

# Southern Climate Impacts Planning Program

**ANNUAL REPORT June 2019- May 2020**



**RISA**  
Regional Integrated Sciences  
and Assessments

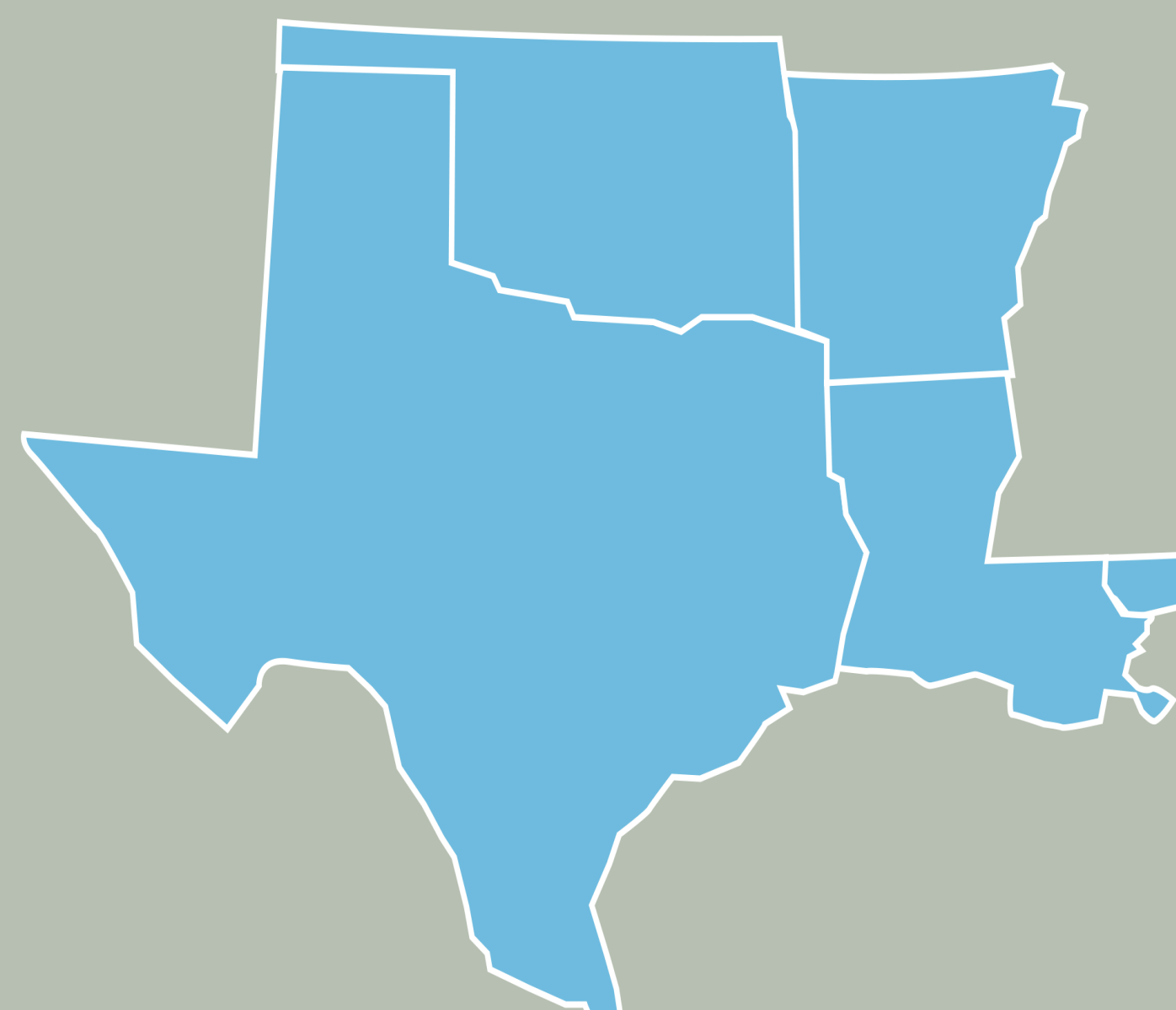
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# Our Mission

**Assist organizations with making decisions that build resilience by collaboratively producing research, tools, and knowledge that reduce weather and climate risks and impacts across the South Central United States.**

SCIPP Phase III was funded on award NA18OAR4310337. Our annual performance report is submitted under the title "Southern Climate Impacts Planning Program (SCIPP) Phase III".



# Our Team

SCIPP is a collaborative effort between the Oklahoma Climatological Survey (OCS), the Cooperative Institute for Mesoscale Meteorological Studies and the South Central Climate Adaptation Science Center (SC-CASC) at the University of Oklahoma (OU), the Department of Geography and Anthropology and Southern Regional Climate Center (SRCC) at Louisiana State University (LSU), the School of Public Affairs & Administration Urban Planning Program at the University of Kansas (KU), the School of Natural Resources at the University of Nebraska – Lincoln (Nebraska), and Sea Grant Texas at Texas A&M University (Texas A&M).



Arkansas river flooding.

**Principal Investigators:** Mark Shafer (OU); Barry Keim (LSU); Rachel Riley (OU)

**Co-Principal Investigators:** Renee Edwards (LSU); Michael Hayes (Nebraska); Cynthia Lyle (Texas A&M); Ward Lyles (KU); Renee McPherson (OU); Randy Pepler (OU); David Sathiaraj (LSU)

**Core Office:** Margret Boone - Program Manager (OU); Vincent Brown\* - Program Manager (LSU); William Howe\* - Climate Assessment Specialist (OU); Amanda Lewis\* - Research Associate (LSU); James Cuellar - Student Assistant (OU)

**Senior Personnel:** Harold Brooks (OU); Aimee Franklin (OU); Kim Klockow-McClain (OU)

**Graduate Students:** Ashley Autore (LSU); Marisa Karpinski (LSU); Penn Pennell (KU); Derek Thompson (LSU); Anna Wanless (OU)

**Advisory Committee:** Bill Hooke (American Meteorological Society); Maria Carmen Lemos (Great Lakes Integrated Sciences + Assessment); Tim Lovell (Disaster Resilience Network); Jamie Olson (Feeding Texas); Sascha Petersen (Adaptation International); Melissa Stults (University of Michigan); and Trevor Timberlake (United State Army Corps of Engineers – Little Rock District)



\* denotes Early Career Researchers

# Greatest Accomplishment

## Simple Planning Tool Awards and Expansion Initiatives

The accomplishment about which the team was most proud during the reporting period revolved around SCIPP's Simple Planning Tools (SPT), produced in 2018. This past year, SCIPP received two SPT-related awards. The first was that the Oklahoma SPT received the Oklahoma Chapter of the American Planning Association's 2019 award for Outstanding Public Outreach, Program, Project, Tool, or Community Initiative. The award category emphasizes results and demonstrates how innovative and state-of-the-art planning methods and practice help create communities of lasting value.

The second award was the 2019 Route Fifty Navigator Tech Innovators Award. SCIPP Deputy Director Rachel Riley along with stakeholder partners Paula Dennison and Rob Hill from the City of Stillwater, Oklahoma, were given the award for "developing the Simple Planning Tool for planners and emergency managers to assess the local, long-term climate risks in Oklahoma communities." The *Route Fifty* awards honor individuals and teams who work in or with state, county, and municipal governments across the United States.

In addition to the awards, a formal evaluation of the Arkansas and Oklahoma SPT's was conducted, which was the first time SCIPP had formally evaluated a decision support tool it had developed. Some work also took place to expand the SPT. First, graduate student Anna Wanless began drafting a version for Texas. Second, SCIPP was successfully awarded additional grant funding to work with the Western Water Assessment RISA. The focus of that grant will be to expand and test the SPT concept in Utah to test transferability of the tool from SCIPP to another RISA Team, and to move hazard mitigation and climate adaptation planning forward in Oklahoma and Utah.



*Award given by the Oklahoma Chapter of the American Planning Association.*



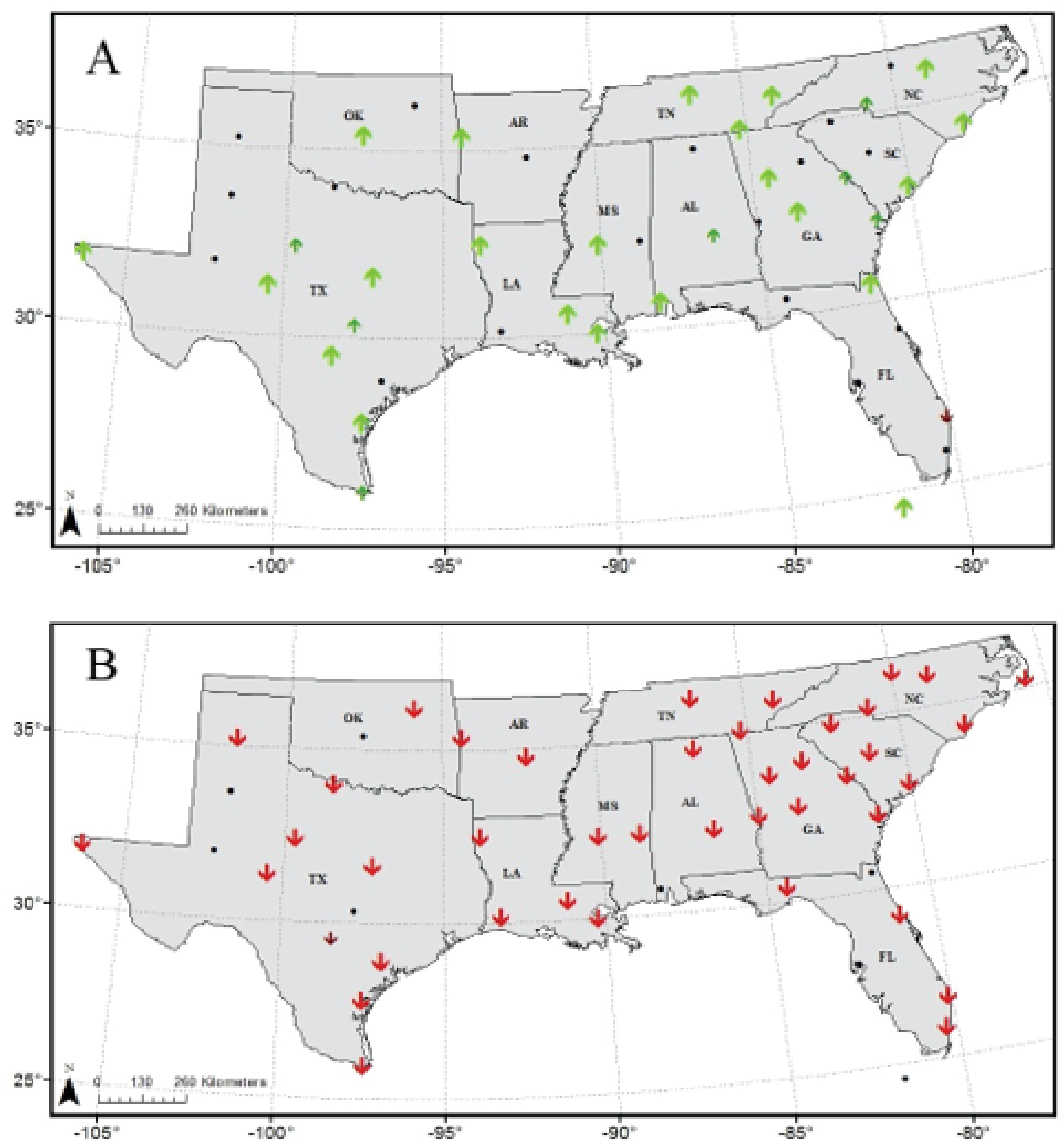
*Paula Dennison, Rachel Riley and Rob Hill receiving the award from Alisha Powell Gillis, Route Fifty Senior Editor, at the awards ceremony in San Antonio, Texas.*

## New Areas of Focus or Partnerships

### New Orleans Sewerage and Water Board

SCIPP is working with the **New Orleans Sewerage and Water Board and Office of Homeland Security and Emergency Preparedness**. Formal presentations have been given at both locations. The work SCIPP conducted on heavy rainfall has helped explain why the drainage network in New Orleans has been overwhelmed repeatedly over the past decade.

Annual average hourly intensity (Fig. A) and annual average duration (Fig. B) analyses showed that hourly events at many stations across the Southeast (including New Orleans) have become more intense and of a shorter duration through time. New Orleans has been plagued by extreme precipitation events recently and the citizens have been outraged at how the city has handled flooding and how the pumps and flooding control measures have been inadequate during the events. SCIPP researchers explained how and why these events were occurring.



### Cross-RISA Collaboration: Making Gulf Communities More Resilient

SCIPP and **GLISA** began collaboration on a newly funded project from the Gulf Research Program, *Making Gulf Communities More Resilient: Scaling-up Customized Vulnerability Assessment for Extreme Events in Gulf Cities*. The \$2.2M funding over 3 years provides an ability to extend GLISA's Vulnerability Assessment Tool from the Great Lakes to the Gulf Coast and test different delivery mechanisms (in-person, online, self-guided) to assess impacts on processes and outcomes. Other partners on the project include Stanford University, Headwaters Economics, and Adaptation International.

SCIPP's role in the project is to develop climate risk profiles that will accompany **Headwaters Economics'** Neighborhoods at Risk tool for each of the 60 Gulf Coast cities and counties that will participate in the project and to work with the broader project team in examining adaptive capacity. The funding provides SCIPP with a Ph.D-level graduate student for two years, a postdoctoral associate for one year, and collaboration with other faculty at OU and at the other partner institutions. The climate assessments and revised Vulnerability Assessment Tool will be useful and expandable to the rest of the SCIPP region following conclusion of the project.

### Examining Extreme Rainfall Forecast and Communication Processes

SCIPP and **Sea Grant** are providing joint support for a graduate student at the University of Oklahoma to study extreme rainfall forecast and communication processes. The partnership builds on collaborations that took place with Sea Grant at the University of Oklahoma several years ago. This study investigates forecaster communication during extreme rainfall events in the SCIPP region from 2015-present. It focuses on how forecasters view, interpret, and communicate model outliers. It also includes a component of whether forecasters consider the link between climate change and an increased frequency of extreme rainfall events when making forecasts. While there is some research on how end users receive National Weather Service (NWS) products, little to no research has been conducted to understand how forecasters create and communicate these products and the decisions made in the process. This project will help address that and provide insight into whether climatology plays a role in how extreme rainfall forecasts are communicated.

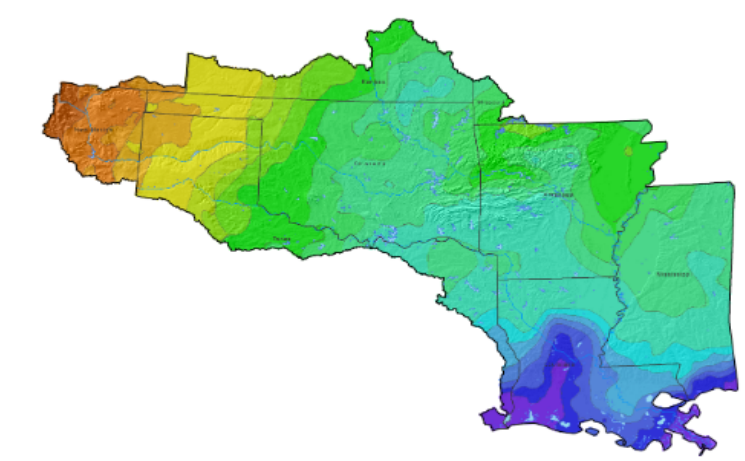
Data collection includes phone interviews with NWS forecasters responsible for a portion (or all in the case of a national center) of the SCIPP region during an extreme rainfall event. This study has been approved by the University of Oklahoma Institutional Review Board and interviews are currently being conducted.

# Outputs

SCIPP PI Barry Keim was a contributing author on the final report on *Regional Probable Maximum Precipitation Study For Oklahoma, Arkansas, Louisiana and Mississippi* produced by Applied Weather Associates. The report is available on the Oklahoma Water Resources Board website. The results are being used by dam safety officials in Oklahoma, Arkansas, Louisiana and Mississippi for dam design and remediation projects. This study brought together stakeholders from the Arkansas Department of Natural Resources, Louisiana Department of Transportation and Development, Mississippi Department of Environmental Quality and the Oklahoma Water Resources Board. More information is available on page 13.

## Regional Probable Maximum Precipitation Study For Oklahoma, Arkansas, Louisiana, and Mississippi Final Report

Prepared for:  
Arkansas Dept. of Natural Resources  
Louisiana Dept. of Transportation & Development  
Mississippi Dept. of Environmental Quality  
Oklahoma Water Resources Board



Prepared by:  
Applied Weather Associates, LLC  
PO Box 175, Monument, CO 80132  
(719) 488-4311  
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August 2019

In Brown et. al (2019b), *Climatology and Trends in Hourly Precipitation for the Southeast United States*, research results indicate hourly intensity significantly increased at 44% of the stations, accompanied by an increase in average hourly accumulation at 40% of the sites analyzed. Geographically, heavy hourly events are more frequent along the Gulf Coast and decrease inland.

In Brown et. al (2019a), *Hourly Rainfall Climatology of Louisiana*, a climatology of hourly precipitation for four first-order weather stations across Louisiana is introduced. The study investigated possible changes in the hourly precipitation distribution, and links winter (DJF) Gulf of Mexico (GOM) sea surface temperatures (SST) to the frequency of hours with precipitation. For example, the duration of events is much longer in winter compared to summer, while the number of rainfall events is greater in summer. It was also determined that winter GOM SST significantly correlated with the number of hours with precipitation across coastal Louisiana, possibly related to the frequency of synoptic types such as frontal isentropic lift.

In Brown et. al (2020), *Trend Analysis of Multiple Extreme Hourly Precipitation Time Series in the Southeast United States*, annual trends in extreme hourly precipitation time series were examined at 50 first-order weather stations across the southeastern United States from 1960 -2017. Results indicated that the magnitude of annual maximum 1-, 3-, 6-, 12-, and 18-h periods did not broadly change at the sites analyzed; however, the numerical value that defines a (station specific) 90th-percentile hourly accumulation significantly increased at 36% (18/50) of the stations. Six stations across Georgia showed significant decreasing trends in the annual maximum consecutive hourly period with measurable precipitation (duration), demonstrating that the longest precipitation events that occurred at these stations have decreased in duration since 1960.

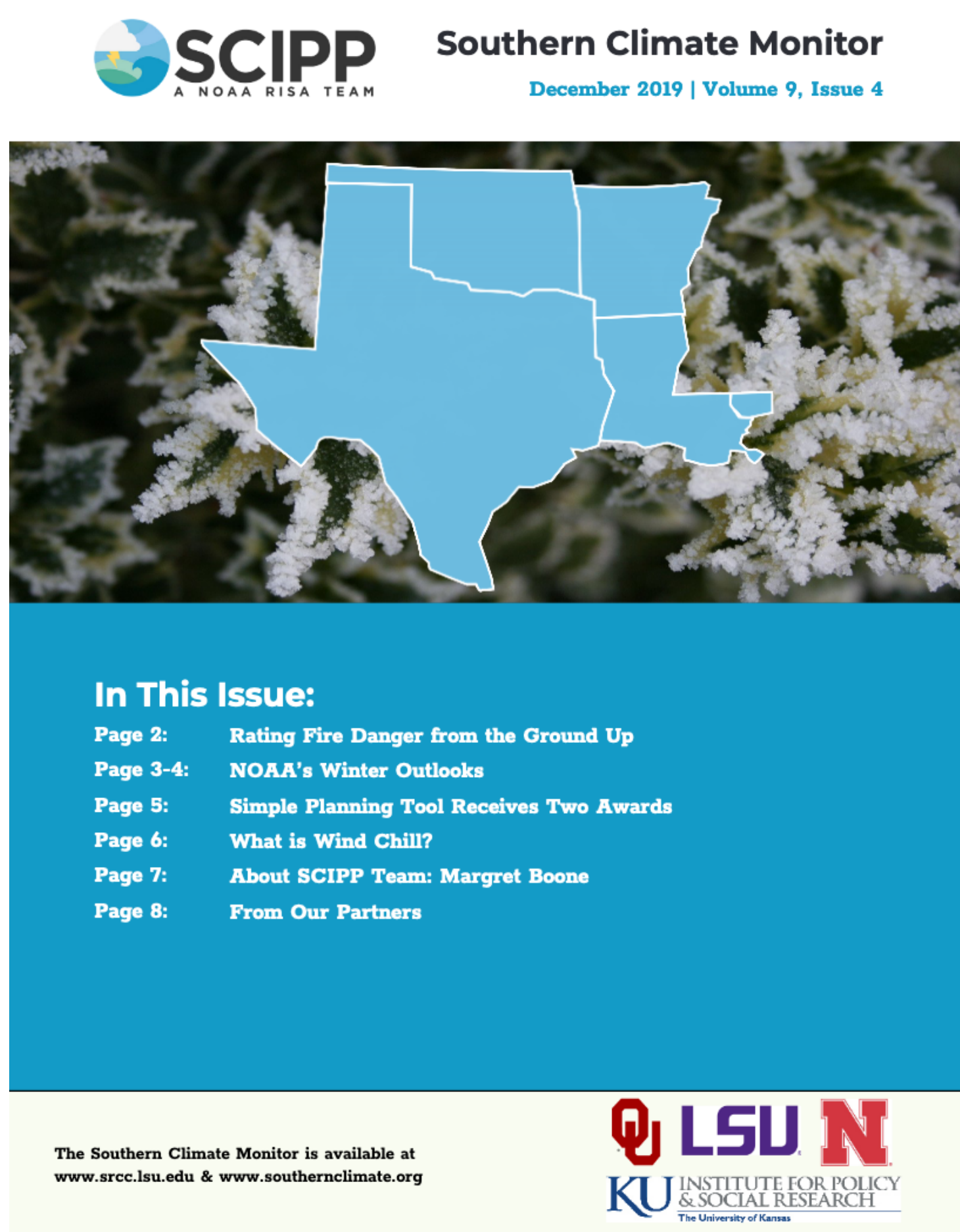
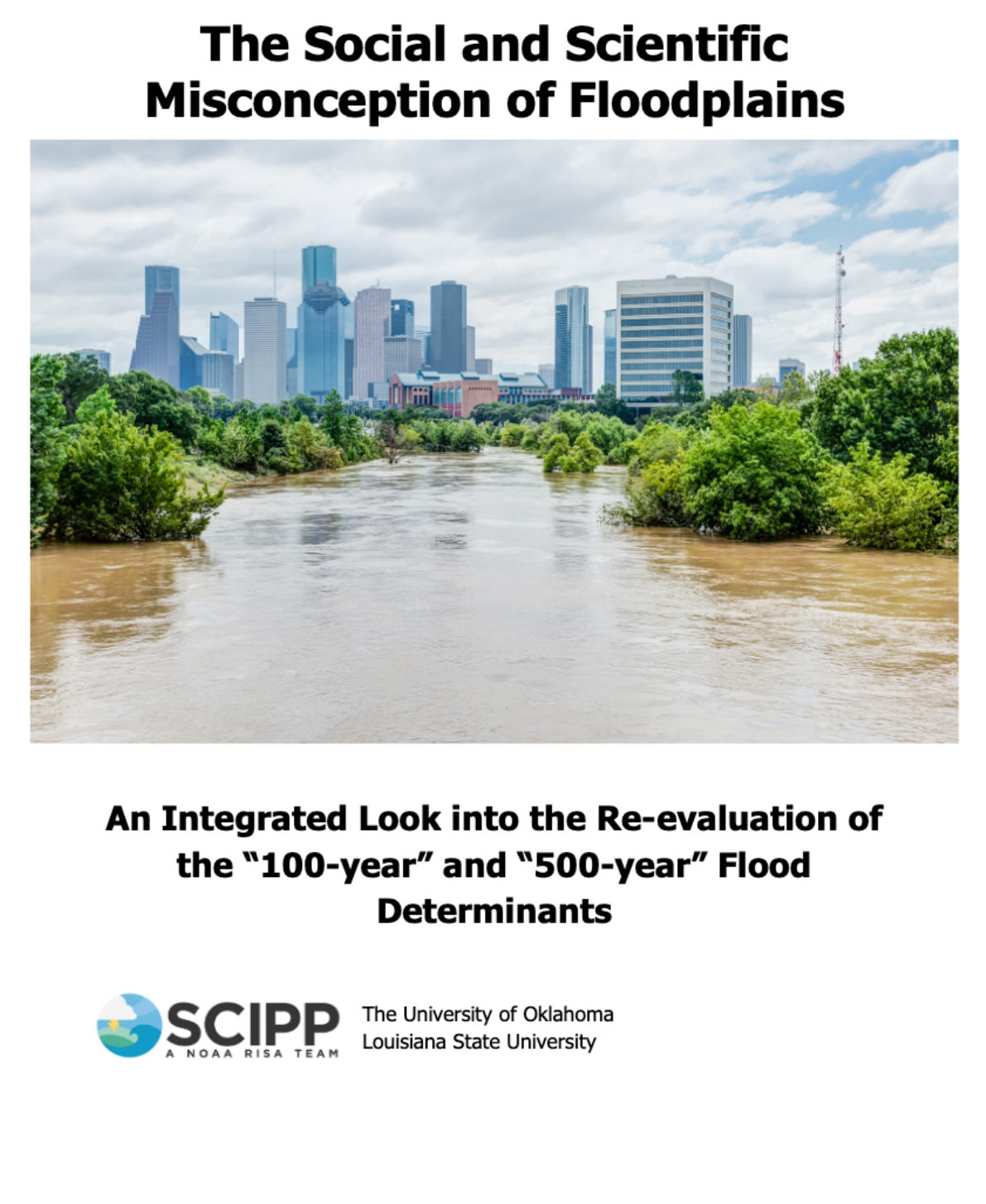
*The New Orleans Sewerage and Water Board in Louisiana has used the results from the above publications to help understand why the city's drainage network has been overwhelmed repeatedly over the past decade.*

Meshek and Associates, LLC and the City of Stillwater in Oklahoma used the *Simple Planning Tool for Oklahoma Climate Hazards* during the development of local FEMA hazard mitigation plans.



# Outputs

Randy Pepler and Mark Shafer worked with Ms. McKenzie Roberts, an undergraduate student at OU in Geography from the Houston area. Ms. Roberts analyzed flooding risk perception and local misconceptions about the 100- and 500-year flood terminology via survey data she collected and historical environmental data in the Houston area, as part of her senior capstone project. Ms. Roberts produced a SCIPP report titled, *The Social and Scientific Misconception of Floodplains: An Integrated Look into the Re-evaluation of the "100-year" and "500-year" Flood Determinants*. Local floodplain managers have expressed interest in the results of her study. The report is available [here](#).



SCIPP produces a quarterly newsletter, the *Southern Climate Monitor*, which is sent to 123 individuals across the United States.

Facebook and Twitter posts are produced when relevant. Currently, 727 people follow our Facebook page and 535 follow our Twitter page. The Facebook post with the largest reach during this reporting period was a regional survey to help better understand how seasonal and sub-seasonal outlooks are used on August 8, 2019 in which the post reached 5,445 people.



# Outreach

## Disaster Resilience Network Meeting



Table top exercises at the SCIPP/DRN meeting at the National Weather Center.



SCIPP team members Mark Shafer and Margret Boone hosted a meeting alongside Disaster Resilience Network (DRN), a non-profit organization in Tulsa, Oklahoma that empowers people, businesses, and communities to reduce impact of disasters.

The meeting brought together representatives from each of the DRN boards with faculty and staff from OU and the National Weather Center. The meeting purpose was to identify opportunities for collaboration on research, identify information needs, and to connect research at OU to applications.

Mark Shafer facilitated the meeting, took notes, and prepared a written summary. Potential collaboration was identified for each of the three DRN Councils: Housing, Business, and Cross-Cultural, along with ideas that spanned multiple elements of the organization. There was particular interest around identifying strategies for homeowner education and research on its effectiveness (Housing), exercise planning for the community and businesses (Business), and message framing (Cross-Cultural). Other potential areas of collaboration included studying the effectiveness of low impact development, measuring outcomes of the Program for Public Information, and multi-disciplinary involvement in resilience planning.

## Oklahoma Hazard Mitigation Working Group (HMWG)

Rachel Riley continued to lead the Oklahoma Hazard Mitigation Working Group (HMWG) which is comprised of representatives from the Oklahoma Department of Emergency Management, Oklahoma Emergency Management Association, Oklahoma Chapter of the American Planning Association, Meshek and Associates, LLC., and City of Stillwater, Oklahoma. Although this partnership was not explicitly incorporated into SCIPP's current grant, the partnership builds off relationships and work that has been building over several years and takes advantage of mutual goals established by the aforementioned partners:

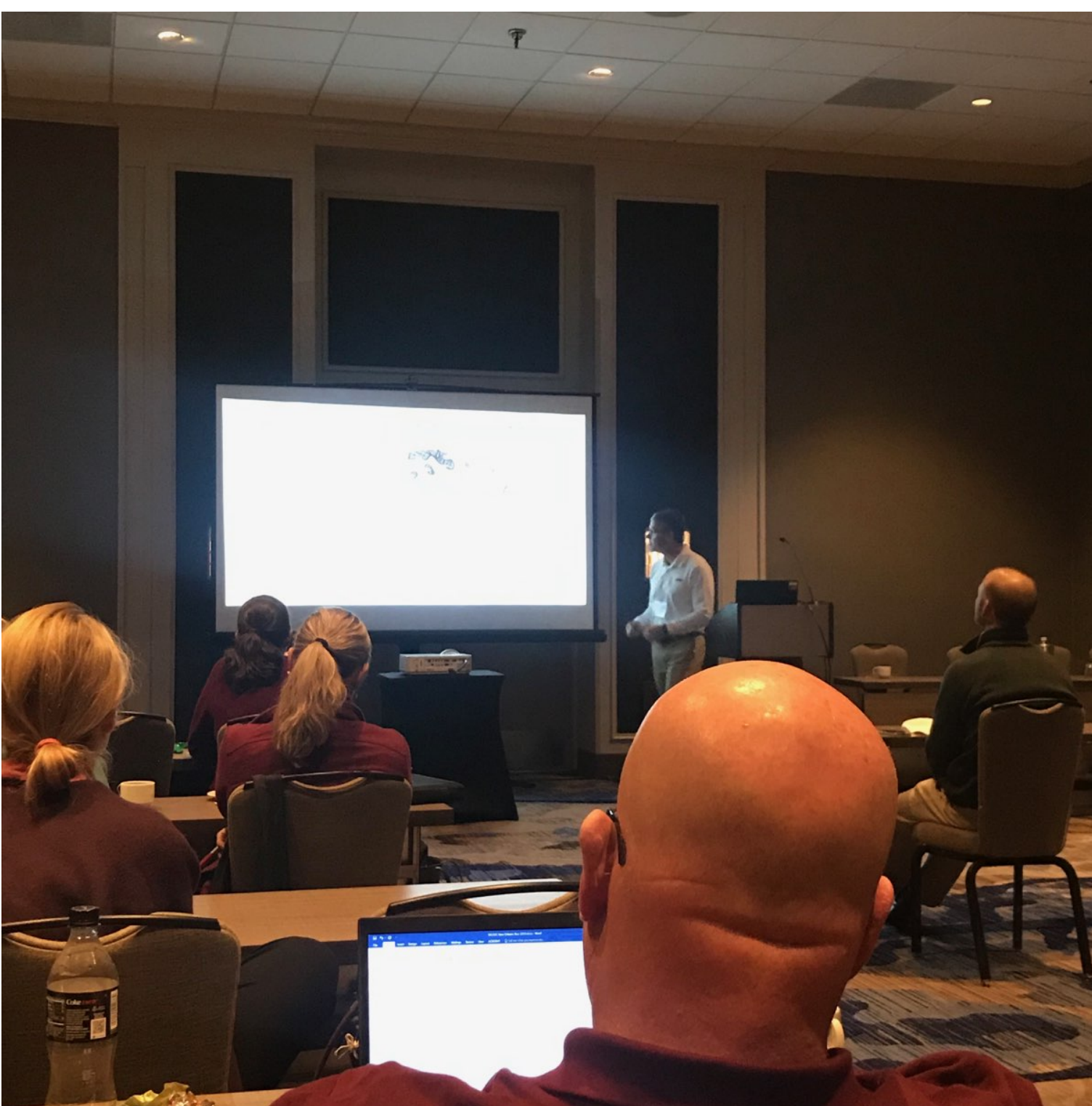
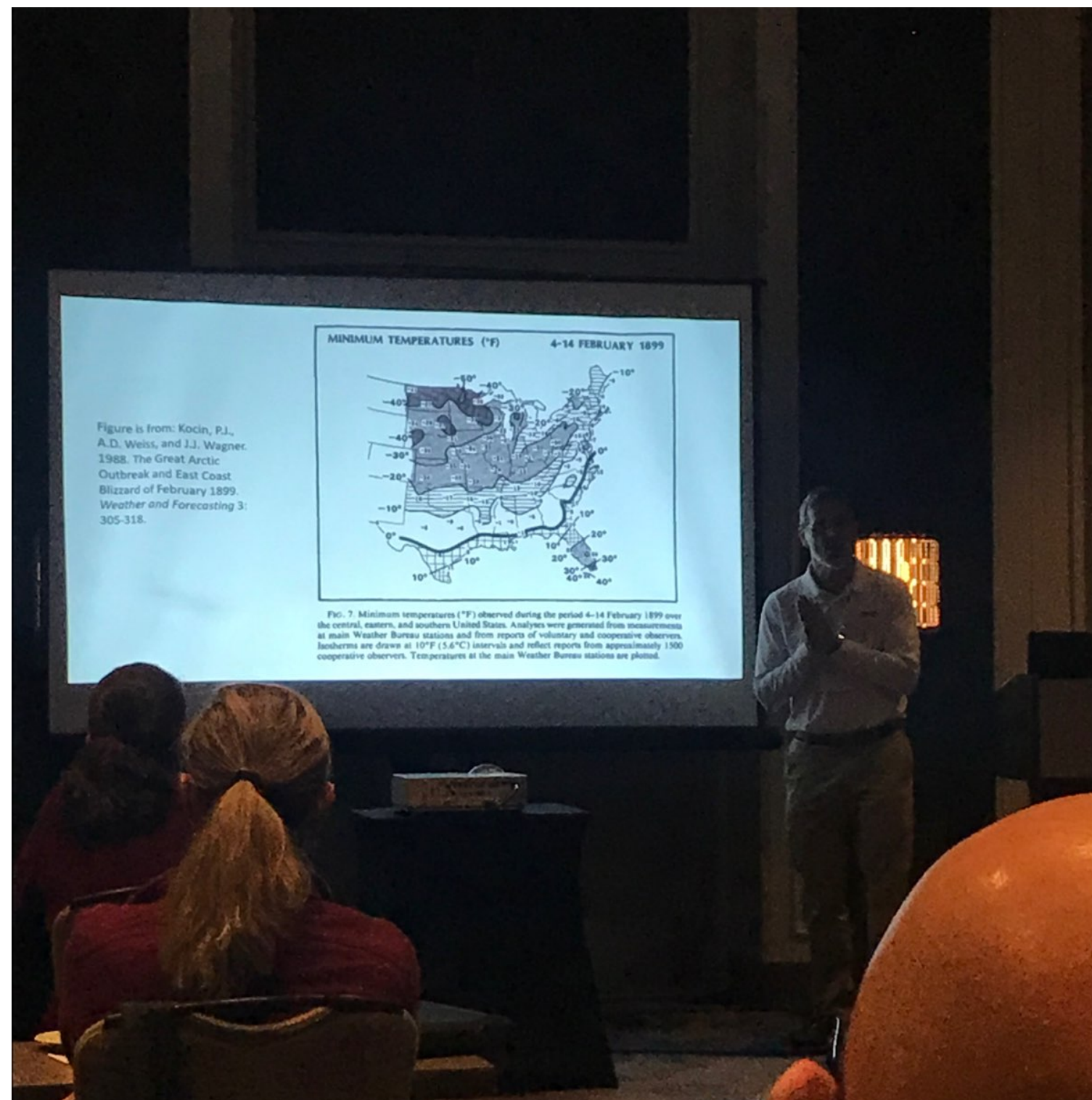
1. To build capacity for hazard-related planning in Oklahoma.
2. To build capacity for implementing hazard mitigation and climate adaptation projects.
3. To reduce the risks and adverse impacts of climate in Oklahoma to reduce long term financial burdens.

Oklahoma's hazard mitigation efforts lag behind other states and the HMWG is working towards improving them. The primary activity that took place during the reporting period was to administer a survey to Oklahoma emergency managers and planners to gauge their understanding and perceptions of hazard mitigation and planning consultants. Riley collaborated with the HMWG to develop a 20-question survey that was administered in Fall 2019. The survey was distributed at the 2019 Oklahoma Emergency Management Conference and through the Oklahoma Emergency Management Association and the Oklahoma Chapter of the American Planning Association list serves. Ninety people participated in the survey and most participants responded to all of the questions. Preliminary analysis revealed that hazard mitigation knowledge and actions are lacking among many participants, and planning consultants are viewed in a positive light but not strongly positive. Many of the activities that are using hazard mitigation funds are basic (e.g. safe rooms). Further, some explanations for the high percentage of expired plans includes burdensome requirements (especially for smaller communities), difficulty in obtaining the necessary participation/buy-in beyond the emergency manager, and lack of guidance and expertise from the State. In general, capacity is lacking.

The HMWG is planning a larger meeting with survey participants who said they would be interested in tackling hazard mitigation issues. Further conversations and the meeting may be delayed by the ongoing pandemic, however.



# Outreach



SCIPP researchers participate in the Southeast Climate Adaptation Science Center Regional Science Symposium on November 13, 2019. Goals of the Symposium included supporting climate adaptation efforts by sharing science resources and tools and providing natural and cultural resource managers and regional experts with an opportunity to share lessons learned.

## Texas Resilience Conference



Planning for the inaugural Texas Resilience Conference occurred during the reporting period. Rachel Riley played an active role, including chairing the program committee and being a member of the steering committee. SCIPP is one of 20 organizations represented on the conference's steering committee. The conference aims to convene about 200 representatives from all levels of government, non-governmental organizations, community groups, private industry, and academia that work on resilience and climate change adaptation in Texas. The conference will also provide a venue for practitioners and researchers to share information about current activities, plans, and opportunities for collaboration.

Topics in the conference will include but not be limited to the latest in Texas climate science and trends, resilience and adaptation actions and solutions that focus on a particular sector or approach, and special topics including but not limited to: climate justice and equity; climate displacement, migration and/or gentrification; drought recovery and resilience; and hurricane recovery and resilience.

Originally scheduled for May 20-21, 2020 in Austin, Texas, the conference was rescheduled for Spring 2021 due to health concerns associated with the coronavirus (COVID-19). The program committee was in the process of accepting submissions and organizing the program at the time the pandemic hit the United States.

# Outreach

## Presentations

"Communication Challenges and the Use of Climate Tools by Coastal Stakeholders." Paper presented at the biannual meeting of the International Environmental Communication Association, Vancouver, Canada, June 2019 (Edwards).

"Risk Communication and the Role of Self-Efficacy, Numeracy, and Training Materials in the Comprehension of Climate Tools." Paper presented at the annual meeting of the National Communication Association, Baltimore, MD, June 2019 (Edwards).

"Hurricane History of the Gulf of Mexico." Presented to the Plaquemines Parish Historical Society, Belle Chasse, Louisiana, August 6, 2019 (Keim).

"Coastal Vulnerability in a Changing Climate." Presented to the New Orleans Office of Homeland Security and Emergency Preparedness, New Orleans, Louisiana. August 8, 2019 (Brown and Keim).

"Hurricane Vulnerability and Precipitation Change in the Southeast US." Presented to the New Orleans Sewerage and Water Board. New Orleans, Louisiana, September 5, 2019 (Brown and Keim).

"A Model of Networked Planning? Evaluating the Plans and People of Tulsa's Award-Winning Risk Reduction Efforts." Presented at the Association of Collegiate Schools of Planning. Greenville, South Carolina, October 2019 (Lyles and Pennell).

"Thunder and Lightning." Presented to the Baton Rouge Chapter of the Lions Club, Baton Rouge, Louisiana, October 7, 2019 (Brown and Keim).

"Helping Communities Become More Resilient to Climate Hazards." Presented at the American Planning Association Quad State Conference, Tulsa, Oklahoma, October 11, 2019 (Riley).

"Southern Climate Impacts Planning Program: A NOAA RISA Team." Presented at the 2019 NOAA Water Meeting, College Park, Maryland, October 16, 2019 (Keim).

"Climate Change and Oklahoma." Presented at the UCO Sustainability Faculty Workshop, Edmond, Oklahoma, October 22, 2019 (Shafer).

"Information-Needs of Water Managers in South-Central U.S." Paper presented at the biannual meeting of the International Environmental Communication Association, Vancouver, Canada, November 2019 (Edwards).

"A Freeze Climatology for Southeast Louisiana." Presented at the Southeast Climate Adaptation Science Center Annual Meeting, New Orleans, November 14, 2019 (Keim).

"Heavy Rainfall and Thunderstorms." Presented to the National Association of State Radio Networks Annual Meeting, Las Vegas, Nevada, December 10, 2019 (Keim).

"A Freeze Climatology for Southeast Louisiana." Presented at the American Society of Sugar Cane Technologists – Louisiana Division Annual Meeting, Baton Rouge, LA, February 4, 2020 (Keim).

"Jazz on Tulsa Time." Presented at the KU Hall Center for Humanities, Nature and Culture Seminar, February 7, 2020 (Lyles and Pennell).

"CRS on Compassion." Presented at Federal Emergency Management Administration, Region 7 Symposium on Community Rating System program, Keynote Address, Kansas City, Missouri, February 19, 2020 (Lyles).

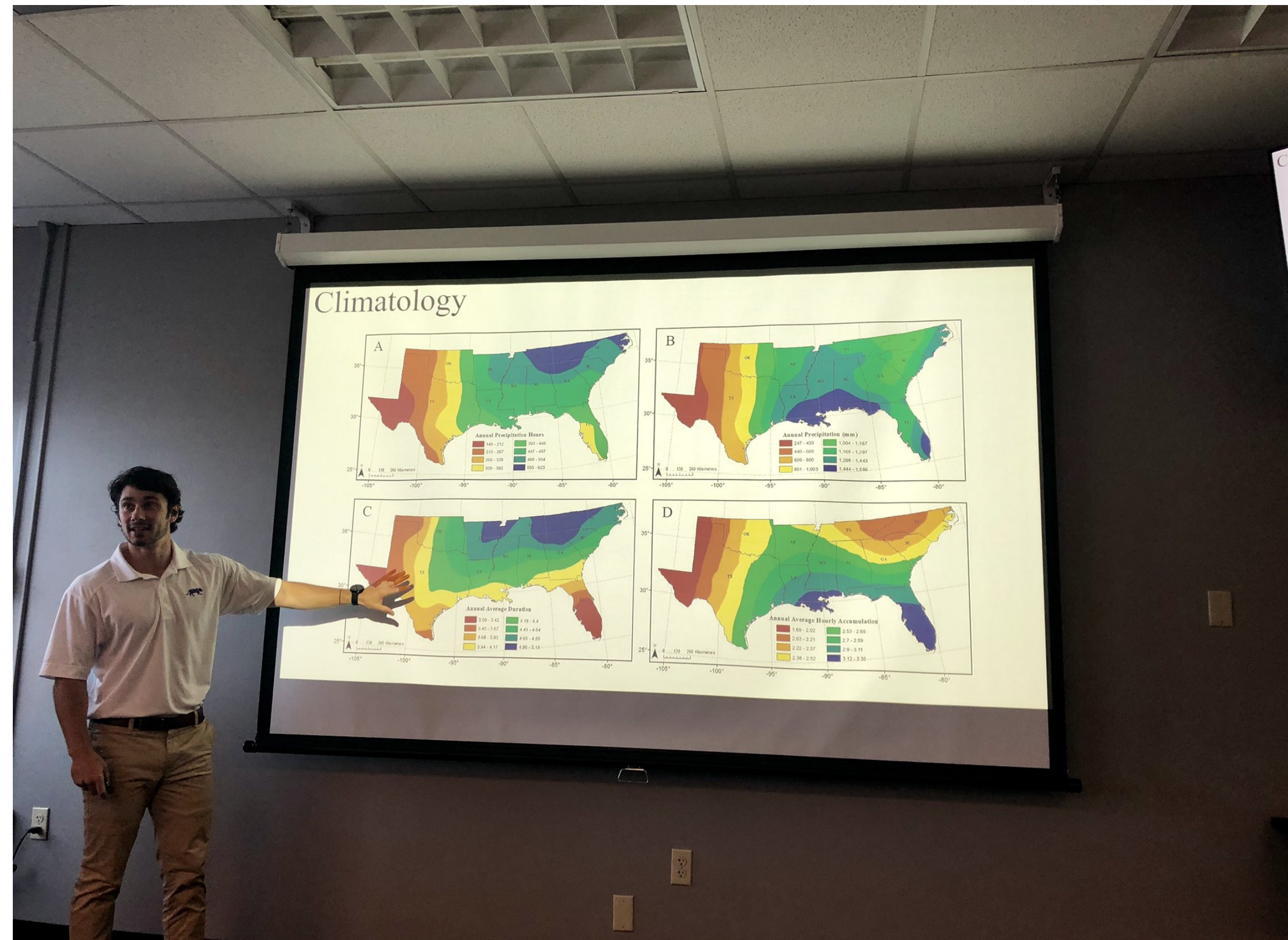
"Climate Change & Health." Class lecture (invited), Educational Health (EDU 311), University of Central Oklahoma, Edmond, OK, February 27, 2020 (Shafer).

"Jazz on Tulsa Time" Hurricane. Presented at the NSF-sponsored workshop at East Carolina University, Greenville, North Carolina, February 27, 2020 (Lyles and Pennell).



*Dr. Barry Keim gives an interview with the BBC World News regarding Hurricane Barry.*

# Outreach



SCIPP team members at LSU, Dr. Barry Keim and Dr. Vincent Brown, give presentations at the New Orleans Homeland Security and Emergency Preparedness Office.



Rachel Riley led a collaborative session with Danielle Barker (OK American Planning Association Chapter), Annie Vest (Meshek and Associates, LLC), and Danielle Semsrott (AR American Planning Association Chapter) at the American Planning Association Quad State Conference in Tulsa, Oklahoma in October 2019. The session was titled, *Helping Communities Become More Resilient to Climate Hazards*.

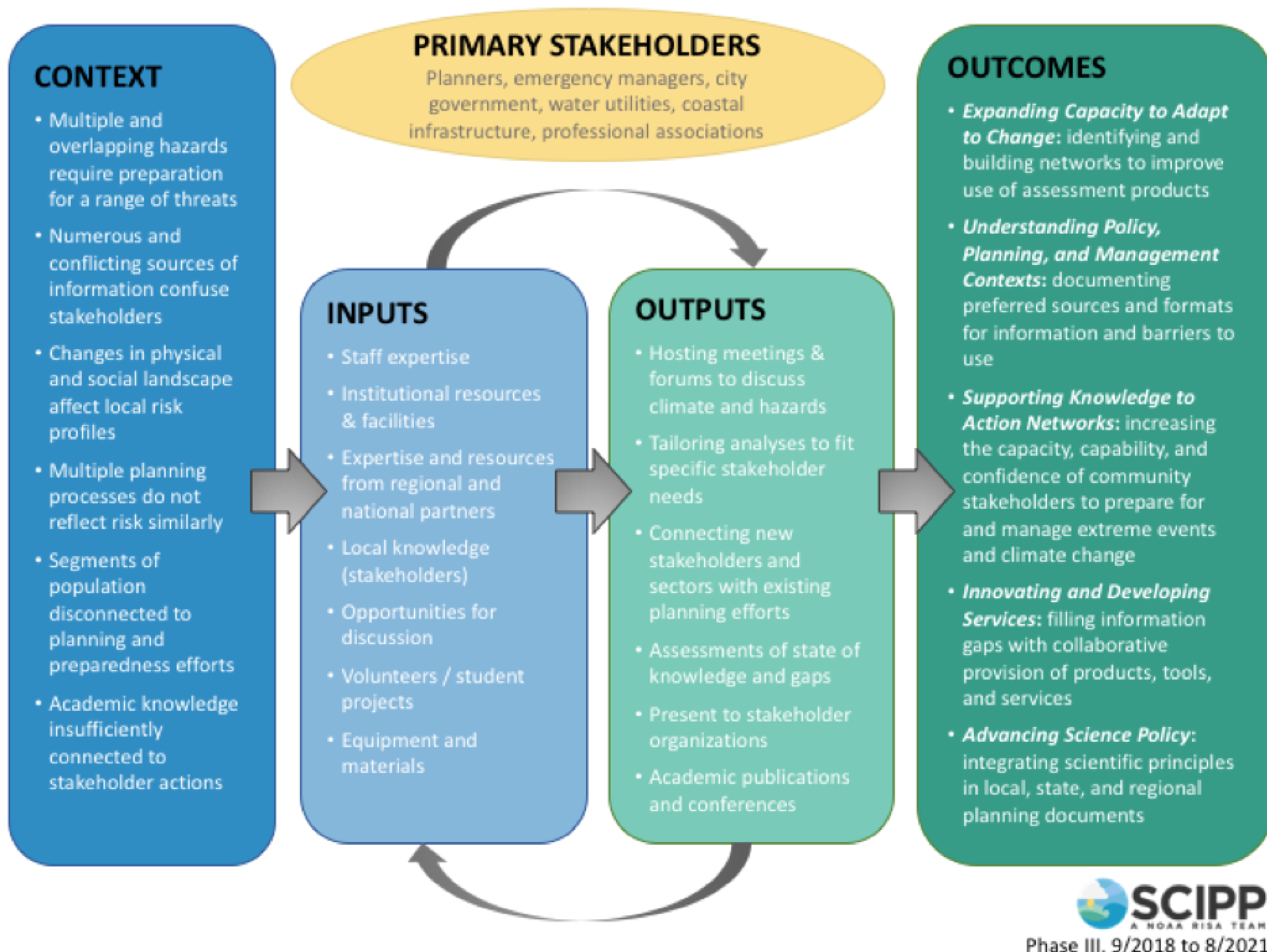
# Evaluation

Central to the RISA philosophy is connecting stakeholders with relevant and actionable climate information. However, on planning time scales, attributing specific sources of information to specific decisions and, especially, to overall outcomes is exceedingly difficult. Most use of information falls under the description of “enlightenment” – background information that forms the dialogue around actions, but interacts with a myriad of other sources and types of information such that decisions that are made can not be attributed to a specific study or actor.

For these reasons, SCIPP’s evaluation will focus on documenting the process used by stakeholders to learn the extent to which information from SCIPP and other climate services partners was considered in the process of formulating policies and strategies. Data will be collected via surveys/interviews with close stakeholders and with a random selection of other stakeholders. Questions will include frequency and modes of interaction with SCIPP, how well SCIPP was able to respond to their needs, how they used the information, and their interactions with other climate services partners.

In addition to external processes, how SCIPP handles requests for information, connects with other expertise, chooses projects to pursue, and disseminates results will be examined. Through examining internal processes, we anticipate that we will be able to document how new questions arise through stakeholder interactions, shifting national or regional priorities, or disasters or extreme events within the region. It will document the extent to which stakeholder interactions led to new questions and the role stakeholders had in designing the research questions, processes, products, and outcomes. It will also document questions which arose through interactions which SCIPP was not able to address and the disposition of those ideas (i.e., were they passed on to another entity that could work with the stakeholder).

SCIPP is coordinating this work with Susi Moser, who is conducting an evaluation of the RISA Program as a whole, and working with an internal consultant, Ionana Cionea (Associate Professor of Communications at OU) to conduct the surveys and interviews.



Action Logic Model showing how SCIPP plans to connect the regional context of hazards and planning processes with RISA desired outcomes. The arrows between inputs and outputs show that the two are connected through an iterative co-production process with stakeholders.

# Evidence of Societal Impact

## Crawfish and Climate Change

SCIPP researchers Vincent Brown and Barry Keim worked with the Louisiana Sea Grant (Dr. Mark Shirley - Marine Extension Agent and Louisiana AgCenter, and Dr. Charles G. Lutz - also with Sea Grant and LSU Ag Center) and the Department of Experimental Statistics at Louisiana State University (Dr. Brian D. Marx). Some crawfish data were received from crawfish farmers in St. Landry parish. The Louisiana Sea Grant Agents work closely with crawfish farmers who noticed year-to-year fluctuations in crawfish harvest yields with no apparent reason. The crawfish farmers assumed the weather was roughly similar but believed that weather conditions played a role.

The crawfish farmers contacted SCIPP and asked for assistance to help determine what weather variables significantly influenced harvests. Dr. Brown quality controlled their harvest data and then used statistical models to relate the harvest data to the weather conditions.



Six crawfish ponds used in the study.

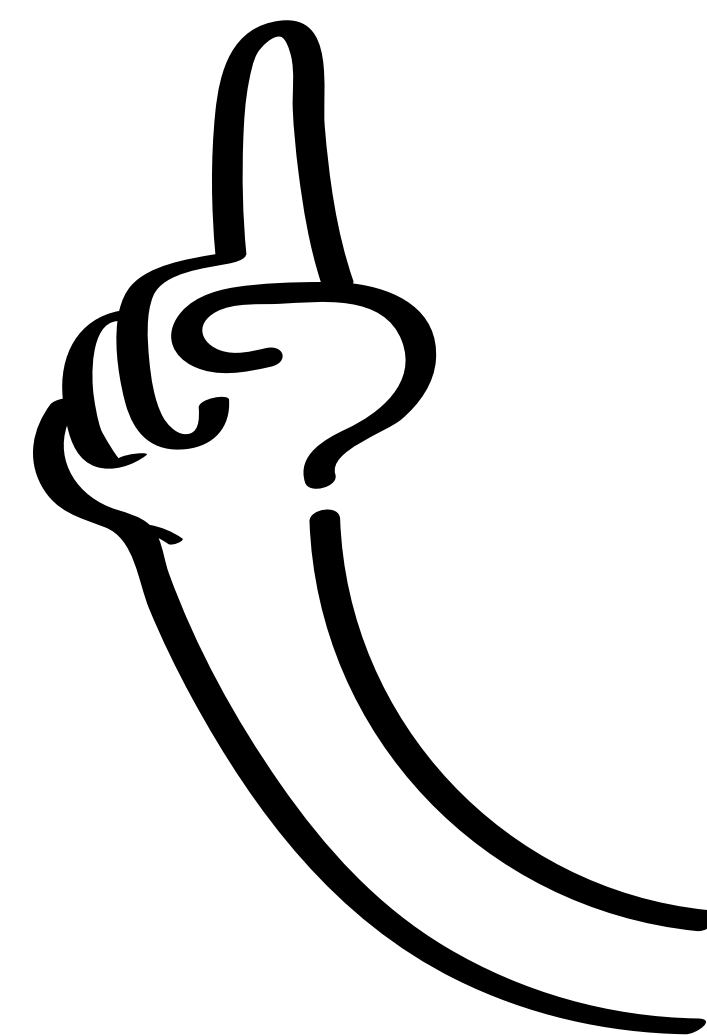
"The results from this study do benefit the crawfish farmers. Knowing how meteorological variables affect harvest can save farmers money, labor and time."

- Anonymous Reviewer of Manuscript

Dr. Brown found statistically significant relationships between precipitation, temperature, and other more complicated variables and crawfish harvests at various time steps (months). Farmers will use these initial results to test established best practices which may result in saving money on bait, labor, and time. For example, the best practices may suggest the number of days a farmer should harvest in a particular week within a month (say February). They might dedicate 4 days per week to harvesting in February, but if there were really unfavorable weather conditions (a month or two before harvests determined by our models) we can recommend that they only harvest 2-3 days per week, saving time, money, and effort.

A journal publication of this research is currently under review.

Farmers will use these initial results to test establish best practices which may result in saving money on bait, labor, and time.



# Next Steps

## Texas Resilience Conference

In Fall 2020 SCIPP will resume planning for the Texas Resilience Conference. SCIPP will work with the conference organizers and the steering committee to determine the best course of action moving forward, including whether to hold an in-person or virtual conference.

## Filling the Gaps: Climate and Weather Information for Small to Medium sized Water Utilities

NOAA is teaming up with SCIPP at LSU to host a 1-day regional meeting to assess and understand the information needs of small- to medium-scale water utilities, improve on existing tools, and build additional resources to meet water sector needs at different scales. The meeting will be on Monday, July 13th and be held virtually. It was originally scheduled for March 23rd as an in-person meeting but had to be postponed due to COVID-19.

The plan is for the workshop to include the following four major sections: 1) state of the science overview on climate, climate change, precipitation, modeling, and, 2) an overview of NOAA common tools such as NOAA Atlas 14, Climate Explorer, Water Resources Dashboard, QPF's, Tropical Weather Outlooks, 3) Setting the Stage: Water Utility perspective on climate and weather extremes where we hear directly from the utilities and then go into breakout groups to discuss, 4) Planning for resilience section, discuss how to plan for future events, best practices, limitations, etc. and then we again go into breakout groups to discuss.

## SURGEDAT

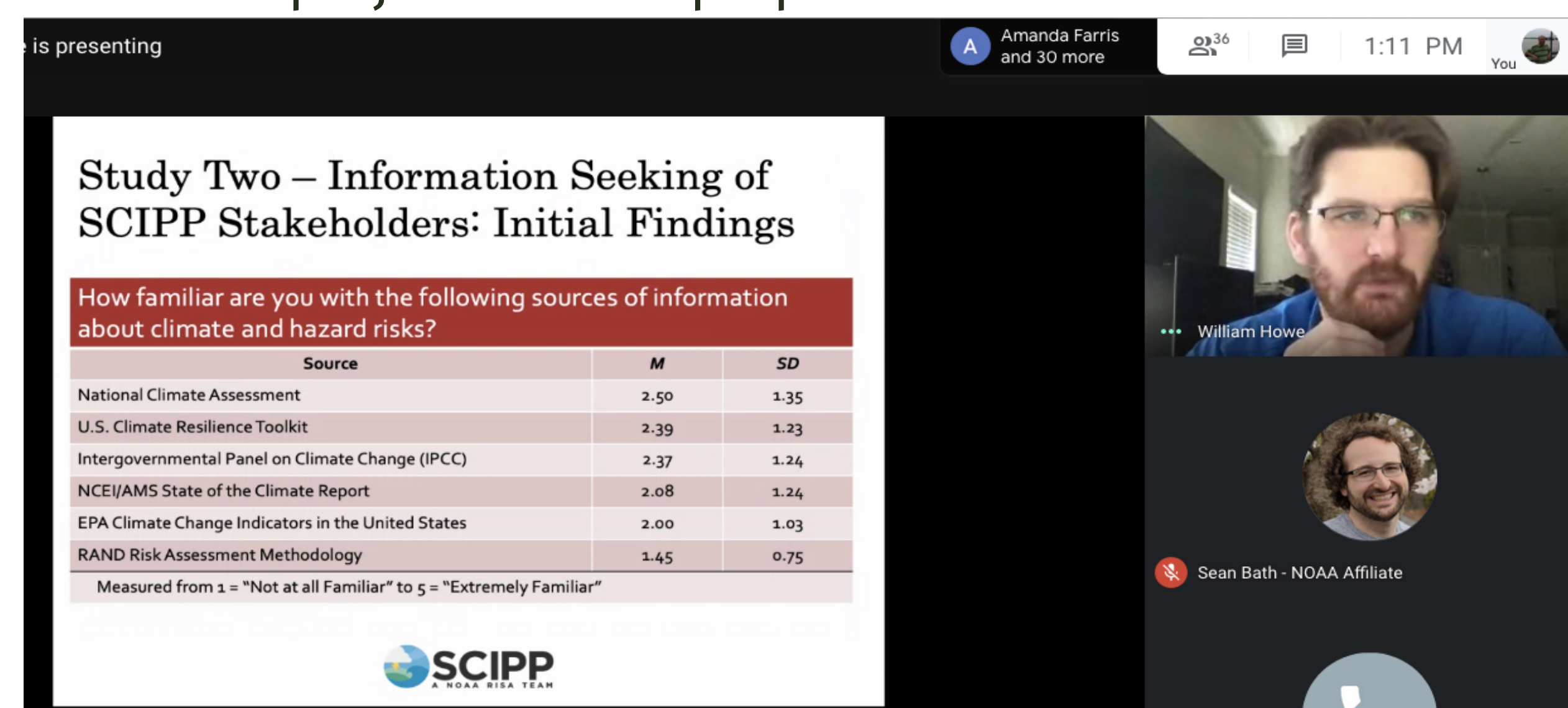
The SURGEDAT database serves as a focal point for continued outreach efforts. SCIPP has worked to expand the database, fill in missing and incomplete data, and develop a comprehensive metadata document. While continuing to upgrade and update the database, SCIPP has adjusted as much data as possible to a standard datum, e.g., the NAVD88.

Looking forward, once researchers construct a robust dataset suitable for analysis, SCIPP intends to develop location specific return frequencies of storm surge at multiple locations around the U.S. Gulf Coast. Researchers plan to work with Sea Grant Officials in all Gulf States to disseminate the information to stakeholders to help communities understand their risk and vulnerability to storm surge and inform the allocation of resources for adaptation and mitigation efforts. The goal is to complete the research paper and open the SURGEDAT database up to select users by September 2020.

## Stakeholder Network Analysis

The project seeks to improve connectivity between the National Climate Assessment (NCA) and stakeholders, allowing for bi-directional flow of information and application of state-of-knowledge practices and processes. This work extends ongoing efforts to identify organizations seeking climate information, interaction with professional associations to assess needs for climate information, and interaction with the broader network of Sustained Assessment Specialists and the NCA process. The goal is to increase the use of products from the NCA in the Southern Great Plains region and to provide information about sector concerns, needs, actions, and indicators of climate change to the NCA process. For assessment, a systematic analysis of information sources and uses is being conducted using a social network analysis of SCIPP stakeholders, organizations, and individuals relating to their use of climate information in planning and preparedness decisions.

The results of the network analysis will feed into ongoing Climate Assessment activities, including participating in regional, state, and local meetings; promoting opportunities to provide inputs or comments into the NCA process; leveraging SCIPP core activities to include discussion of climate assessment needs; and participating in regular calls with counterpart Sustained Assessment Specialists, RISA teams, and NCA staff. As analysis of the SCIPP stakeholder survey is completed, the resulting summary document will be shared with Sustained Assessment Specialists, NCA, RISA, and other climate services partners. Results from the network analysis will inform further engagement strategies by SCIPP. Academic publications resulting from both projects will be prepared over the remainder of 2020 and 2021.



*William Howe presenting the Stakeholder Network Analysis during the June 2020 Monthly RISA Call.*

# Narrative Case Studies

## Probable Maximum Precipitation

Barry Keim has played a key role in overseeing the development of new and improved Probable Maximum Precipitation (PMP) estimates for Louisiana, Mississippi, Arkansas, and Oklahoma conducted by Applied Weather Associates. PMP is defined as the extreme upper capacity of the atmosphere to produce rainfall if every worst case variable came together to produce the worst storm possible. These estimates were derived for durations from 1-hour to 120-hours and for area sizes of 1 square mile to 20,000 square miles. The express use of this information is for the design of dams and this will serve as the guiding document recognized by Federal Energy Regulatory Commission for the design of dams across the 4-state region. It is estimated that the economic impact of this study saved dam owners between \$50-100 million in design and remediation costs in the first year of the study alone. The complete study can be found at the following website:

<http://www.owrb.ok.gov/damsafety/pdf/2019RegionalPMPStudy.pdf>



The study is estimated

**TO SAVE**

*the four-state region mentioned above*

**\$50 — \$100**  
MILLION — MILLION

**IN DESIGN AND  
REMEDIATION  
COSTS IN THE  
FIRST YEAR  
ALONE**

## SCIPP contributes to adaptokc



The City of Oklahoma City, Oklahoma, has developed its first ever sustainability plan called adaptokc. SCIPP's Deputy Director Rachel Riley worked with the City's Sustainability Manager who is leading the planning process to provide text and an image about historical and projected extreme heat and heavy rainfall information that was accurate, relevant to the city, and would resonate with readers of the plan. Riley used information from the future trends sections of SCIPP's Simple Planning Tool for Oklahoma Climate Hazards along with the *Fourth National Climate Assessment* to help edit a portion of the draft plan. SCIPP's text and graphic suggestions contributed to the Urban Flooding and Extreme Heat sections of the plan.

adaptokc is the City of Oklahoma City's first sustainability plan. It has been adopted by the Oklahoma City Planning Commission and will be presented to the City Council in July 2020.

On June 11, 2020, adaptokc was unanimously adopted as an amendment to the city's comprehensive plan by the Oklahoma City Planning Commission. The plan will be presented to the City Council on July 7, 2020, with a request to receive the plan for implementation.

"The perspective and knowledge SCIPP provides are absolutely vital for our climate planning and adaptation efforts." - T.O. Bowman, City of Oklahoma City Sustainability Manager

## Project Objectives and Research Findings

Below is a list of our SCIPP Phase III Objectives and Research Questions with any relevant project updates to date.

### ***Assess changes in the frequency of events that may change hazard exposure profiles in communities within the region***

Investigators: Vincent Brown (LSU), Barry Keim (LSU), Amanda Lewis (LSU)

Changing precipitation characteristics, particularly at the hourly level, has been and remains a primary focus of SCIPP. We began by completing a pilot study using hourly data from four first-order stations across Louisiana (Brown et al. 2019a) and then expanded the study to cover the entire Southeast United States (Brown et al. 2019b). Results showed that the number of hours it rains annually did not change for a majority of the region from 1960-2017, excluding locations in Georgia and South Carolina, but overall hourly intensity increased for roughly half the stations, while the average duration of precipitation events decreased at ~80% of the stations. This demonstrates that hourly precipitation events, on average, have become shorter but slightly more intense across the region. Adding to this work, Brown et al. (2020a) found that dry spells were decreasing on average across the southern portion of the region and that the average amount of precipitation produced by a 90th percentile hourly event increased at ~36% of the stations, again highlighting that hourly precipitation has increased in intensity since 1960.

Papers are highlighted in the publications section, page 17.

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Investigators: Vincent Brown (LSU), Barry Keim (LSU), Amanda Lewis (LSU)

Another focal area for SCIPP is completing research on individual precipitation events that occur in our domain with Applied Weather Associates, one of SCIPP's stakeholders. We published Brown et al. (2020b) on the August 2016 south-central Louisiana flood event and a preliminary report summary of Hurricane Barry, explaining why the forecasted precipitation totals never came to fruition. Currently, we are planning to conduct a similar analysis as Brown et al. (2020b) but for Hurricane Harvey – one of the largest precipitation events in recorded history for our region. We also have two manuscripts that are undergoing revisions related to precipitation. First, on the effect of the El Niño Southern Oscillation on precipitation characteristics, and second, how precipitation and a suite of other meteorological variables influence crawfish harvest in southern Louisiana. As part of our mission, we frequently disseminate the research results at conferences and meetings or produce short information documents for our stakeholders. For example, the crawfish manuscript will be presented at a Louisiana Sea Grant meeting and disseminated to crawfish farmers in the region who can then send us their data for future collaboration.

Papers are highlighted in the publications section, page 17.

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### ***Improve the use of climate information, from sub-seasonal and seasonal forecasts to climate change projections, in planning processes***

Investigators: Ward Lyles and Penn Pennell (GRA) (KU), Rachel Riley (OU)

The first part of this objective begins to address the disconnects between planning and emergency management so long term disaster risk reduction is more likely. The following three research questions are being investigated.

1. Does a nationally acclaimed model local hazard mitigation effort fit the standard model of hazard mitigation?
2. How have the characteristics and roles of local champions and the relationships between them shaped a national model hazard mitigation effort?
3. How do multiple communities within a region compare in terms of the networks of plans and networks of champions?

RQ's 1 and 2 are being answered through an in-depth case study of Tulsa, Oklahoma. RQ 3 is being answered through a comparative case study analysis of six cities or counties (whichever relevant) within the SCIPP region (except for one) that have historically not paid much attention to climate change but have high hazard exposure: Amarillo (TX), Benton County (AR), Stillwater (OK), Tulsa (OK), Waco (TX), and Wichita (KS).



The localities were chosen to offer multiple layers of comparison: within and between states, within and between population sizes, and within and between participation in the most prominent incentive-based federal program for flood risk reduction: the Community Rating System run by the Federal Emergency Management Agency. For each locale, content analysis approaches were systematically applied to the flood-related plans focusing on land use policies, cross-referencing of other relevant plans, and stakeholder engagement in the plans. Semi-structured interviews were also conducted with key stakeholders, including emergency managers and planners, paying particular attention to the ‘soft skills’ like emotional and social intelligence that too often are ignored when investigating planning relationships. The analytical approach consisted of comparative case studies that identify the structure and quality of the relationships that make up the networks of plans, policies, and people.

The findings identify important commonalities across the cases, notably underwhelming levels of relationships among the plan documents and land use policies with each community. They also point to important variations as well, though, including some provocative dynamics responsible for the remarkable success in flood risk reduction over a multi-decadal time period of one locale in particular, Tulsa.

The findings reinforce and extend previous research that has shown fragmented and disconnected local risk-reduction networks and point to problems when planners play secondary roles to emergency managers in the realm of hazard mitigation (c.f. Lyles 2015). The scope of implications of this study extend from local planner behavior to federal policy, especially when considered in the context of the last two decades’ research on hazard mitigation and the growing attention to climate change.

In summary, Tulsa’s local hazard mitigation effort fits the national model (RQ1). Multiple champions, multiple leadership styles, and changing dynamics over time have been key to Tulsa’s success (RQ2). Further, planners, engineers and communicators have played more prominent roles in hazard risk reduction rather than emergency managers, who are typically thought of as the go-to official for the topic. Findings for RQ3 are not yet fully developed as interviews are ongoing with the cohort cities and are expected to be completed by May 2020. Plans for each of the communities/counties have already been content analyzed, however.

A manuscript is currently under review.

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## **An Evaluation of the Utility and Impact of a Stakeholder-Driven Local Climate Hazard Assessment Tool**

Investigator: Rachel Riley (OU)

Decision makers who have little to no formal training in atmospheric science are increasingly accessing and interpreting climate information within planning contexts. While information availability has greatly improved over the last decade, challenges can arise when decision makers use and interpret that information given the complex and nuanced nature of atmospheric data and climate model projections. Many climate data and information tools (i.e. decision support tools, DSTs) have been developed to support decision making across a variety of sectors and scales, but until recently little research has been conducted.

This study evaluated the utility and impact of a stakeholder-driven local climate hazard assessment tool, the Simple Planning Tool (SPT), a compilation tool that was inspired by and co-developed with planners, emergency managers and a boundary organization in two South Central U.S. states.

Data collection occurred in Spring 2019 and a manuscript is currently under review.

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## ***How is vulnerability along the western U.S. Gulf Coast changing in light of changes in frequency and intensity of coastal storms?***

Investigators: Amanda Lewis (LSU), Vincent Brown (LSU), Barry Keim (LSU)

SURGEDAT project description and current updates are described in the Next Steps section, page 12.

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Investigators: Ashley Autore (LSU), Barry Keim (LSU)

Ms. Autore focused her research on sea level rise along the Gulf coast. She analyzed hundreds of papers about sea level rise in the Gulf, as well as globally, including its implications, past trends, and future outlook. Using these papers, she put together the first draft of a review paper that emphasizes how sea level rise is affecting the Gulf Coast’s environment, cities, and existence. Overall, she found that the Gulf Coast is highly vulnerable to being inundated and lost, due to land subsidence and the rate at which the Gulf is rising. Aside from this research, she also helped SCIPP obtain contact information for water utility and emergency management employees.

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## ***Compare perceptions of risk related to flooding from hurricane storm surge and flooding from inland rainfall***

Ms. Roberts' capstone project can be considered a pilot study that could be expanded at some later date with a qualified student. The work already completed was exemplary for an undergraduate student and comparable in quality to many Masters theses. In lieu of expansion of this work, the SCIPP report could be transformed into a journal manuscript.

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## ***Assess how climate information is used and accessed by stakeholders within the region and identify how it can be applied to climate adaptation and planning efforts***

Investigators: William Howe (OU), Mark Shafer (OU), Aimee Franklin (OU)

Project description and current findings are described in the Next Steps section, page 12.

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## ***Create a map of a regional knowledge management network related to the management and distribution of information used for climate adaptation***

Investigators: William Howe (OU), Mark Shafer (OU), Aimee Franklin (OU)

Project description and current findings are described in the Next Steps section, page 12.

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## ***Assess gaps in research, products, and services applied to sector needs***

Investigators: Mark Shafer (OU), Mike Hayes (Nebraska)

SCIPP will create working groups to review relevant science to connect with sector needs and identify gaps in research, products, and services. Each working group will include a balance of expertise between those conducting research in the area and those tasked with management responsibilities. This assures a direct connection between research and decision maker needs.

From ongoing, previously-funded drought work, SCIPP PI is prototyping the process with a regional view of drought management strategies in the Southern Plains. Background materials have been prepared and working group members identified for invitations. The invitations and a background questionnaire should go out in Summer 2020 and a report developed in Fall 2020. This will serve as a template for applying the process to other subject areas.

SCIPP is in the initial stages. The prototype was intended to be accomplished in Year 1 but was delayed. When the prototype is completed, an additional (remote) process can be started with another subject area, with the topic dependent upon regional stakeholder needs.

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## ***Identify types of information needed from seasonal to sub-seasonal forecasts***

Investigators: Mark Shafer (OU), Margret Boone (OU)

This project was designed to engage stakeholders via focus groups and small meetings to examine the utility of S2S products and desired features for future development. It was written anticipating opportunities for leveraged funding. However, since NOAA moved S2S outside of CPO, we have not yet been able to obtain funding to pursue this project.

SCIPP did conduct a national survey on the use of Climate Prediction Center products that included questions on S2S products needs and decisions. The online survey was distributed nationally via National Weather Service offices. Although it only produced a small (not statistically significant) sample, the responses were aggregated and provided to CPC.

# Full Publication List

The most significant publications include a brief summary.

Bartels, R.J., A.W. Black, and B.D. Keim. 2020. Trends in Precipitation Days in the United States. *International Journal of Climatology*, 40(2):1038-1048. <https://doi.org/10.1002/joc.6254>

Brown, V.M., B.D. Keim. 2019. Preliminary Report Summary of Hurricane Barry: July 10–17, 2019. Southern Climate Impacts Planning Program. [http://www.southernclimate.org/documents/Final\\_Barry.df](http://www.southernclimate.org/documents/Final_Barry.df)

Brown, V.M., A. Black, and B.D. Keim, 2019a. Hourly Rainfall Climatology of Louisiana. *Theoretical and Applied Climatology*, 137(3-4):2011-2027.

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Brown, V.M., B.D. Keim, and A. Black, 2019b. Climatology and Trends in Hourly Precipitation for the Southeast United States. *Journal of Hydrometeorology*, 20(8):1737-1755.

*This research introduces a climatology of hourly precipitation characteristics, investigates trends in precipitation hours (PH) and hourly accumulation, and uses four different time series to determine if precipitation intensity is changing across the southeastern United States from 1960-2017. Results indicate hourly intensity significantly increased at 44% (22/50) of the stations, accompanied by an increase in average hourly accumulation at 40% of the sites analyzed (20/50). Geographically, heavy hourly events are more frequent along the Gulf Coast and decrease inland.*

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Brown, V.M., B.D. Keim, and A. Black, 2020a. Trend Analysis of Multiple Extreme Hourly Precipitation Time Series in the Southeast United States. *Journal of Applied Meteorology and Climatology*, 59:427-442.

*Annual trends in extreme hourly precipitation time series were examined at 50 first-order weather stations across the southeastern United States from 1960 -2017. Results indicated that the magnitude of annual maximum 1-, 3-, 6-, 12-, and 18-h periods did not broadly change at the sites analyzed; however, the numerical value that defines a (station specific) 90th-percentile hourly accumulation significantly ( $p \leq 0.05$ ) increased at 36% (18/50) of the stations. Six stations across Georgia showed significant decreasing trends in the annual maximum consecutive hourly period with measurable precipitation (duration), demonstrating that the longest precipitation events that occurred at these stations have decreased in duration since 1960.*

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Brown, V.M., Keim, B.D., Kappel, W.D., Hultstrand, D.M., Peyrefitte, A.G., Black, A. W., Steinbilber, K. M., and Muhlestein, G.A. 2020b. How Rare was the August 2016 South-Central Louisiana Heavy Rainfall Event? *Journal of Hydrometeorology*, 21:773-790.

Eachus, J.D., and B.D. Keim. 2019. A Survey for Weather Communicators: Twitter Information Channel Preferences. *Weather, Climate, and Society*, 11(3):595-607.

Eachus, J.D., and B.D. Keim. 2020. Content Driving Exposure and Attention to Tweets during Local, High-Impact Weather Events. *Natural Hazards*, <https://doi.org/10.1007/s11069-020-04078-6>

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Grecni, Z., L. Shore, and B. Duncan, 2019. Learning from Success in Climate-Informed Decision-Making: Case Studies Across Three U.S. Regions. Honolulu: East-West Center. 34 pp. Available at <https://www.eastwestcenter.org/climate-case-studies>.

*A network of sustained assessment specialists created within the National Oceanic and Atmospheric Administration's Regional Integrated Sciences and Assessments (NOAA RISA) program present five case studies of successful local responses to climate change that are supported by scientific information. Based in three regions—the U.S. Pacific Islands, the South Central United States, and the Rocky Mountain West—the case studies in this report feature local managers who are providing and applying climate information, with valuable outcomes, across a range of geographic scales and sectors. They include improving local climate-adaptation efforts in San Angelo, Texas, enhancing the resilience of iconic coastal ecosystems on Hawai'i Island, managing water in the Colorado River Conservation District, increasing conservation resilience in the southern Great Plains, and using El Niño forecasts to plan for drought in the Pacific Islands. The case studies provide new insights, which are summarized as five practical lessons for anyone seeking to better integrate climate considerations into decision-making.*

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Reilly, A., J. Anderson, B.D. Keim, D.T. Thompson. 2019. Distribution of Extreme Heat Days across Louisiana. In *Louisiana Morbidity Report* (1st ed., vol. 1, pp. 1-5). New Orleans, LA: Louisiana Department of Health. [http://ldh.la.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/LMR/Newsletter/2019/November2019\\_FINAL.pdf](http://ldh.la.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/LMR/Newsletter/2019/November2019_FINAL.pdf)

Roberts, McKenzie, 2019. The Social and Scientific Misconception of Floodplains: An Integrated Look into the Re-evaluation of the “100-year” and “500-year” Flood Determinants. Southern Climate Impacts Planning Program, 31pp. [Available online at [http://www.southernclimate.org/documents/Floodplains\\_Misconceptions.pdf](http://www.southernclimate.org/documents/Floodplains_Misconceptions.pdf)].

