Can climate change issues be incorporated into already existing hazard planning mechanisms such as the Federal Emergency Management Agency's hazard mitigation planning program?*

### CLIMATE ADAPTATION PLANNING

The issues and 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 changing climate on weather sensitive components of their systems?*
- *What impacts of a changing climate will have the most significant local impacts, and how do those vary across our diverse region?*
- *Is climate perceived to be an issue, or rather the individual weather events that comprise climate? This allows for opportunities to learn how to better communicate the issues to make them relevant to stakeholders.*
- *What information, research, tools, and others aspects are needed to support scientifically informed planning as related to future climate?*

### WATER-RELATED PLANNING

The issues and questions:

- *What impacts does climate variability and change have on coastal communities? Have any problems already been noticed and have any actions or plans been initiated?*
- *Are the range of hydrologic futures being incorporated into long-term water planning?*

### Methods for Accomplishing Research in These Focus Areas

The Southern Climate Impacts Planning Program utilizes a mix of methods and strategies for accomplishing work in these three primary focus areas. The following are short descriptions detailing the different methods SCIPP employed during the past program year.

### *Operation of a Core Office*

The core office plays a key role in the functioning of the Southern Climate Impacts Planning Program by providing a full time staff presence needed to guide the team, interact closely with stakeholders, travel and attend meetings, undertake research, interact with other RISA teams and the NOAA RISA program office, and facilitate connections between scientists as well as between scientists and stakeholders. During the past year SCIPP not only maintained a core office but expanded it with the help of several funding opportunities, particularly provided through the National Climate Assessment. As of April 30, 2011, SCIPP maintains a core office of two program managers (one for each academic campus), two research associates (one for each academic campus), and an undergraduate student assistant.

During the past year the core office helped to facilitate SCIPP team interactions through a variety of routine conference calls. This included monthly SCIPP Investigator video conferences, monthly calls to discuss work on the National Climate Assessment, and monthly calls to discuss tool development projects. All meetings involved participants from both the OU and LSU campuses. In addition, numerous other individual campus meetings were held on an as needed basis. The core office also instituted new collaboration mechanisms including a team-wide shared calendar.

The core office also planned and hosted the annual meeting of the SCIPP Stakeholder Services Committee (see committee membership on pg. 2), which was held in Baton Rouge, Louisiana June 22-23, 2010. During this two-day meeting, the SCIPP team met both on its own (day 1) and with the committee (day 2) to review the team's activities from the past year and receive recommendations moving forward into the next program year. Another major role of the core office during the past year was providing proposal support in the pursuit of projects fitting within SCIPP's areas of focus. This included coordinating colleagues on the team, organizing meetings, working closely with stakeholders and partners on proposal teams, and serving as co-authors and reviewers.

### *Tool Development*

Products and tools provide a tangible resource that decision-makers and others can utilize to help answer a question or make their jobs easier. SCIPP continues to place much of its focus on the development of products and tools that help to answer questions regarding past climate, and in particular, past extreme climate events. While it is true that past climate cannot necessarily be used as a guide for future climate, SCIPP research has found that information on past climate extremes is not readily available to decision-makers - or when it does exist, it is not necessarily in a format that is understandable or relevant at the local level. Before tackling the question of how future extreme events might change in a given area, the question of what has already happened must first be answered. SCIPP continues to conduct work on developing tools that document past extremes information, as well as bringing together proven tools that other groups have created into a common area. Having such information available can additionally help to provide the critical context needed when major extreme events do occur.

### *Stakeholder Engagement*

Stakeholder engagement is one of the most critical tools available for conducting research in our focus areas. The key to understanding how climate affects local issues and the resultant information needed to help support planning decisions relies heavily on interacting with people. SCIPP has made use of this method throughout the last year on a variety of projects, including a series of stakeholder engagement projects associated with the National Climate Assessment, through the continued development of a historical extreme events tools and other new climate tools, through a variety of workshops and meetings with stakeholders, and various other projects. Informal conversations at meetings or as a follow-up to a meeting later on can also be particularly productive. In general, SCIPP has found that a key to successful engagement is the willingness of the stakeholder to participate in a given effort.

### *Capitalizing on Recent or Current Extreme Weather/Climate Events*

Given that extreme events and hazards represent the major program focus of SCIPP, significant focus was placed this past year on making use of recent or current extreme weather events for research and engagement purposes. The following represent the spectrum of on-going projects spanning a variety of different hazards:



- *May 10, 2010 Oklahoma Tornado Outbreak Public Survey Project*
- *Historical Hurricane Storm Surge Map and Experimental Blog*
- *South Central U.S. State Drought Planning Workshop*
- *February 2011 Winter Storm Post Event Survey Project*
- *Post Flood Event Survey Project (being undertaken in partnership with NOAA's River Forecast Centers across the National Weather Service's Southern Region)*

For each of these projects, SCIPP is making use of extreme weather events for research purposes. While the projects vary in specific focus, the common goal is to better understand information needs for planning. Some projects are focused more on the public side of the spectrum, as was the case for the May 10, 2010 tornado outbreak study, which focused on public response, needs, and expectations for information during tornado situations. The South Central U.S. State Drought Planning Workshop represents another way in which SCIPP is capitalizing off of current climate conditions. Since the fall of 2010, drought conditions have been expanding and worsening throughout much of the South Central U.S. With this as a backdrop, SCIPP is making use of the situation to initiate a dialogue with key state agency representatives across the region.

### *Education & Outreach*

Providing education and outreach on climate-related issues continues to be a critically important method of translating science. During the past year, SCIPP enhanced its educational outreach offerings by initiating a new monthly climate outreach publication entitled the “Southern Climate *Monitor*” which provides updates on climate conditions as well as articles focusing on a variety of topics including research, climatology, and current climate events. In other activities, SCIPP team members gave presentations to a variety of audiences including decision-makers, non-scientists, and scientists. Finally, the SCIPP team continues to add valuable content to the program website including reports written by the team and additional resources provided from other sources. Climate-related news stories relevant to the region were also posted frequently to provide context.

## **3. Stakeholders and Partners**

During May 2010 through April 2011, SCIPP continued to expand its network of regional stakeholders and partners. The following are the primary federal, regional, state, and local groups SCIPP has developed working relationships with thus far.

### **National/Federal**

- American Planning Association
- CEQ Adaptation Task Force
- Federal Emergency Management Agency
- Government Accounting Office
- ICLEI - Local Governments for Sustainability
- National Drought Mitigation Center
- National Integrated Drought Information System
- National Sea Grant Program (Louisiana Sea Grant, MS/AL Sea Grant, Texas Sea Grant)
- NOAA Coastal Services Center
- NOAA National Climatic Data Center
- NOAA National Estuarine Research Reserve System
- NOAA Storm Prediction Center
- Pew Center on Global Climate Change
- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- U.S. Department of Agriculture
- U.S. Fish and Wildlife Service

- U.S. Geological Survey
- U.S. Global Change Research Program

### **Regional**

- Arkansas Red River Basin River Forecast Center
- Lower Mississippi River Forecast Center
- RISAs: Climate Assessment for the Southwest, Climate Decision Support Consortium, Great Lakes Integrated Sciences and Assessments, Southeast Climate Consortium, and Western Water Assessment
- Southern Alliance for Clean Energy
- West Gulf River Forecast Center
- Western States Water Council

### **State**

- Arkansas Natural Resources Commission
- Louisiana Association of Landscape Architects
- Louisiana Coastal Zone Management Program
- Louisiana Dept. of Agriculture & Forestry
- Louisiana Governor's Office of Homeland Security & Emergency Preparedness

- Mississippi Dept. of Environmental Quality - Office of Land & Water Resources
- Oklahoma Association of Conservation Districts
- Oklahoma Biological Survey
- Oklahoma Conservation Commission
- Oklahoma Dept. of Agriculture, Food, and Forestry
- Oklahoma Dept. of Emergency Management
- Oklahoma Dept. of Environmental Quality
- Oklahoma Dept. of Transportation
- Oklahoma Dept. of Wildlife Conservation
- Oklahoma Insurance Dept.
- Oklahoma State Dept. of Health
- Oklahoma State Hazard Mitigation Team
- Oklahoma Water Resources Board
- Tennessee Dept. of Environment & Conservation
- Texas Division of Emergency Management
- Texas Office of State Climatology
- Working group of Oklahoma emergency managers

#### Local

- Center for Planning Excellence (Baton Rouge, LA)

- City of Austin, TX
- City of League City, TX
- City of Mandeville, LA
- City of New Orleans, LA
- City of Port Arthur, TX
- Houston Yacht Club (Shoreacres, TX)
- Newcastle, OK emergency management
- Tulsa Partners
- Yazoo MS Delta Water Management Group

#### Tribal

- Chickasaw Nation
- Delaware Tribe of Indians
- Iowa Tribe
- Kiowa Tribe
- Muscogee (Creek) Nation
- Osage Nation
- Seminole Nation
- Seneca-Cayuga Tribe

#### Private/Other

- Adaptation International
- Lower Colorado River Authority

## 4. Research Findings

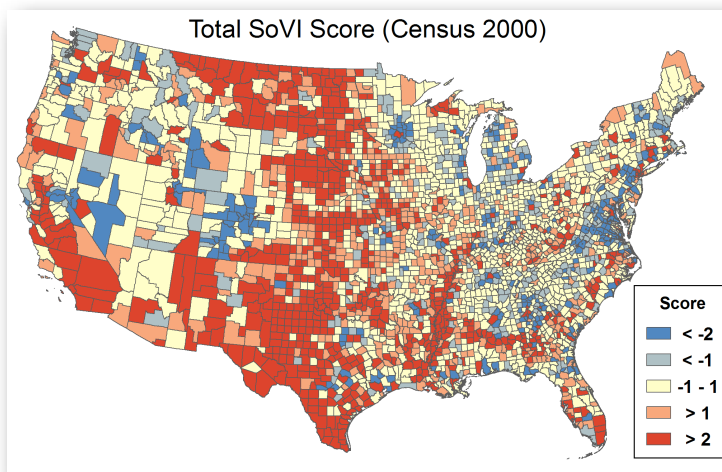
The following are summaries of several SCIPP research efforts and associated findings.

### Using GIS to Assess Vulnerability to Climate Hazards in the Southern United States (Gottlieb, Shafer)

This particular project focuses on quantifying vulnerability to climatological hazards due to the presence of hazards and a community's response to hazards. This requires looking both at the occurrence of hazards and the socio-economic factors that contribute to vulnerability. The map shown in Figure 1 displays preliminary results of this research effort, which are a modified version of the Social Vulnerability Index (SoVI) originally developed by Cutter et al. (2003). It identifies areas that are more susceptible to loss from meteorological hazards based solely on socioeconomic conditions, not the actual occurrence of the hazards. The index is derived from data from the 2000 U.S. Census. Positive values of the index (marked in red) indicate higher social vulnerability and negative values (marked in blue) indicate lower social vulnerability. In the continuation of this project the index will be combined with hazards data to give a more complete view of vulnerability in the U.S.; particularly the SCIPP region. The end goal of this work is to help emergency managers and decision-makers identify at-risk locations and populations to aid in hazard planning processes.

Figure 1 (right). Modified version of the Social Vulnerability Index (SoVI). Red (blue) counties indicate areas with higher (lower) levels of social vulnerability.

Cutter, S. L., B. J. Boruff, and W. L. Shirley, 2003: Social vulnerability to environmental hazards. *Soc. Sci. Quart.*, **84**, 242-261.



### Trends in Heavy Precipitation in the SCIPP Region of the Southern USA (White, Shafer, Hocker)

This research project examined whether there have been changes in the frequency of 1-day heavy precipitation events in the South Central United States over the past 60-100 years using data from individual rain gauge stations and climate divisions. In the examination of individual stations, 23% of stations were found to have positive trends significant at the 5% level, reducing to 15% between 1948-2009. No statistically significant decreases in heavy precipitation were found. Data was also analyzed on a climate division basis. Figure 2 shows changes in rainy days (a), number of 2 inch or greater days (b), number of 3 inch or greater days (c), and number of 5 inch or greater days (d). Results <5% are statistically significant, while areas without any notable trends are shaded in white. The results reveal that while the region has a mixed signal with respect to changes in rainy day frequency, heavy precipitation days have become more prevalent throughout much of the region. This research also looked into seasonal trends and changes in high magnitude events (top 0.3% of events), see White et al. 2011 for more details.

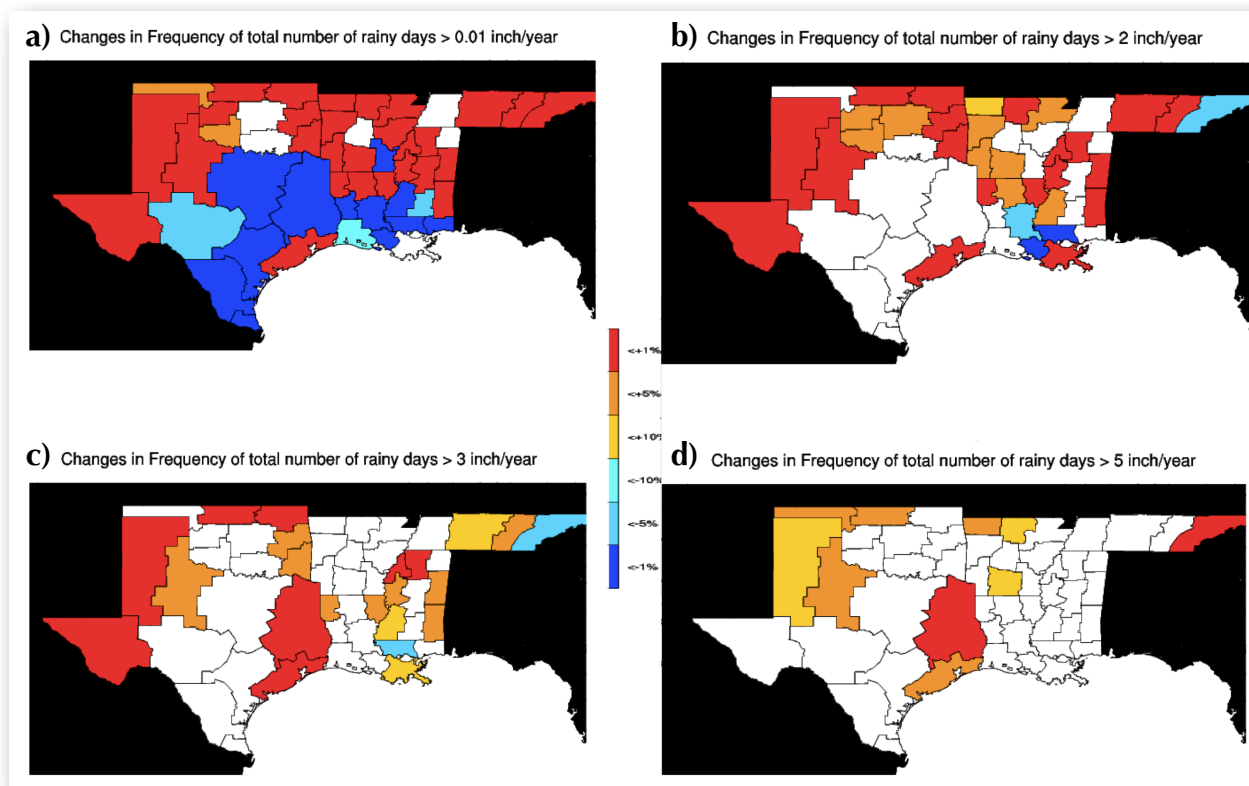


Figure 2. Results of the SCIPP heavy precipitation study showing: changes in number of rainy days (a), changes in number of days with greater than 2 inches of rainfall (b), greater than 3 inches of rainfall (c), and greater than 5 inches of rainfall (d). Blues indicate decreasing trends, while red indicate increasing trends. Results <5% are statistically significant; whites indicate no upward or downward trend.

### Analyzing Past Drought and Predicting Future Drought with Comprehensive Drought Indices for the Arkansas-Red River Basin (Liu, Hong, Carter, Hocker, Shafer, Gourley)

A recent SCIPP project has focused on investigating drought from multiple perspectives: the past and the future. The region focused on for this particular project was the Arkansas-Red River Basin and sub-basins. The historical Standardized Precipitation Index (SPI), Palmer Drought Severity Index (PDSI), and Standardized Runoff Index (SRI) were derived from Parameter-elevation Regressions on Independent Slopes Model (PRISM) data (simulation for 1900-2000) as well as the WCRP CMIP3 dataset (simulation for 1950-1999). Projected drought indices were derived from the CMIP3 projections for 2000-2099. Indices were calculated on different timescales to illustrate drought at 1-month, 3-month, 12-month, and 48-month timescales. From the historical perspective, the results highlighted past droughts including major episodes in the 1910s, the infamous dust bowl droughts of the 1930s, and droughts of the

1950s (not shown). Results of the projections of future drought conditions in Oklahoma's Blue River Basin for the A1B scenario are shown in Figure 3. This represents the SPI, PDSI, and SRI from 2000 to 2100 at the 12-month scale. Fairly significant differences in the forecast of the different indices is apparent, which are continuing to be investigated by the SCIPP team.

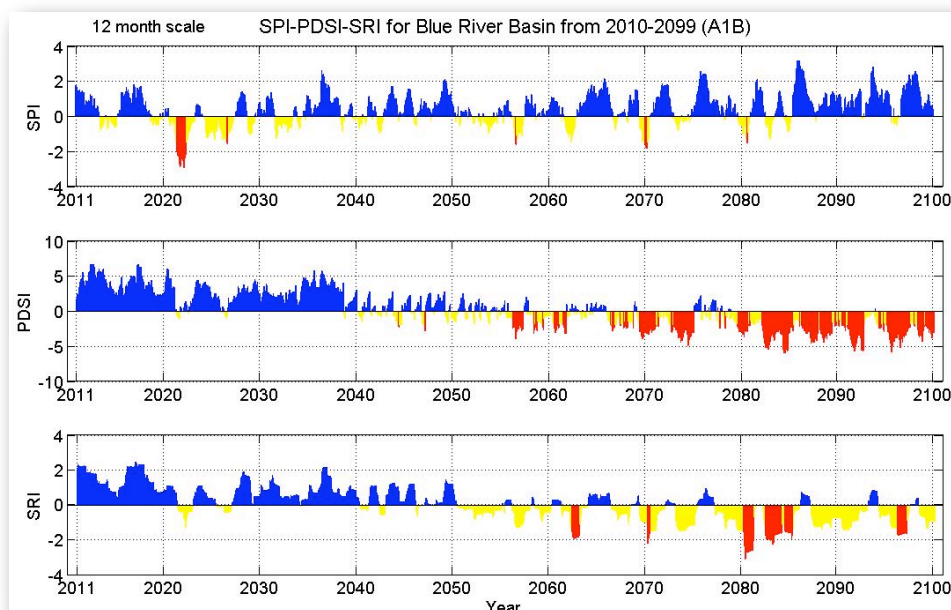


Figure 3. Projection of future SPI, PDSI, and SRI conditions (at a 12-month scale) across the Blue River Basin (Oklahoma) for the A1B scenario.

### Southern U.S. Regional Hazards and Climate Change Planning Assessment (Hocker, Carter)

Hazard planners throughout the SCIPP region were surveyed during the fall of 2009 to assess several aspects of hazard planning including: perceptions, challenges, limitations, perceptions of climate change, incorporation of climate change into hazard planning, and information use and needs. Approximately 300 emergency managers, planners, and other decision-makers throughout the SCIPP region completed the survey providing valuable information on these topics. A wealth of information was obtained through the project and is available through a SCIPP produced report (Hocker and Carter 2010); one of the results of the study is shown in Figure 4 below.

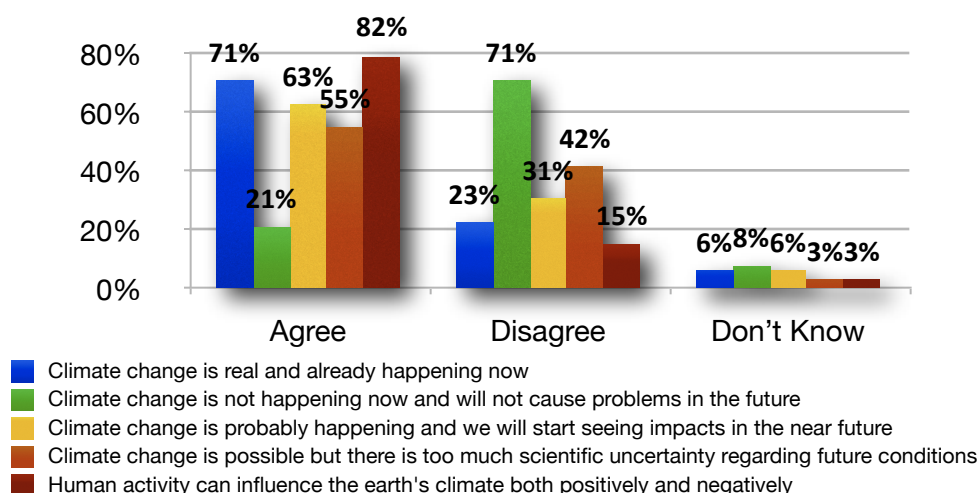


Figure 4. Percentage of survey respondents who agreed or disagreed (both strongly and negatively) with the five statements posed in the legend (225 individuals answered the question).

## 5. Accomplishments

The following section details several major SCIPP team accomplishments from the past year.

### New Climate Tools Developed

During the past year, several new climate information tools were developed by the SCIPP team and evaluated with the help of stakeholder feedback. These include the Historical Climate Trends Tool (Fig. 5), Climograph Tool (Fig. 5), and Historical Coastal Surge Map (Fig. 6) powered by the SURGEDAT database. All are available on the SCIPP webpage in the data products section (<http://www.southernclimate.org/data.php>) as experimental tools. The motivation for many of these new products was largely driven by stakeholder and user requests provided to the state climate offices over the years. A webinar was held in the fall of 2010 to have a select set of users provide feedback on the tools, and additional feedback was solicited from the climate community through the American Association of State Climatologist list serve.

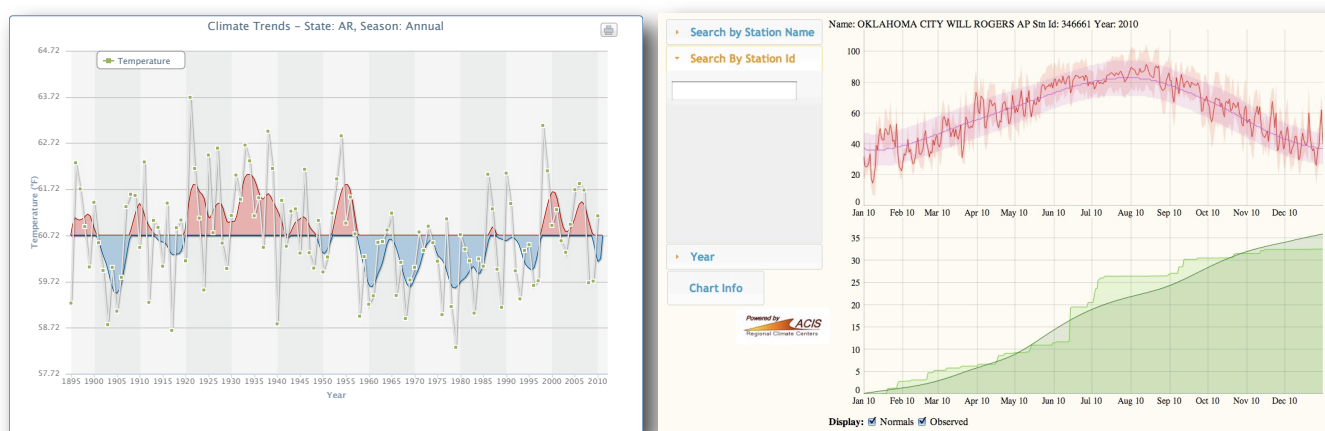
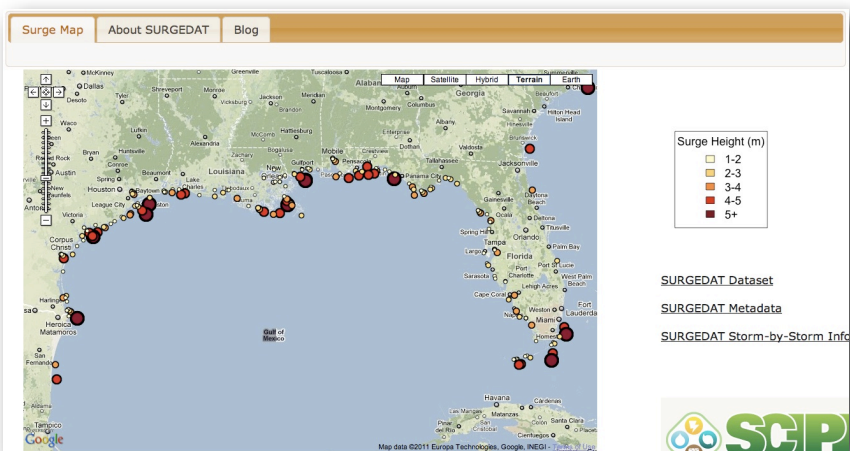


Figure 5. New SCIPP climate tools: the Historical Climate Trends Tool (left) and Climograph Tool (right).

### Storm Surge Research

As of May, 2010, the SURGEDAT dataset provided a comprehensive list of the maximum height and location of 193 surges along the U.S. Gulf Coast since 1880. In the past year this dataset was expanded to include 440 surge observations across the globe. This dataset is the world's most comprehensive archive of historical storm surge data. Of these 440 storm surge events, 411 have been mapped on the newly created SURGEDAT web tool available at <http://surge.srcc.lsu.edu> (Fig. 6). This tool has been shared with a variety of coastal communities along the Gulf through in-person and telephone interactions. The tool holds potential for planning purposes (to quantify past occurrences of surges for a given area) as well as real-time decision making (how does a current forecast compare to a particular area's surge history). The accompanying experimental blog was maintained during the 2010 hurricane season to relate historical surges to predicted surges for upcoming events.

Figure 6 (right). Historical Coastal Surge tool and blog. The map contains maximum historical surge locations for the U.S. as well as the globe.





The motivation for a global storm surge database is that it provides context to understand the physical processes that generate storm surge, as well as maximum surge potential for every vulnerable region of the world. As the physics that drive storm surge are the same everywhere in the world, expanding the surge database to include over 400 observations will improve surge research, such as training of surge models, which will ultimately improve storm surge forecasts along the U.S. Gulf Coast. In addition, a global archive of historical storm surges provides opportunities for research collaboration. For example, Western Australia observes storm surges nearly equal in magnitude to the Gulf of Mexico. Surges in Western Australia and Texas have both inflicted similar agricultural impacts, particularly large livestock losses. Collaborative research between scientists in the United States and Australia could benefit stakeholders from both countries.

SCIPP work on historical storm surges also led to the completion of a book chapter on surges and impacts by team members Hal Needham and Barry Keim (Fig. 7).

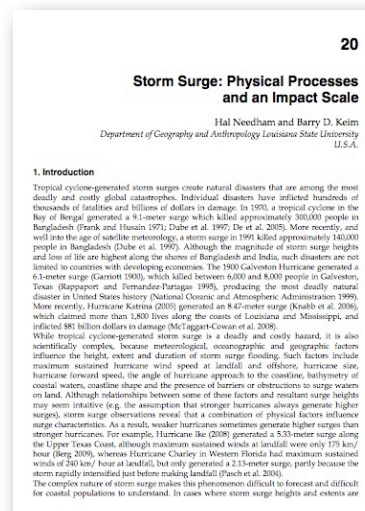


Figure 7 (right). Needham and Keim 2010, Storm Surge: Physical Processes and an Impact Scale. Book chapter in Recent Hurricane Research - Climate, Dynamics, and Societal Impacts.

## Several Major Reports Produced

During the last year, SCIPP produced several reports (Fig. 8) that provided summaries of different research and engagement efforts in the region. As a follow up to SCIPP leading a break out session at a U.S. Fish and Wildlife Service and USGS hosted conference in Austin, TX, program managers Lynne Carter and James Hocker compiled a comprehensive report highlighting the major findings from the discussions. The final report was approved by the U.S. Fish and Wildlife Service in fall 2010 and was provided for posting to the agency webpage. Support for producing the report was provided by the U.S. Fish and Wildlife Service (totaling \$9,248). In another project, the SCIPP team produced a geographic assessment of major disaster declarations using geographic information systems. The findings of the study were presented at the American Meteorological Society annual meeting and were also compiled into a public-friendly report made available on the SCIPP webpage and shared with several stakeholders. In another effort, SCIPP produced a summary report from a fall 2009 surveying project in which approximately 300 hazard planning-related decision makers were surveyed about hazard planning, climate change, and information needs (discussed in the previously section).

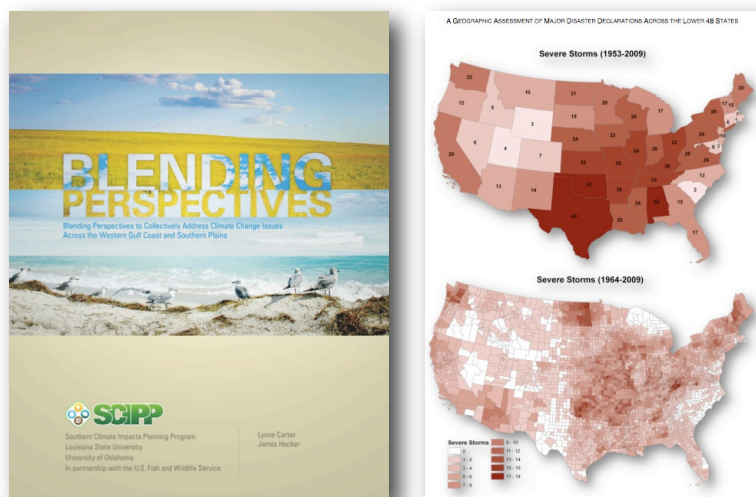


Figure 8. SCIPP's Blending Perspectives report for the U.S. Fish and Wildlife Service (left) and the Geographic Assessment of Major Disaster Declarations report (right).

## SCIPP Summer Internship Program 2010

During the summer of 2010, SCIPP's University of Oklahoma campus hosted a summer internship program. The purpose of the internship was to provide students with an opportunity to gain experience in climate-related work while likewise benefiting SCIPP with new research findings and outreach work. The internship was broadcast during the spring of 2010 and invited any interested students (undergraduate and graduate) in the atmospheric sciences or related disciplines to apply. SCIPP selected a total of three students for the program, including a graduating senior,

MS student, and a PhD student. In addition, SCIPP also hosted a student as part of the Research Experience for Undergraduates (REU) program being held at the National Weather Center during the summer. Collectively the four summer interns worked on a mix of projects (Fig. 9) including a 10-year climatology of ice storms across the South Central U.S., trends in heavy precipitation events across the south (discussed previously in Section 4), a climatological assessment of tornado occurrences, and a climatological assessment of hurricane occurrences. The tornado and hurricane work was packaged into two public-friendly brochures intended to provide decision-makers and general readers with information on the occurrences of these hazards in the region.

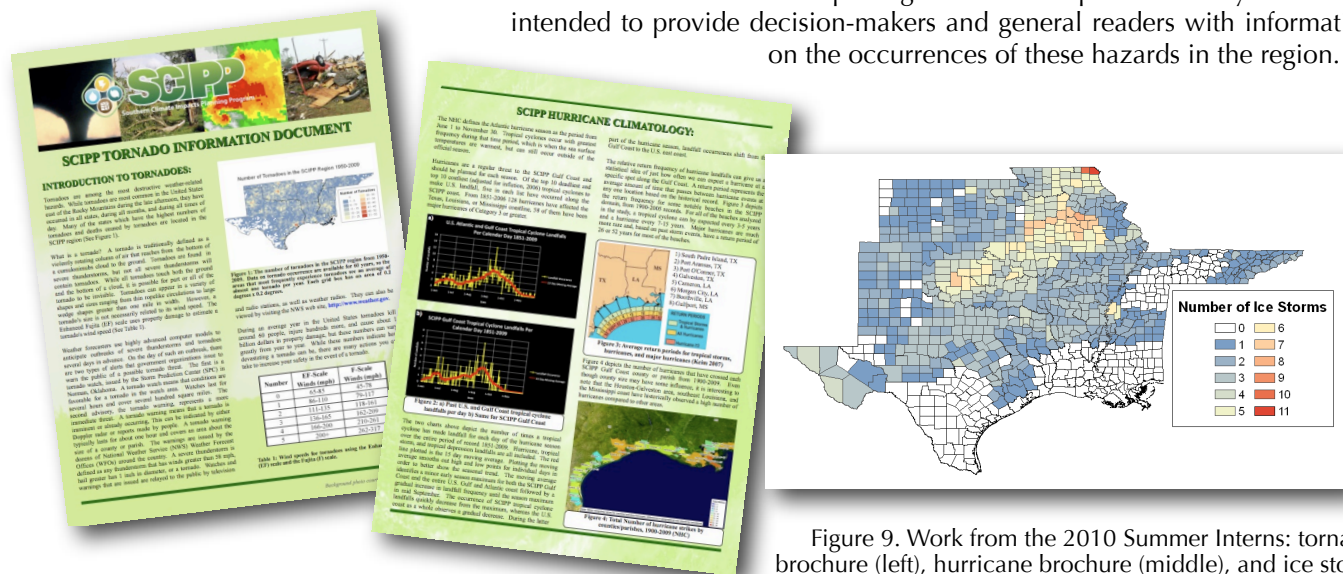


Figure 9. Work from the 2010 Summer Interns: tornado brochure (left), hurricane brochure (middle), and ice storm climatology (right).

## 6. Research Projects and Stakeholder Collaborations (in progress)

The following section highlights several major ongoing SCIPP projects.

### National Climate Assessment (Riley, Carter, Needham, Shafer, Keim, Monroe, Smith, Hocker)

During 2010, the SCIPP team began its formal involvement with the current National Climate Assessment through a funding award provided by the U.S. Global Change Research Program. In particular, SCIPP set out to undertake a series of three separate, yet related projects focusing heavily on varying stakeholder needs for climate-related information across the region. The three projects include: 1) a climate needs assessment for Oklahoma, 2) a climate needs assessment for the Gulf of Mexico region, and 3) a social network analysis. In order to successfully accomplish these projects, SCIPP hired 2 new full time research associates (one on each campus), a new graduate student, and additional staff time to work on the Assessment. The following summarizes progress made on the three different projects as of April 30, 2011.

#### Oklahoma Needs Assessment

To date, SCIPP staff have conducted 19 in-person semi-structured interviews with federal, state, tribal, and local agencies for the Oklahoma Climate Needs Assessment. Interviews were recorded to enable accurate and detailed analysis of responses. The goal of the Assessment is to determine the most significant climate-related issues that Oklahoma decision-makers are currently facing and anticipate they will face in the future, the spatial and temporal scales in which they make decisions, and their need for climate information, education, and decision-support tools. Interviews will continue with the goal of thoroughly covering the following sectors: agricultural production, ecosystems, energy, health, transportation, water resources, and public safety. Through the process of interviewing thus far, a common theme that emerged is the need for more education on climate, models, and information sources. To address this need, the SCIPP team has organized a full day workshop entitled "Adapting to Oklahoma's Climate" which will be held May 10, 2011 at the National Weather Center. Participants from the assessment interviews as well

as many other participants from across Oklahoma have been invited to attend the full day meeting, which will feature a mix of break out sessions, educational sessions, and stakeholder presentations. To continue learning about Oklahoma's stakeholders, the break-out sessions are being designed as research opportunities to learn more about how users interpret information and uncertainty.

### *Gulf Coast Needs Assessment*

More than 20 in-person interviews have been conducted along the western Gulf of Mexico as part of the Gulf Coast Assessment, including much of the Texas coast (Houston/Galveston region in particular) as well as Louisiana. The goal of the Gulf Coast Assessment is very similar to the Oklahoma assessment and focuses on climate data needs for coastal stakeholders, perceptions of climate change, and use of climate projections and models. This assessment places a more significant emphasis on place-based analysis than the Oklahoma Assessment, due in large part to the multi-state region of study. Among survey participants thus far have been cities of varying sizes, government personnel, port authorities, and planning corporations. As part of the interviews, the SCIPP team provides a series of educational handouts focused on temperature, precipitation, and sea-level rise (Fig. 10). Each handout is a two-sided publication that provides information about observed and projected changes for those three climate drivers.

Not surprisingly, the research has revealed that storm surge and hurricanes are the hazards with the biggest impact on the coast, while sea-level rise is an issue that stakeholders expect to become a bigger threat in the future. The engagement has also provided insight into the complex relationship between rainfall runoff and sea levels, as many stakeholders have indicated that heavy rainfall events do not drain well when sea levels are high because of onshore winds. This finding reveals that even a slight rise in sea level could have serious impacts (such as reduced drainage rates), which could negatively impact coastal communities long before actual sea levels inundate the coast directly.

Figure 10. The sea level rise (left) and precipitation (right) handouts provided during the assessment interviews.



### *Regional Social Network Analysis*

The purpose of the Regional Social Network Analysis project is to understand the interactional connections between networks, identify barriers to use of climate information in planning activities, and suggest ways in which network linkages between organizations could be made more productive. To date, a survey has been created through the online survey site [www.surveymonkey.com](http://www.surveymonkey.com) and will be launched soon to climate related agencies across the six-state SCIPP region. Benefits of this project include the ability of social network analysis to identify individuals or communities eager to take steps to increase their resiliency to climate change, but are not yet well connected to primary sources of information, the creation of a network map of climate information providers across the SCIPP region, and, depending on the depth of information obtained, a network map of stakeholders and information recipients.

### **Extreme Events Tool Development** (Robbins, Yuan, McPherson, Sathiaraj, Shafer, Hocker)

Progress continued during the past year on SCIPP's extreme event tools development. Activities that occurred during the last year included establishing a working group of 25 stakeholders to formally contribute to the project (which drew predominately from the emergency management community), holding a 1-day workshop with the working group to begin contributing to the process (November 17, 2010), producing a near complete version 1.0 of the



severe storms component of the tool (complete with map, table, and graphing capabilities - see Fig. 11), building a large cache of extreme occurrences of weather phenomena from the Applied Climate Information System (heat and cold spells, major precipitation events, and periods of no or little rainfall), and conceptualizing other components needed for the system. Current work on the extreme event tools activities is transitioning into the development of an extreme events portal. The concept is that through a portal, both products developed by SCIPP as well as other sources can be combined to provide a holistic view of the climatological hazards that affect the South. The portal will help to answer the questions of what, when, and how frequently past hazards have occurred for a given area.

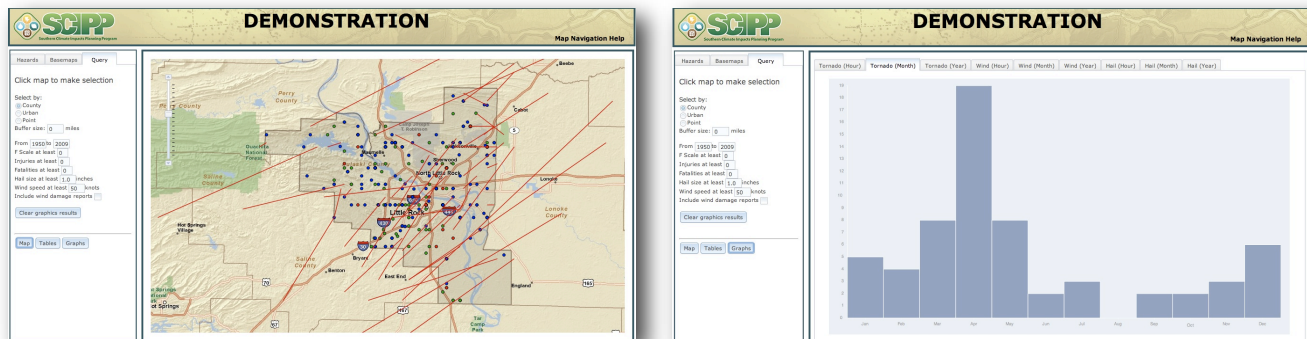


Figure 11. Near final version 1.0 of the historical severe storm reports tool showing a search by county for reports (left) and associated tornado counts by month (right).

### River Forecast Center Post Flood Event Surveying Effort (Edwards, Carter, Hocker, Shafer)

Since the fall of 2009, the SCIPP team has been interacting with partners from three River Forecast Centers (RFCs) within the boundaries of SCIPP's 6-state region - the Arkansas-Red River Basin RFC, the West Gulf RFC, and the Lower Mississippi RFC - to formulate a project of mutual interest and benefit. The intent of working on a project together was the mutual pursuit of learning more about stakeholder information needs as it pertains to significant flooding episodes - SCIPP provides the critical social science expertise, while the RFCs provide the knowledge of information their offices provide and connections to their stakeholder community.

Though the concept has been evolving with time, recent meetings during the spring of 2011 have refined the focus of the project as well as the plan for moving forward. The agreed upon concept for this project is for the RFCs and SCIPP to co-produce a "Post Flood Event" survey aimed at decision-makers involved with major flooding events. The short survey will evaluate items such as information sources accessed, products used, information gaps, and successes and failures of the process. The survey would be made available to decision makers right after a major event to capitalize while memory is fresh. The SCIPP and RFC teams will seek NOAA headquarters approval of the survey instrument such that it can be 'at the ready' to use any time following a major hydrologic event. To date, the SCIPP team has developed an initial prototype and will be working with RFC colleagues throughout the current warm season to refine the survey and pilot it. NOAA approval will be sought in the fall of 2011 for eventual use of the instrument during the warm season of 2012.

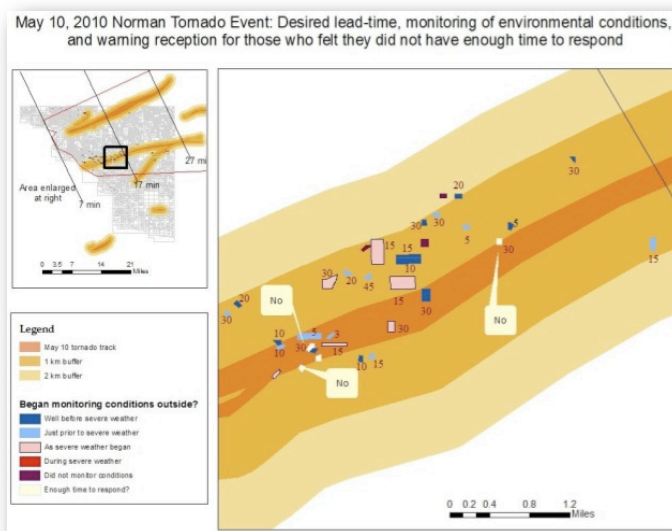
### State-level Drought Planning (Shafer, Keim, Becker)

The SCIPP region is home to a variety of hazards, including the often ill-prepared for hazard of drought. In fact, at the state level more than half of the states in the SCIPP region either have no state drought plan or are well overdue for a re-fresh of their plan. Given this major planning deficiency and the regional expansion and intensification of drought conditions through much of the South Central U.S. particularly during the winter of 2010-2011, the SCIPP team has been in the process of convening a multi-state meeting on state-level drought planning. Planning for the meeting began during the winter with an initial focus on identifying a key state-level contact for drought among SCIPP's 6 states. With interested representatives in hand, SCIPP has since scheduled, coordinated, and planned a workshop to bring the state representatives and a variety of drought experts together to discuss the planning process and related issues. Drought experts invited to the meeting include several SCIPP team members, colleagues from the National

Drought Mitigation Center, colleagues from the National Integrated Drought Information System, NOAA, and state climate offices throughout the region. The goal is that through this supportive environment, states can learn from national experts what is needed to develop a plan as well as what successful 'neighbor states' have developed. It is hoped that the meeting will establish a forum conducive for encouraging state drought plan development, after which time SCIPP will continue to support the state's planning efforts.

### Social Science Projects (Klockow, Lunday, Shafer)

Several SCIPP students have been focusing on social science-themed projects aimed at better understanding public perceptions of hazards and needs for information related to extreme weather events. In one such project a PhD graduate student developed a public survey following the major May 10, 2010 tornado outbreak in Oklahoma. In this study, students mailed surveys to residents within 2 km of a tornado path to identify desired lead-time, methods residents were using to monitor conditions, and ability to receive warning information. Many of the results were mapped out (Fig. 12) to identify any geographic patterns. In general residents were found to have received the warnings with sufficient lead time, and in cases where they indicated they did not have enough time, the amount of time between warning and the tornado actually exceeded their desired lead time.



In another project, SCIPP's undergraduate research assistant is developing a survey to better understand public perception of community preparedness for major winter storm events. Motivation for the project grew from public outcry that occurred following several major winter storm events during the winter of 2010-2011 and the criticism that several cities received in being perceived to be unprepared for a given winter storm event. The survey instrument is currently in the final revision phase and is planned to be run for a series of major winter storm events that occurred in Oklahoma during February 2011. In addition, the survey may also be used in future winter situations following major events in the SCIPP region.

Figure 12. Tornado track from the May 10, 2010 tornado outbreak with survey respondents mapped out.

### Other Student Research Projects

#### *Dry Event Trends and Frequencies in the South Central United States (Roberts, Keim)*

In this study, dry spells in the SCIPP region were analyzed. Dry spells were defined as consecutive days with no recorded rainfall. Seventy (70) weather stations were examined across the SCIPP region for the period from 1950-2008, and a subset (24) of these stations were analyzed from 1908-2008. The best geographical indicator for consecutive dry days across this region is longitude, where dry spells have longer durations at westernmost stations due to natural climatological controls on moisture availability. Dry spell return periods were determined for 2-, 5-, 10-, 25-, 50-, and 100-year events. Steep gradients were discovered in the western half of the study area. Results from this research should assist those in the agriculture industry, water resource management, and others who depend on high-quality forecasts of precipitation.

#### *Emergency Managers: Training, Uncertainty, and Decision-making (Erickson, Shafer)*

The goals of this research process are to 1) assess the needs of emergency managers with respect to weather information and training, 2) propagate and provide guidelines for training and educational curriculum development, and to 3) better prepare emergency managers to make decisions before, during, and after an event.

### *How Local Weather Affects Public Opinion Toward Climate Change (Shao, Keim)*

The goal of this research project is to understand how local weather and socio-economic factors affect public perception of climate change. Efforts in the most recent year included organizing the climate data used in the public opinion model, developing an effective survey to address research questions, and identifying the most appropriate research methods for the analysis. Results of this research can benefit scientists by providing more understanding of public opinion toward climate change and therefore improve the communication with the public.

### *Mechanisms of Urban Influence on Precipitation in the Southeastern United States: Detection, Storm Bifurcation, and Synoptic Characteristics (Trevino, Brown)*

This research focuses on quantifying precipitation from urban areas in the southeastern United States in an effort to determine urban enhancement in an effort to understand its role in regional precipitation climatology in the South.

## 7. Communicating Science to Decision-Makers

The following section highlights several examples of SCIPP efforts to communicate science to decision makers, which take place in a variety of forms - publications, collaborative projects, forums, advisory committees, website, and workshops, conferences, and presentations.

### Publication: Southern Climate Monitor

Beginning in January 2011, SCIPP launched a new monthly publication called the Southern Climate *Monitor* (see Fig. 13). The publication is a joint effort between SCIPP and colleagues at the Southern Regional Climate Center. The publication is being offered on a monthly interval through the SCIPP website to provide stakeholders and interested members of the public with a combination of summary information on climate conditions across the South Central U.S. as well as a feature article on a particular topic. The topics for the feature article are wide ranging and include such items as applied climatology, summaries of specific research projects in progress at SCIPP, analyses of a recent extreme event, discussions of current climate conditions (such as ENSO or drought), seasonal forecasts (such as hurricane outlook, winter outlook, etc.), and so on. Much of the climate summary information is compiled and written by staff at the Southern Regional Climate Center while feature articles are written by a rotation of authors throughout the SCIPP team. The publication is being treated as an experimental product to enable the *Monitor* team to allow the content to evolve with time based on user feedback. In addition to making the publication available through the SCIPP website, the *Monitor* will also be made to a subscribers through an email list serve.

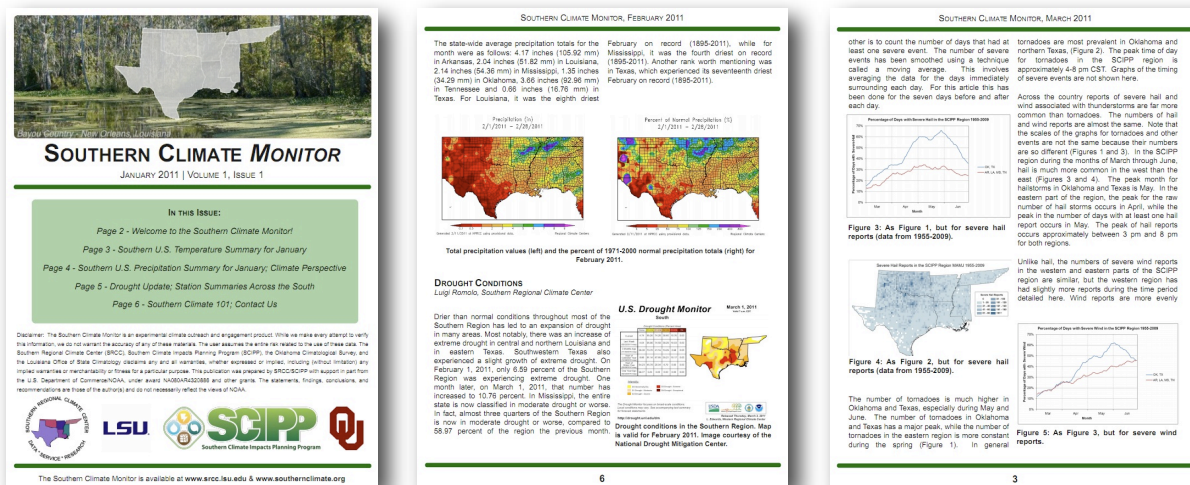


Figure 13. Sampling of the new Southern Climate Monitor publication showing the front page of the first issue (left), precipitation and drought conditions from the February issue (middle), and the feature article on storm climatology from the March issue (right).

### **Collaborative Project: Mandeville, Louisiana**

SCIPP has been working with Louisiana Sea Grant on a project with the city of Mandeville, Louisiana (which is located on the northern coast of Lake Pontchartrain) on sea level rise issues. Three workshops with Mandeville, Sea Grant, and SCIPP have been held with an additional meeting in the works for city and parish government officials on several issues related to sea level rise. The first workshop featured a presentation by Lynne Carter on the science behind sea level rise, as well as a talk from deEtte Smythe, an engineer from St. Tammany Parish, on what steps the parish is taking to address relative sea level rise. The second workshop focused on using geographic information systems data to evaluate storm surge and sea level rise risks, and the legal issues local governments will face as they learn more about how hazards can impact their community. The third workshop focused on risk communication. A fourth workshop took place on April 27 and featured Shirley Laska from University of New Orleans and Camille Manning Broome from the Center of Planning Excellence. SCIPP has participated in the planning and carrying out of the entire series of workshops and has provided information on how to approach these issues as well as consideration of increases in temperature and changes in precipitation as well as sea-level rise. City and parish officials as well as Louisiana Coastal Zone Management program representatives and other NOAA groups (e.g. National Estuarine Research Reserve System) have been regular participants and will receive a sea level rise tool kit and information on how to best adopt sea level rise planning into their decision making process.

### **Forum: Blue Ribbon Resilient Communities Initiative**

America's Wetland Foundation's new initiative "Blue Ribbon Resilient Communities (BRR): Envisioning The Future of America's Energy Coast" is in response to the growing vulnerabilities along the Gulf Coast in the wake of coastal land loss and degrading landscapes that threaten coastal populations and indigenous cultures. BRR is hosting a series of twelve leadership forums that will be held in twelve communities across the five Gulf Coast States during 2011 and 2012. SCIPP has been invited to present the climate change picture at several of the forums including the first one that was held in Lake Charles, Louisiana on March 22-23, 2011 (Lynne Carter's presentation available here: <http://www.futureofthegulfcoast.org/fogcfiles/LynneCarter-ResilientCommunities1.pdf>) and the second one to be held in Plaquemines Parish, Louisiana (May 16-17, 2011).

### **Advisory Committees**

SCIPP has contributed to the translation of science through its involvement in several national advisory committees. SCIPP team member Lynne Carter was invited to join ICLEI Local Governments for Sustainability's new Climate Adaptation Steering Committee. ICLEI USA, a membership association of local governments working on climate protection and sustainable development, formed a Steering Committee to assist their rapidly expanding Climate Resilient Communities™ Program (CRC). The Steering Committee is an interdisciplinary group of 8-10 experts on various aspects of climate change adaptation. Its role is to provide input to ICLEI on critical issues such as program structure and priorities, tool development, and funding issues. Committee members will have the opportunity to interact with the Local Government Advisory Group and to network with other experts working on climate change adaptation issues. Lynne Carter was also selected to be a member of the Federal Advisory Committee for the the National Climate Assessment Federal Advisory Committee. The members of the committee play a critical role in providing input on both the ongoing Assessment process and product development for the report due in 2013. Furthermore, SCIPP PI Mark Shafer serves on an advisory board for the Oregon Climate Change Research Initiative (OCCRI) - the host organization for the Climate Decision Support Consortium RISA - and he also serves on the National Integrated Drought Information System Implementation Team.

### **Website**

During the past year, the SCIPP team continued to add more content to the SCIPP webpage including reports written by the team, new data products, more resources added to the resource section, a growing collection of monthly Southern Climate *Monitor* articles, and other content. In addition, SCIPP maintained a feed of news items of relevance to the region - largely focused on extreme events, updates on climate conditions, and seasonal forecasts. All of these contributed to the translation of science to stakeholders and the general public.



## Workshops, Conferences, and Presentations

Another major method of communicating science is through workshops, conferences, presentations, an activity the SCIPP team has been heavily involved with during the past year.

### *Workshops and Conferences*

The following are workshops the SCIPP team has held, is currently planning, or is playing a major role in organizing:

- **Oklahoma Stakeholder Working Group 1-day Workshop (November 17, 2010, Norman, OK)** - Workshop to provide feedback on the development of the severe weather portion of the extreme events tools (17 attendees).
- **Oklahoma Climate Adaptation Workshop (May 10, 2011, Norman, OK)** - Workshop as part of the National Climate Assessment, which will bring together various federal, state, tribal, and community stakeholders to continue a dialogue on climate change and adaptation planning for Oklahoma (40 to 60 attendees expected).
- **South Central U.S. State Drought Planning Workshop (May 11-12, 2011, Memphis, TN)** - Workshop bringing together state agency representatives from all of SCIPP's states to discuss state-level drought plan development (20 attendees expected).
- **American Meteorological Society Conference on Climate Adaptation (July 18-20, 2011, Asheville, NC)** - SCIPP team member Lynne Carter is co-program chair and is developing the scientific program for the conference.

### *Presentations*

The following are a listing of presentations members of the SCIPP team gave at a variety of conferences, workshops, and meetings. They are provided in alphabetical order with the presenter indicated in parentheses.

- "2010 Hurricane Risks in Louisiana." Presented at the annual ENTERGY Hurricane Preparedness Meeting, Baton Rouge, LA, May 24, 2010 (Keim).
- "An Analysis of Historical Storm Surge Activity Along the U.S. Gulf Coast." Presented at the 1st National Flood Workshop, Houston, TX, October 24-26, 2010 (Needham).
- "An Analysis of Historical Storm Survey Activity Along the U.S. Gulf Coast." Presented at the annual meeting of the Association of American Geographers, Seattle, WA, April 13, 2011 (Needham).
- "An Analysis of Southern U.S. Ice Storm Frequency from 2000-2009." Presented at the 91st annual meeting of the American Meteorological Society, Seattle, WA, January 26, 2011 (Kovacik).
- "An Analysis of Storm Surge Activity Activity Along the U.S. Gulf Coast." Presented at the SSPEED Program Workshop at Rice University, Houston, TX, January 28, 2011 (Needham).
- "An Investigation of Urban Influence on Precipitation in the Southeastern United States: Enhancement, Bifurcation, and Synoptic Characteristics." Presentation at Applied Geography Conference, Fort Worth, TX, October 2010 (Trevino).
- "Analyzing Past Drought and Predicting Future Drought with Comprehensive Drought Indices for Arkansas-Red River Basin." Poster presented at AGU Chapman Conference on Climates, Past Landscapes, and Civilizations, Sante Fe, NM, March 21-25, 2011 (Liu).
- "Analyzing Projected Changes and Trends of Temperature and Precipitation in the Southern U.S. from 16 Downscaled Global Climate Models under Different Emission Scenarios." Poster presented at TeraGrid 2010, Pittsburgh, PA, August 2-5, 2010 (Liu).
- "Assessing Climate Change Impacts on the Blue River Basin of Oklahoma." Poster presented at 2010 Oklahoma Governor's Water Conference, Norman, OK, October 26-27, 2010 (Liu).
- "A Look Back at Major Disaster Declarations: A GIS Perspective." Presented at the 91st annual meeting of the American Meteorological Society, Seattle, WA, January 24, 2011 (Hocker).
- "Bridging the Gap Between Climate Science and Decision Making: the RISA Program and an Overview of SCIPP." Guest lecture in Dr. Yang Hong's class - Climate Change and Natural Hazards Class (Hocker).
- "Calculating Storm Surge Return Periods for Coastal Locations on the Gulf of Mexico." Presented at 29th Conference on Hurricanes and Tropical Meteorology, Tucson, AZ, May 10-14, 2010 (Needham).

- “Climate Adaptation Planning to Aid State, Municipal, Tribal, and Federal Governmental Decision Makers.” Presented at the 91st annual meeting of the American Meteorological Society, Seattle, WA, January 24, 2011 (McPherson).
- “Climate Change.” Presented at the Ag Leadership Conference, Baton Rouge, LA, January 4, 2011 (Keim).
- “Climate Change Impacts on Water Availability and Hydrological Extremes: Case Studies from Southern USA and Emerging Regions.” Presented at the Department of Geography and Environmental Sustainability, Colloquium Series, University of Oklahoma, Norman, OK, April 1, 2011 (Hong).
- “Crisis Knowledge and Preparedness after Katrina as a Function of Race.” Poster presented at the Alabama-Mississippi Bays and Bayous Symposium, Mobile, AL, December 2010 (Edwards).
- “Developing a System to Support Hazard Mitigation Planning in the South: Process and Lessons Learned.” Presented at 9th Annual Climate Prediction Applications Science Workshop, Des Moines, IA, March 3, 2011 (Hocker).
- “Engaging Oklahoma Decision-Makers to Produce a Climate Needs Assessment for the State.” Presented at the 9th Annual Climate Prediction Applications Science Workshop, Des Moines, IA, March 4, 2011 (Riley).
- “GIScience Approaches to Understanding Geographic Dynamics.” Presented at GIS Day at the University of Nebraska, Lincoln, NE, November 17, 2010 (Yuan).
- “How Weather Affects Public Opinion of Global Warming.” Presented at the annual meeting of the Association of American Geographers, Seattle, WA, April 16, 2011 (Shao).
- “Hurricanes and Climate Change: The Gulf Coast Experience.” Keynote address presented at the Groves Conference on Marriage and Family, New Orleans, LA, March 15, 2011 (Keim).
- “Hurricanes in a Changing Climate.” Presented to the Coastal Sustainability Studio, Louisiana State University, January 21, 2011 (Keim).
- “Hurricanes of the Gulf of Mexico.” Presented at New Orleans’ Presbytere - Louisiana State Museum speaker series entitled “Living with Hurricanes: Katrina and Beyond”, New Orleans, LA, February 17, 2011 (Keim).
- “Hurricanes, Institutional Procedures, and Information Processing.” Presentation at the annual meeting of the National Coastal Storms Program Team (NOAA), Ocean Springs, MS, May 2010 (Edwards).
- “Hurricane-related Communication and Decision-Making for the Expert Community and Citizens.” Presentation for the Coastal Community Resilience Team Meeting of the Gulf of Mexico Alliance, Spanish Fort, AL, January 2011 (Edwards).
- “Knowledge and Action: The Role of Social Sciences.” Presented to the Research Experience for Undergraduates program, Norman, OK, June 9, 2010 (Shafer).
- “Lessons Learned: Evacuations Management of Hurricane Gustav.” Presented at the Digital Hurricane Consortium: Field Planning and Impacts Workshop, Norman, OK, June 28, 2010 (Shafer).
- “Observed Changes in the Frequency of Heavy Precipitation Events in the Southern Climate Region and Policy Implications.” Presented at the 91st annual meeting of the American Meteorological Society, Seattle, WA, January 24, 2011 (White).
- Panel Presenter at “State of the Coast: Implementing a Sustainable Coast for Louisiana,” in session: *Adapting Natural and Built Environments to a Changing Climate*, Baton Rouge, LA, June 9, 2010 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” Presented at the America’s Wetland Foundation Blue Ribbon Resilient Communities Forum, Lake Charles, LA, March 22, 2011 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” Climate Communities Webinar Series presentation, March 10, 2011 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” Public presentation at league of women voters January meeting, St. Tammany Parish, LA, January 31, 2011 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” Plenary Panel at Restore America’s Estuaries, 5th National Conference, Galveston, TX, November 15, 2010 (Carter).
- “Planning to Protect: Thinking About Climate Change and Adaptation.” Prowalk/Probike Annual Conference, Chattanooga, TN, September 14, 2010 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” CPEX Smart Growth Conference, Baton Rouge, LA, August 20, 2010 (Carter).
- “Planning to Protect: How We Might Think About A Changing Climate and Be More Ready.” National Park Service Webinar Series presentation, August 12, 2010 (Carter).

- “Scientific Assessments: What Good are They?” Presented at the University of Oklahoma Department of Geography Sustainability Seminar Series, Norman, OK, September 10, 2010 (Shafer).
- “Southern Climate Impacts Planning Program: You Can Work Somewhere Other Than a TV Station or the NWS!” Presented to meteorology students at Iowa State University, Ames, IA, March 1, 2011 (Riley).
- “Storm Surge Return Periods for the U.S. Gulf Coast.” Presented at the annual meeting of the Association of American Geographers, Seattle, WA, April 14, 2011 (Keim).
- “University of Oklahoma International Collaboration.” Presented at USDA-China MOST Climate Change Workshop, San Diego, CA, November 9, 2010 (Shafer).
- “The Urban Influence on Precipitation in the Southeastern United States.” Presented at the annual meeting of the Association of American Geographers, Seattle, WA, April 13, 2011 (Trevino).
- “Using GIS to Assess Vulnerability to Climate Hazards in the Southern United States.” Presented at the 91st annual meeting of the American Meteorological Society, Seattle, WA, January 24, 2011 (Gottlieb).
- “Water Resources Assessment and Management Under Changing Climate at Global and Regional Scales.” Invited talk at International Water Resources Association Annual Conference, Nanjing, China.

## 8. Publications and Reports

The following are various SCIPP-related publications and reports produced during the past year. An \* indicates that the information was communicated to stakeholders.

### Peer Reviewed

- Liu, W, Y. Hong, S. Khan, P. Adhikari, and M. Huang, 2011: Evaluation of global daily reference ET's hydrological utility using Oklahoma's world-class environmental Monitoring Network-MESONET. *Water Resources Management*. In press.
- Needham, H., D. Brown, L. Carter, H. Holsinger, R. Meyer, S. Seidel, 2011: Climate Change Adaptation: Impacts and Adaptation Options in the Gulf Coast. Published by The Pew Center on Climate Change, 45 pp.
- Needham, H., and B. D. Keim, 2011: Storm Surge: Physical Processes and an Impact Scale. *Recent Hurricane Research – Climate, Dynamics, and Societal Impacts*. E. Lupo (Ed.). Intech Open Access. Publisher: Croatia.
- Nogueira, R., and B. D. Keim, 2011: Contributions of Atlantic Tropical Cyclones to Monthly and Seasonal Rainfall in the Eastern United States 1960–2007. *Theoretical and Applied Climatology*, 103(1-2):213-227, doi: 10.1007/s00704-010-0292-9.
- Nogueira, R., and B. D. Keim, 2010: Annual Volume and Area Variations in Tropical Cyclone Rainfall Over the Eastern United States. *Journal of Climate*. 23(16): 4363-4374, doi: 10.1175/2010JCLI3443.1
- Piazza, B. P., M. K. La Peyre, and B. D. Keim, 2010: Relating Large-scale Climate Variability to Local Species Abundance: ENSO forcing and Brown Shrimp (*Farfantepenaeus aztecus*) in Breton Sound, Louisiana, USA. *Climate Research*. 42:195-207, doi: 10.3354/cr00898.
- Wang, J., Y. Hong, J. J. Gourley, P. Adhikari, L. Li, and F. Su, 2010: Quantitative assessment of climate change and human impacts on long-term hydrologic response. *International Journal of Climatology*, **30**, 2130-2137, doi: 10.1002/joc.2023 (special issue on Hydro-climatology).

### Non Peer-reviewed

- Edwards, R., A. Miller, S. H. Grey, and D. Brown, 2010: Hurricanes and decision-making: The role of emotion, knowledge, and past experience. Paper accepted for presentation at the annual meeting of the National Communication Association, San Diego, CA.
- Gottlieb, R., H. E. Brooks, M. A. Shafer, and M. B. Richman, 2011: Using GIS to Assess Social Vulnerability to Climate Hazards in the Southern United States. *Preprints*, 6<sup>th</sup> Symposium on Policy and Socioeconomic Research, American Meteorological Society, Seattle, WA.
- Hocker, J. E., 2011: A Look Back at Major Disaster Declarations: A GIS Perspective. *Preprints*, 6<sup>th</sup> Symposium on Policy and Socioeconomic Research, American Meteorological Society, Seattle, WA.
- Liu, L., Y. Hong, J. E. Hocker, M. A. Shafer, L. M. Carter, J. J. Gourley, C. N. Bednarczyk, P. Adhikari, 2011: Analyzing Projected Changes and Trends of Temperature and Precipitation in the Southern U.S. from 16 Downscaled

Global Climate Models under Different Emission Scenarios. Submitted to the *Journal of Theoretical and Applied Climatology*.

Miller, A., D. Brown, S. Grey, and R. Edwards, 2010: Crisis knowledge and preparedness four years after Hurricane Katrina: Comparing Gulf Coast populations according to race. Paper presented at the annual meeting of the Association for Education in Journalism and Mass Communication, Denver, CO (top paper for Minorities and Communication Division).

White, E. D., M. A. Shafer, and J. E. Hocker, 2011: Trends in Heavy Precipitation in the SCIPP Region of the Southern USA. *Preprints*, 6<sup>th</sup> Symposium on Policy and Socioeconomic Research, American Meteorological Society, Seattle, WA.

### SCIPP Reports

\*Hocker, J. E., 2011: Geographic Assessment of Major Disaster Declarations Across the Lower 48 States. Available at: [http://www.southernclimate.org/publications/Disaster\\_Report\\_Final\\_low-res.pdf](http://www.southernclimate.org/publications/Disaster_Report_Final_low-res.pdf).

\*L. M. Carter, and J. E. Hocker, 2010: Blending Perspectives to Collectively Address Climate Change Issues Across the Western Gulf Coast and Southern Plains. Summary report of World Café sessions from the August 10-12, 2009 U.S. Fish and Wildlife Service (Regions 2 and 4) and USGS co-sponsored regional climate change workshop entitled "Climate Change: The Western Gulf Coast and Southern Plains." Available at: [http://www.southernclimate.org/documents/World\\_Cafe\\_2009\\_Report\\_Final.pdf](http://www.southernclimate.org/documents/World_Cafe_2009_Report_Final.pdf).

\*Hocker, J. E., and L. M. Carter, 2010: Southern U.S. Regional Hazards and Climate Change Planning Assessment. A summary report based on a regional survey conducted by the Southern Climate Impacts Planning Program (SCIPP). Available at: [http://www.southernclimate.org/publications/SCIPP\\_Hazards\\_Survey\\_Report\\_Final.pdf](http://www.southernclimate.org/publications/SCIPP_Hazards_Survey_Report_Final.pdf).

\*Riley, R. B., 2010: Oklahoma Climate Adaptation Planning Kick-Off Meeting Summary Report. A summary report on the December 10, 2009 Oklahoma Climate Adaptation Planning Meeting. Available at: [http://www.southernclimate.org/documents/Climate\\_Adaptation\\_Meeting\\_Summary\\_Report.pdf](http://www.southernclimate.org/documents/Climate_Adaptation_Meeting_Summary_Report.pdf).

## 9. Links with Other NOAA Programs

- Cooperative Institute for Mesoscale Meteorological Studies; National Severe Storms Laboratory
- National Climatic Data Center
- National Estuarine Research Reserve System
- National Integrated Drought Information System
- National Weather Service (NWS) Climate Prediction Center
- NWS Climate Services Division
- NWS River Forecast Center (Arkansas Red River Basin, West Gulf, and Lower Mississippi)
- NWS Southern Region Headquarters
- NWS Storm Prediction Center
- NWS Weather Forecast Office (Norman, OK)
- NOAA Coastal Services Center
- NOAA Regional Climate Services
- NOAA Regional Integrated Sciences and Assessment Programs
- NOAA Sea Grant: LA, MS/AL, and TX

## 10. Cross-RISA Activities

- Collaborated with RISA colleagues at the Great Lakes Integrated Sciences and Assessments (GLISA) team and Southeast Climate Consortium (SECC) on the development of several break out sessions at the RISA meeting held in Washington D.C., September 29-30, 2010.
- Submitted a project in partnership with the Climate Assessment for the Southwest (CLIMAS) in conjunction with the National Climate Assessment (not selected).
- Maintained communications with other RISA teams in the network, particularly the California Nevada Applications Program (Kelly Redmond), Climate Decision Support Consortium (Phil Mote, Denise Lach, and Josh Foster), CLIMAS (Dan Ferguson, Gigi Owen, Zack Guido, and Jonathan Overpeck), GLISA (Tom Dietz), SECC (Keith Ingram), and Western Water Assessment (Eric Gordon and Kristen Averyt).