Southern Climate Impacts Planning Program (SCIPP)

Annual Report

for

August 1, 2008 – April 30, 2009

Report Contents

1. SCIPP Project Team

The SCIPP project team consists of the following members from the University of Oklahoma (OU) and Louisiana State University (LSU):

Principal Investigators
Mark Shafer (PI) and Barry Keim (Co-PI)

Co-Investigators
David Brown (LSU), Ken Crawford (OU), Peter Lamb (OU), Mark Meo (OU), Dan O'Hair (OU), Kevin Robbins (LSU), and May Yuan (OU)

Program Managers
James Hocker (OU) and Lynne Carter (LSU, beginning Apr 2009)

Research and Support Staff
Stdrovia Blackburn (OU), Kyle Brehe (LSU), David Demko (OU), Russ Frith (LSU), Gary McManus (OU), Billy McPherson (OU), Luigi Romolo (LSU), David Sathiaraj (LSU), and Himanshu Shrivastava (OU)

Graduate Students
Heather Campbell (OU), Somer Erickson (OU), Hal Needham (LSU), Michael Roberts (LSU), Amanda Schroeder (OU), Wanyun Shao (LSU), and Anna Trevino (LSU)

Affiliates
Carol Silva (OU) and Suzanne Van Cooten (OU, National Severe Storms Lab)

2. Primary Stakeholders and Partners

- Center for Risk and Crisis Management, Community Advisory Board
- Federal Emergency Management Agency
- ICLEI – Local Governments for Sustainability
- National Drought Mitigation Center
- Oklahoma Department of Emergency Management
- Oklahoma State Hazard Mitigation Team
- Oklahoma Water Resources Board
- Tulsa Partners
- United States Climate Change Science Policy
- United States Fish and Wildlife Service
- Western States Water Council

3. Current Areas of Focus

The primary focus areas of SCIPP span seven themes, as outlined in the SCIPP proposal document. These areas include the operation of the core office as well as six research elements which are identified in the timeline below:

		YEAR				
Project	**Lead(s)**	**1**	**2**	**3**	**4**	**5**
Operation of Core Office -Task 1: Hire Program Manager -Task 2: Monitor and revise project schedule -Task 3: Stakeholder Services Committee meetings -Task 4: Website, Newsletter & Products -Task 5: Contacts database	Shafer					
Element I: Integrated Extreme Events Database -Task 1: assemble information -Task 2: reconcile & review -Task 3: integrate into ACIS -Task 4: reporting capability / add events -Task 5: evaluation and revision	Robbins, Crawford					
Element II: Climate risk assessments -Task 1: integrate existing maps -Task 2: create drought risk maps -Task 3: create severe risk maps -Task 4: create maps for 2020, 2050 & 2100 -Task 5: integrate demographic information -Task 6: evaluation and revision	Lamb, Keim					
Element III: Climate Risk WebGIS -Task 1: Data integration & database -Task 2: spatiotemporal analysis & modeling -Task 3: assessment of community needs -Task 4: evaluation and revision	Yuan, Brown					
Element IV: Community Engagement -Task 1: select pilot communities -Task 2: determine community metrics -Task 3: conduct community assessments -Task 4: revise information & products	Meo, Brown					
Element V: Education & Outreach -Task 1a: develop outreach materials -Task 1b: distribute outreach materials -Task 2: conduct awareness survey -Task 3: regional workshops	O'Hair, Keim					
Element VI: NIDIS Pilot Project -Task 1: Drought communication model – OK, MO -Task 2: Replicate model in other states -Task 3: Introduce Portal through intermediaries -Task 4: Import drought products from others	Shafer					

Table 1. SCIPP project timeline.

A. Operation of the Core Office

- Year 1 activities of SCIPP have focused significantly on the establishment of the core office staff on both the University of Oklahoma and the Louisiana State University campuses along with related management and start-up activities.

- The SCIPP program manager on the OU campus (Mr. James Hocker) was hired on September 1, 2008 and full operation of the core office began. The SCIPP program manager on the LSU campus (Dr. Lynne Carter) was hired on April 20, 2009. Dr. Barry Keim served as the interim program manager on the LSU campus prior to the hiring of the full time LSU program manager.

- In October 2008, the OU team traveled to Baton Rouge, LA where a SCIPP kick-off meeting was held on October 17, 2008. Beginning in November of 2008, monthly SCIPP PI conference calls were established to facilitate communication between campuses and coordinate both short-term and long-term program tasks. In addition, SCIPP subgroups were developed to establish routine communications on particular program components in greater detail. Beginning in January 2009 a data & products group was initiated and additional groups are in development including a stakeholder engagement subgroup and graduate student subgroup.

- In addition to the establishment of inter-campus communications, primary responsibilities of the SCIPP core office staff in Year 1 focused on the development of a program webpage (www.southernclimate.org), the establishment of a 15-member Stakeholder Services Committee, initial product development, as well as organizing and co-hosting the 7th annual Climate Prediction Applications Science Workshop (CPASW). For more details on these activities please see the program highlights shown in Section 4.

- Additional Year 1 operations for the core office included the oversight of seven new graduate student research projects.

B. Element 1 – Integrated Extreme Events Database

- The focus of work on Element 1 during Year 1 has been predominantly on the assembly and integration of various extreme event data sources into a single, common database. Data sources that have been acquired to date include the storm report database from the National Climatic Data Center and the Storm Prediction Center (SPC), drought intensity levels from the Drought Mitigation Center, and tropical cyclone tracks from the National Hurricane Center. For an example of the developing database, see section 4e.

- Further work is currently underway between SCIPP staff and our NOAA partners at the SPC to incorporate several additional storm-related datasets including historical watch-box and convective storm outlook information.

- The Extreme Events database will support future web services and product development (Element 2) as well as climate risk-related research (Elements 2 and 3).

C. Element 2 – Climate Risk Assessments

- Initial emphasis on Element 2 during Year 1 has focused on the transition of a set of experimental drought risk monitoring tools from Oklahoma's state climate office to the Southern Regional Climate Center. These information products will be made available through the SCIPP webpage in the products section. Further plans are in development to add a geographical component to these information tools.

- Some effort is already underway with climate change scenarios along the Gulf Coast. Over the empirical record since 1919, there was an increase in rainfall, and that combined with relatively cool temperatures, led to a 36 percent increase in runoff across the north central Gulf Coast. To assess future extremes in regional hydroclimatology, the A1B and B1 emission scenarios were examined for the region. Output from an ensemble of 21 regional climate models run with the two emission scenarios indicates a wide range of possible climates out to the year 2050, but the models agree to a warmer Gulf Coast region of about 1.5°C ± 1°C. Precipitation projections are more varied, but the models lean slightly toward a decrease in annual rainfall across the Gulf Coast. However, by compounding changing precipitation with increasing temperatures, overall runoff is likely to remain the same or decrease, while deficits (or droughts) are more likely to become more severe. The plan is to continue this research by analyzing the worst-case scenarios, and then to potentially expand the study to the entire SCIPP region.

- Much of the future work on Element 2 will be derived from various data sources present in the Extreme Events Database, especially for the development of historical risk maps.

D. Element 3 – Climate Risk WebGIS

- Year 1 emphasis has been centered on the integration of climate hazard data sources into the Extreme Events database. See section 4e for more information. More focused GIS work on this element will not occur until Years 2 and 3.

E. Element 4 – Community Engagement

- Preliminary community engagement focus during Year 1 of SCIPP has concentrated on developing and selecting a wide-ranging set of candidate stakeholder communities that SCIPP will engage throughout the course of the 5-year program. The communities under consideration span the 6-state study region and are required to include a range of sizes, information needs, and vulnerabilities to various climate-related risks. For more details on the selection of candidate cities see section 4f.

- Focus in future years will shift towards actively engaging the selected stakeholder communities in forms such as assessing climate hazards needs, evaluating climate literacy, and providing education and outreach. This engagement will improve SCIPP product development and allow the program's research goals to evolve based on user needs.

F. Element 5 – Education and Outreach

- Year 1 progress on Element 5 has focused on the initial development of a regional awareness survey that will be tested and distributed across the SCIPP region during Year 2 of the program. A development team has been established to collaboratively develop the survey; the team consists of SCIPP members, survey development experts, and specialists in hazard planning and emergency management.

- The baseline survey will evaluate the current knowledge level of various local-level decision makers (such as emergency managers, community planners, risk management planning groups, NGOs, insurance community, local emergency planning committees, etc.) particularly regarding natural hazards risks, communication, climate, climate variability and change, sources of climate information, and other related topics. The survey will be repeated in Year 5 of SCIPP to evaluate the effectiveness of the climate information tools and outreach/education provided throughout the course of SCIPP.

- In addition to the awareness survey, future focus on Element 5 will center on developing outreach and educational materials, particularly through the new SCIPP webpage.

G. Element 6 – NIDIS Pilot Project and Coping with Drought

- Initial focus on the Coping with Drought element was on conducting a baseline assessment of drought awareness, monitoring practices and communication in Oklahoma and Missouri. This will, in part, inform future development of the planned NIDIS pilot project in the region. The project consists of interviews with officials in state agencies and a survey of county-level officials who are likely to be affected by drought. The latter includes agricultural management (Farm Services Agency, Natural Resources Conservation Service, Cooperative Extension), water district managers, and emergency managers. As of April 2009, interviews in Oklahoma and Missouri had been conducted and analysis was ongoing. The survey is under development with an expected distribution during summer 2009. Both the interview guide and survey were developed with guidance from the National Drought Mitigation Center (NDMC).

- SCIPP collaboration with NDMC led to a coping with drought proposal to apply the interview and survey developed for the NIDIS pilot baseline assessment to Mississippi. Early scoping of potential NIDIS pilots by the NIDIS Implementation Team included a possible pilot in Mississippi to examine how an underserved state accesses and uses drought information. The proposed project would fulfill this need to examine how NIDIS could effectively serve locations that do not have such well-developed monitoring and social networks.

- A SCIPP student, Heather Campbell, will serve a summer internship with the Western States Water Council to help them finalize a contract with the Western Governors' Association related to implementation of NIDIS. The work likely will involve some recommendations relating to development of a national climate service.

4. Research, Stakeholder Collaboration, and Tool Development Highlights

A. CPAS Workshop

- Through collaboration with NOAA's National Weather Service Climate Services Division, SCIPP hosted the 7th annual Climate Prediction Applications Science Workshop (CPASW) March 24-27, 2009 at the National Weather Center in Norman, OK. The workshop brought together 80 climate-focused researchers, scientists, and students to discuss the latest work in the area of climate predictions applications.

- SCIPP staff took a lead role in organizing the 3.5 day workshop, including schedule development, facility arrangements, food and local transportation logistics, website development and maintenance, coordination with session moderators and presenters, and registration management.

- Sessions were organized to communicate the latest in research findings as well as encourage open discussion on a number of topics. Sessions included the following: stakeholder evaluation of climate products and services, drought monitoring and tools, water issues, agricultural applications, regional climate modeling applications, extreme events and severe weather applications, international climate applications, poster session, products and tools, stakeholder perspective of climate services, fostering collaboration in decision support tool development, and adaptation.

- All information pertaining to CPASW 2009, including all presentation files and recordings are available through the workshop webpage at the following address: http://climate.ok.gov/cpasw/.

B. SCIPP Webpage

- Version 1.0 of the SCIPP webpage was officially launched on March 18, 2009 and is available at www.southernclimate.org and www.scipprisa.org.

- Current webpage content includes information about SCIPP, the team, research focuses, publications, a live RSS feed from FEMA on natural disaster declarations, and calendar of events.

- Current content under development includes the Data Products section which will highlight various experimental and operational products that will be developed and evaluated through stakeholder engagement and expressed needs. Additional content that will be added with time includes a routine SCIPP newsletter and an educational component to the webpage.

C. Stakeholder Services Committee Development

- A key component of SCIPP is the presence of a multi-disciplinary 15-member Stakeholder Services Committee which reviews SCIPP's engagement of stakeholder groups and pilot communities to gauge the effectiveness of the past year's activities. In addition, the committee also reviews the progress and current direction of SCIPP research goals and provides recommendations and counsel.

- As of late April 2009, 10 of 15 committee member positions have been filled, with the final 5 in process. The committee is composed of climate, scientific, and hazards-related experts from across the country, as detailed in Table 2 below.

Committee Member	SCIPP State	Organization	Expertise
Gregg Garfin	Outside SCIPP	RISA (CLIMAS), University of Arizona	Climate adaptation and communication
Marilu Hastings	Texas	Houston Advanced Research Center	Climate change mitigation policy
Michael Hayes	Outside SCIPP	National Drought Mitigation Center	Drought preparedness
William Hooke	Outside SCIPP	American Meteorological Society	Science policy
Kelly Hurt	Oklahoma	Chickasaw Enterprises	Environmental science
Rebecca Jennings	Outside SCIPP	Federal Emergency Management Agency	Hurricane planning
Shirley Laska	Louisiana	University of New Orleans	Environmental sociology
Putnam Reiter	Oklahoma	OK Dept. of Emergency Management	State EM
Russell Vose	Outside SCIPP	National Climatic Data Center	Climate; data
Thomas Wilbanks	Tennessee	Oak Ridge National Lab	Energy and environmental policy

Table 2. SCIPP Stakeholder Services Committee.

- The final five committee members are being drawn from within the SCIPP 6-state region and will likely include several members involved in local and community level decision making processes. Each SCIPP state will have at least one representative (and no more than 2 per state) thus establishing a majority influence from within the region.

- The committee provides their review and evaluation of the program through an annual 1-day committee meeting held within the SCIPP region, with a different state hosting the meeting each year. Plans are being developed for the Year 1 meeting which will be held in Norman, Oklahoma at the National Weather Center on June 19, 2009. Several agenda items for the June 2009 meeting include the selection of SCIPP pilot communities, review of the regional hazard awareness survey, review of Year 1 activities, and recommendations for any unfilled committee positions.

D. Applied Research

The following applied research projects are underway by members of the SCIPP team:

- **A Climatology of Protracted Periods of No Rain in Louisiana** (Roberts, Keim)

  This project is centered on an analysis of dry day frequencies across Louisiana, with the goal of informing decision-makers regarding the spatial and temporal patterns of drought events in the state. Twenty-nine stations have been selected for an analysis that covers the period 1931-2008. Included among the specific objectives are: the identification of the average length of time between rain events; an analysis of trends in the average length of consecutive dry days over time; and the production of return periods of 15-, 20-, 25-, and 30-day dry periods at each station.

- **A Quantitative Description of the Urban Heat Island in Oklahoma City** (Schroeder, Crawford, Shafer)

  The primary research thrust of this project is to examine the magnitude and circumstances under which strong urban heat islands develop and dissipate in Oklahoma City, OK using data from the newly established Oklahoma City Micronet (OKCnet) during the warm seasons of 2008 and 2009. Research during year 1 has centered on quantifying past temperature trends near Oklahoma City utilizing COOP data for a 54-year period. Future work focuses on utilizing the higher resolution OKCnet data to further investigate the urban heat island effect at finer spatial and temporal scales.

- **Calculating Storm Surge Return Periods Along the Gulf of Mexico** (Needham, Keim)

  During the past year, significant storm surge-level database development was undertaken in support of this project. Datasets obtained and processed include annual high-water data for 54 USGS coastal water gages and 14 NOAA tide gages. All water gages are located along the Gulf of Mexico and consist of at least 30 years of annual data. Initial analysis of the database has identified 80 Gulf of Mexico storm surges of at least 4 feet from the

years 1880-2008. The majority of large surges occur in the western Gulf of Mexico, as 20 of the 25 largest surges were observed along the coast of Texas, Louisiana or Mississippi.

- **Developing an Urban Drought-Mitigation Plan in the South-Central U.S.** (Shao, Keim)

  The goal of this project is the identification and enhancement of drought planning process, policy analysis, and assessment in the south-central United States. Much of the past year's work has focused on the development of a literature review of drought; namely, its definition (by scientists and policymakers), spatial characteristics and patterns across the contiguous United States; and existing mitigation efforts and programs at the national and state levels. This qualitative background review is being augmented by a quantitative analysis of drought planning, utilizing tools such as multiple regression and factor, cluster, and discriminant analysis.

- **Drought Management in Oklahoma and Missouri** (Campbell, Shafer, Crawford)

  The goal of this project is to identify and document the different tools and strategies used in Oklahoma and Missouri to monitor and communicate drought information to affected constituencies. This past year the state drought plans for Oklahoma and Missouri were reviewed and compared to determine policy theories and frameworks that went into the creation of each state's plan. Three individuals who helped to develop the state drought plan or who work with drought information at the state level were interviewed. Future work will focus on identifying networks of communication at a more localized level. This will include interviewing people in charge of extension offices or local emergency management offices. The goal of this stage is to map out communication networks and determine where each person gets all of their drought information.

- **Emergency Managers: Weather Communication and Training** (Erickson, Shafer)

  This research project allows for the opportunity to work with and train local officials to enhance their knowledge base for a better understanding of weather information products and how they can be utilized. The goal is to identify needed training and aid in a more rounded comprehension and understanding of how to utilize or enhance existing products or create new ones in order to aid in the emergency management cycle of mitigation, preparation, response, and recovery. Through this study, the hope is to build a unique program of training and outreach that will enhance the ability to communicate weather information to emergency managers.

- **Influence of Atlantic Basin Tropical Cyclones on the U.S. Gulf Coast** (Nogueira, Keim, Brown)

  The contribution of Atlantic basin tropical storms and hurricanes to the monthly and seasonal rainfall climatology of the Gulf Coast and eastern U.S. seaboard has been one of the foci of this project over the past year. Elements of this study include: a GIS-based spatial analysis of tropical cyclone influence on rainfall totals; the characterization of

tropical cyclone variability on inter-annual to decadal timescales; and the identification of linkages between Atlantic basin tropical variability and climate teleconnections such as ENSO and AMO. This project is part of a broader research agenda related to SCIPP centered on Atlantic basin tropical impacts and vulnerability in the Gulf Coast region.

- **Urban Impacts on Rainfall Patterns in the South-Central United States** (Trevino, Brown)

  The central research question for this project is: How does the urban signal on precipitation vary between cities in the south-central United States? The research is being undertaken around three objectives: first, the determination of cities for analysis and the identification of urban precipitation signals; second, the characterization of rainfall patterns within and around these urban areas as a function of storm movement; and third, a synoptic analysis of atmospheric mechanisms responsible for enhancing or diminishing the urban precipitation signal. During the past year, a general methodology for these three objectives has been developed, along with an extensive literature review on urban impacts on precipitation. Results from a pilot study in the Dallas/Fort Worth region were also presented at a national conference.

E. GIS Extreme Events Database

- A preliminary version of the GIS Extreme Events Database has been developed through Year 1 of the program. The goal of the database is to pull together historical data on weather and climate-related hazards including severe storm reports, drought conditions, tropical cyclone tracks, and additional datasets that will be added with time. By grouping various climate hazard databases into a common database it will be possible to provide our stakeholders and data users with future products and tools that present information in a multi-hazard context.

- Figures 1 and 2 illustrate a functional example of the GIS Extreme Events Database. Future developments include the addition of other data sources, downloadable information, and web services powered by the extreme events database.

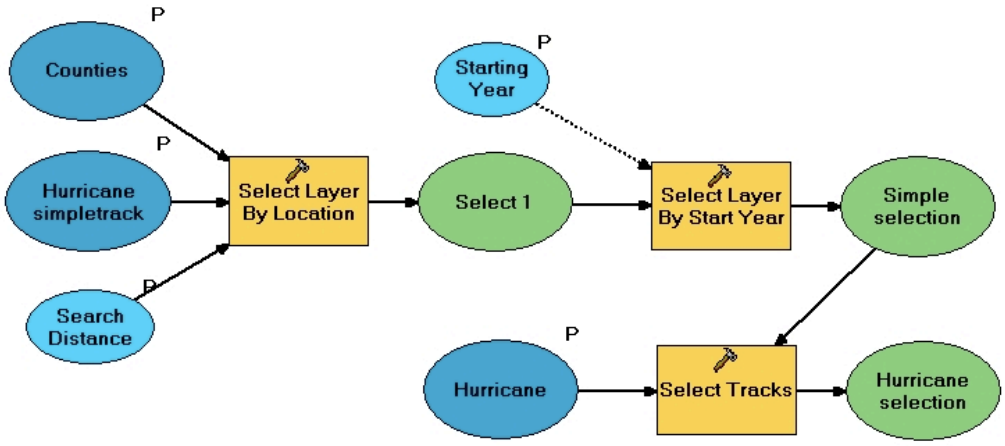

Figure 1. GIS model used to query tropical cyclone tracks based on user input.

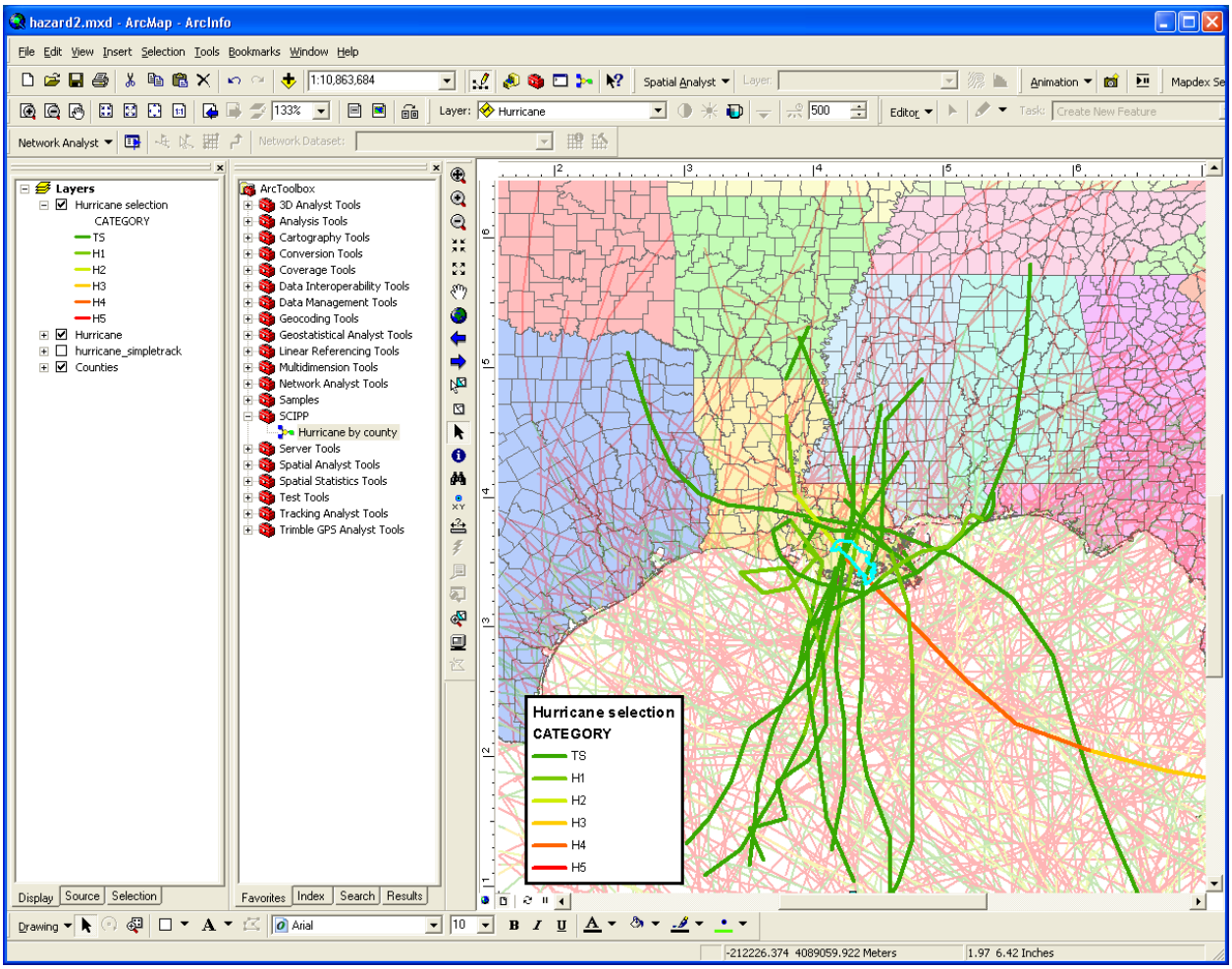

Figure 2. Tropical cyclone tracks (heavy lines) passing within 25 miles of Lafourche Parish, Louisiana (1950 to end of database) as selected using the GIS model shown in Fig. 1.

- Web services utilizing the Extreme Events Database will equip climate data users and city planners with easy-to-use tools to quantify past climate hazards for a wide variety of applications.

F. SCIPP Pilot Community Selection

- With SCIPP responsible for a significant geographic domain that spans Oklahoma, Texas, Louisiana, Arkansas, Tennessee, and Mississippi, a key Year 1 task has focused on the identification of a representative collection of pilot engagement communities across the region. These communities will serve as one of SCIPP's primary means of engaging its stakeholders in a systematic and routine fashion. Engagement with the pilot communities will allow SCIPP to determine key data and educational needs of communities and planners while additionally assisting the project team with the development of climate hazards products and tools. This process will also guide SCIPP researchers towards new avenues of climate research and product development based on the needs and applications of decision-makers.

- An initial analysis to identify potential pilot communities has been undertaken and is currently under review. The analysis used a proportionate population scheme to give equal state representation based on the varied state populations across the region (e.g., population of Texas is 23,904,000 and represents 55% of the total population of the SCIPP region). The challenge with this methodology is identifying a manageable number of communities to engage while maintaining fair representation of a range of community sizes region-wide. See Table 3 below for initial analysis of candidate SCIPP pilot communities:

State	No. of Cities	Population (candidate cities)	Goal %	Actual %
Arkansas	5	457,892	6	6
Louisiana	4	736,034	10	9
Mississippi	11	534,508	7	7
Oklahoma	2	931,311	8	12
Tennessee	3	1,027,458	14	13
Texas	3	4,191,753	55	53
Total	**28**	**7,878,956**	**100**	**100**

Table 3. Preliminary analysis to determine candidate SCIPP pilot communities.

- Candidate cities in Table 3 include a range of city sizes to test the applicability of SCIPP research for communities with different needs. Consideration was given to communities with higher vulnerabilities to environmental hazards as identified in Borden et al. 2007, as shown in Fig. 3. In addition, cities that are members of the ICLEI – Local Governments for Sustainability are also being considered as city candidates. The SCIPP Stakeholder Services Committee will provide recommendations regarding community selection during the first annual meeting on June 19, 2009 in Norman, OK.

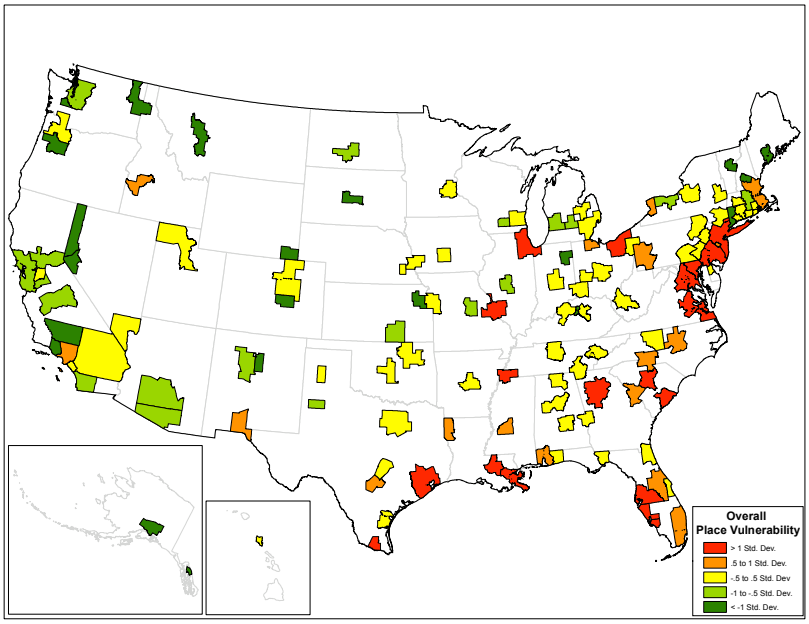

Figure 3. Overall city vulnerability to environmental hazards (Borden 2007).

5. Workshops, Presentations, and Media Briefings

- SCIPP planned, organized, and hosted the 7th Annual Climate Prediction Applications Science Workshop (CPASW) in partnership with NOAA Climate Services Division. CPASW was held at the National Weather Center in Norman, OK during March 24-27, 2009 (80 attendees). For more information see the workshop webpage at http://climate.ok.gov/cpasw/.

- SCIPP co-hosted the 4th annual Climate Hazards and Loss Mitigation Conference held at the National Weather Center on April 9, 2009. The conference was developed between the Oklahoma Insurance Department and Oklahoma Climatological Survey, to inform Oklahoma insurance agents and adjustors about climate variability and change and resulting risks to their industry. The keynote speaker was Mr. Kevin McCarty, Florida Insurance Commissioner, who spoke on "A Comprehensive Catastrophe Plan."

- Assisted the OU Center for Crisis and Risk Management in organizing the "Communicating Science: A Conference on Communicating Weather Risks." Over 120 attendees and 100 online participants attended this conference on April 2, 2009 at the National Weather Center in Norman, OK. Panels and discussion focused on weather/climate information and how such information can be communicated more effectively with stakeholders (Conference led by Dan O'Hair).

- Introduction to the SCIPP program provided at the Oklahoma State Hazard Mitigation Team meeting at the Oklahoma Capitol, October 9, 2008 (James Hocker).

- SCIPP overview presentation and discussion at the University of Oklahoma Center for Risk and Crisis Management, Community Advisory Board Meeting, November 6, 2008. Participants included over 50 professional risk managers, emergency management personnel, local officials, and leaders from non-profits (James Hocker).

- Hurricanes, Nicholls State University Forum Series, October 28, 2008 (Barry Keim).

- Climate Change: Fact or Fiction, Agricultural Leadership Program, LSU, Baton Rouge, LA, January 6, 2009 (Barry Keim).

- Hurricanes of the Gulf South, LSU College of Arts and Sciences Spring Luncheon, New Orleans, LA, March 12, 2009 (Barry Keim).

- Hurricanes in a Changing Climate, 25th Annual Louisiana Remote Sensing and GIS Workshop, Baton Rouge, LA, April 14, 2009 (Barry Keim).

- Managing Drought in a Multi-Hazard Context: Overview of the new SCIPP RISA program, NOAA Climate Board Meeting, February 27, 2009 (Mark Shafer).

- Update on Activities of the National Integrated Drought Information System (NIDIS), 7th Annual Climate Prediction Applications Science Workshop (Mark Shafer).

- Weathering Drought: One State's Experience, 7th Annual Climate Prediction Applications Science Workshop (Mark Shafer).

- Communicating and Managing Drought in Oklahoma, Drought in a changing climate, sharing management approaches joint USA-Australia Drought Workshop, Canberra, Australia, November 17-19, 2008. Workshop discussions comparing national, regional, and local drought issues and monitoring practices between the two countries. Joint workshop was developed by NIDIS, the National Drought Mitigation Center, and the Australian Bureau of Rural Sciences (Mark Shafer).

- Strategies for Federal Legislation to Support Adaptation (panel), Western States Water Council Climate Change Adaptation Policy workshop, Irvine, CA, September 24-26, 2008 (Mark Shafer).

- Drought Policy in Oklahoma and Missouri, 7th Annual Climate Prediction Applications Science Workshop (Heather Campbell).

6. Links with Other NOAA Programs

- Cooperative Institute for Mesoscale Meteorological Studies
- National Severe Storms Laboratory
- National Climatic Data Center
- NOAA Sea Grant
- NWS Climate Prediction Center
- NWS Climate Services Division
- NWS Southern Region Headquarters
- NWS Storm Prediction Center
- NWS Weather Forecast Offices (Norman, OK)
- RISAs: CLIMAS and WWA
- Southern Regional Climate Center

7. Cross-RISA Activities

- Collaboration with CLIMAS on a World Café exercise (topic: climate change) to be conducted at the 2009 U.S. Fish & Wildlife Service, Region 2 Climate Workshop in Austin, TX August 10-12, 2009. CLIMAS provided guidance and materials produced from a similar workshop held in Tucson, AZ in August 2008. The SCIPP team will lead the development of materials for the 2009 workshop as well as conduct the exercise at the workshop.

- Initial collaboration with WWA on the transfer of 1-day "climate 101" workshop materials which were applied initially across Oklahoma through funding provided by a NOAA SARP grant. The workshop aims to increase climate literacy for climate information users, particularly at the decision-making level. Through the use of a participant evaluation, the materials are being adjusted and adapted as necessary for relevance across Colorado. Additional transfer of these materials to other RISA programs is planned in future years.

- Involved with western RISA centers (WWA, CLIMAS, CIG, CAP, and ACCAP) and several federal agencies on the potential development of a collaborative climate training program for western water practitioners.

- Involved in a new routine cross-RISA teleconference (organized and developed by Kristen Averyt and Dan Ferguson) to discuss collaborative opportunities and increase communication between RISA centers (began April 2009).

8. Peer Reviewed Publications

Hamilton, L. C., and B. D. Keim. In Press. Regional Variation in Perceptions about Climate Change. International Journal of Climatology.

Keim, B. D., and R. A. Muller. 2008. Overview of Atlantic Basin Hurricanes. Chapter 4, In: Oceans and Human Health: Risks and Remedies from the Seas. Academic Press/Elsevier, Burlington, MA, pp. 79-89.

Keim, B. D., T. W. Doyle, and V. R. Burkett, with seven contributing authors. 2008. How is the Gulf Coast Climate Changing? Chapter 3, In: CCSP. Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research by Savonis, M. J., V. R. Burkett, and J. R. Potter (eds.). Department of Transportation, Washington, DC, USA, 445 pp.

Kafalenos, R. S., K. J. Leonard, with contributing authors D. M. Beagan, V. R. Burkett, B. D. Keim, A. Meyers, D. T. Hunt, R. C. Hyman, M. K. Maynard, B. Fritsche, R. H. Henk, E. J. Seymour, L. E. Olson, J. R. Potter, M. J. Savonis, 2008. *What Are the Implications of Climate Change and Variability for Gulf Coast Transportation?* Chapter 4, In: CCSP. Impacts of Climate Change and Variability on Transportation Systems and Infrastructure:

Gulf Coast Study, Phase I. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research by Savonis, M. J., V.R. Burkett, and J.R. Potter (eds.). Department of Transportation, Washington, DC, USA, 445 pp.

Savonis, M. J., V. R. Burkett, J. R. Potter, with contributing authors T. W. Doyle, R. Hagelman, S. B. Hartley, R. C. Hyman, R. S. Kafalenos, B. D. Keim, K. J. Leonard, M. Sheppard, C. Tebaldi, and J. E. Tump. 2008. *What Are the Key Conclusions of This Study?* Chapter 6, In: CCSP. Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research by Savonis, M. J., V. R. Burkett, and J. R. Potter (eds.). Department of Transportation, Washington, DC, USA, 445 pp.

O'Hair, H. D. In press. Managing community risks through a community-communication infrastructure approach. In H. Canary & R. McPhee (Eds.), *Communication and organizational knowledge: Contemporary issues for theory and practice.* New York: Routledge.

9. Non Peer-Reviewed Publications

Eosco, G. M., M. A. Shafer, and B. D. Keim, 2009: Lessons learned: Evacuations management of Hurricane Gustav. 89th Annual Meeting of the American Meteorological Society, January 11-15, 2009, Phoenix, AZ. http://ams.confex.com/ams/pdfpapers/151280.pdf.

Keim, B. D., and K. D. Robbins, 2009: Intraseasonal occurrence dates of North Atlantic tropical storms and hurricanes. 105th Annual Meeting of the Association of American Geographers, March 22-27, 2009, Las Vegas, NV.

Nogueira, R. and B. D. Keim, 2009: Characteristics of tropical cyclone rainfall over the eastern United States, 1960-2007. 105th Annual Meeting of the Association of American Geographers, March 22-27, 2009, Las Vegas, NV.

Trevino [Nordfelt], A. and D. P. Brown, 2009: A comparative study of urban influences on precipitation throughout the south-central United States. 105th Annual Meeting of the Association of American Geographers, March 22-27, 2009, Las Vegas, NV.

10. Related SCIPP Publications

Crawford, K. C., J. B. Basara, B. G. Illston, and A. J. Schroeder, 2009: An analysis of the July and August 2008 heat wave using Oklahoma City Micronet observations. 89th Annual Meeting of the American Meteorological Society, January 11-15, 2009, Phoenix, AZ. http://ams.confex.com/ams/pdfpapers/150127.pdf.

Erickson, S. A., H. E. Brooks, J. G. LaDue, and H. D. O'Hair, 2008: Emergency managers: Weather communication and training. 24th Conference on Severe Local Storms, Savannah, GA, American Meteorological Society.

Heath, R. L., and H. D. O'Hair (Eds.), 2009: *Handbook of risk and crisis communication.* New York: Routledge.

Myint, S., M. Yuan, R. S. Cerveny, and C. P. Giri, 2008: Categorizing natural disaster damage assessment using satellite-based geospatial techniques. *Natural Hazards and Earth System Sciences*, **8**, 707-719. http://www.nat-hazards-earth-syst-sci.net/8/707/2008/nhess-8-707-2008.pdf

Shafer, M. A., T. E. James, and N. Giuliano, 2009: Enhancing climate literacy. 89th Annual Meeting of the American Meteorological Society, January 11-15, 2009, Phoenix, AZ. http://ams.confex.com/ams/pdfpapers/150334.pdf.

Shafer, M. A., 2008: Climate literacy and a National Climate Service. *Physical Geography*, **29.6**, 561-574. http://bellwether.metapress.com/content/u495830084152305/fulltext.pdf

11. Report References

Borden, K. A., M. C. Schmidtlein, C. T. Emrich, W. W. Piegorsch, and S. L. Cutter, 2007: Vulnerability of U.S. cities to environmental hazards. *Journal of Homeland Security and Emergency Management*, **4.2**, 1-21. http://www.bepress.com/cgi/viewcontent.cgi?article=1279&context=jhsem