

REGIONAL GRADUATE STUDENT, POST-DOC, AND EARLY CAREER RESEARCHER WORKSHOP

FINAL REPORT

DEPARTMENT OF INTERIOR CLIMATE SCIENCE CENTERS ANNUAL FUNDING FOR FISCAL YEAR 2013

1. ADMINISTRATIVE:

Principal Investigator: Renee A. McPherson
The University of Oklahoma
201 Stephenson Parkway, Suite 2100
Norman, OK 73019
Phone: (405) 325-1272 **Fax:** (405) 325-1122
Email: renee@ou.edu

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2. PUBLIC SUMMARY:

Led by members of the South Central Climate Science Center (SC CSC) consortium, this project developed and implemented a professional development workshop for graduate students, post-docs, and early-career researchers within the SC CSC region. The workshop (1) introduced participants to the goals, structure, and unique research-related challenges of the SC CSC and its place within the U.S. Department of the Interior and the larger CSC network, offering them insight into how their research fits into the broader research priority goals and its eventual applicability to end-user needs across the region; (2) provided an opportunity for participants to present their research to fellow peers; (3) facilitated interdisciplinary interactions between participants within the SC CSC purview in an effort to foster collaborative opportunities; and (4) generated a set of digitally recorded presentations on the SC CSC enterprise and a “how to” guide for conducting a similar workshop in other CSC regions. A major benefit of this project was the development of a cohort of early-career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. This experience for the participants is anticipated to help remove some of the institutional barriers, or “silos,” at an influential time in the development of these professionals so that they can better navigate multi-institutional and multi- or inter-disciplinary research. It is also expected to contribute to the development of better communication and collaboration practices for the long-term benefit of the CSCs, Landscape Conservation Cooperatives, and their partners. Participants had a two-way transfer of knowledge about climate change impacts across disciplines.

3. TECHNICAL SUMMARY:

Led by members of the South Central Climate Science Center (SC CSC) consortium, this project developed and implemented a one week professional development workshop for graduate students, post-docs, and early-career researchers within the SC CSC region. The goals were to: (1) introduce participants to the goals, structure, and unique research-related challenges of the SC CSC and its place within the U.S. Department of the Interior and the larger CSC network, offering them insight into how their research fits into the broader research priority goals and its eventual applicability to end-user needs across the region; (2) provide an opportunity for participants to present their research to fellow peers; (3) facilitate interdisciplinary interactions between participants within the SC CSC purview in an effort to foster collaborative opportunities; and (4) generate a set of digitally recorded presentations on the SC CSC enterprise and a “how to” guide for conducting a similar workshop in other CSCs.

Each of the four stated project objectives was met through the careful construction of the workshop agenda. The workshop was held on June 15-20, 2014 at the SC CSC main office on the Research Campus of the University of Oklahoma in Norman, OK and was comprised of: (1) a series of instructional presentations organized into themed sessions (e.g., introduction of the SC CSC and its partner members, early career development and interdisciplinary research, climate change science and impacts, Indigenous knowledge, science communication, and the national science-policy landscape) that met the goal of introducing the participants to the SC CSC and its research; (2) two keynote addresses by nationally/internationally renowned figures to provide a broader perspective of stakeholder-based climate science research that met the goal of providing insight on the applicability of research to end-user needs; (3) a real-world case study on the Arbuckle-Simpson aquifer showcasing how scientific results are used in the decision-making process that met the goal of facilitating interdisciplinary research; (4) participant research introduction presentations that met the goal of presenting research to peer; (5) participant small group projects/presentations on interdisciplinary proposal team development that met the goal of facilitating interdisciplinary research; and (6) field trips relevant to the major themes of the SC CSC that met the goal of providing insight on the applicability of research to end-user needs. In addition, we purposely created informal opportunities for participants to network, which met the goal of facilitating interdisciplinary interactions.

This project advanced science within the SC CSC region by developing of a cohort of early-career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. Participating individuals gained insight into how their research fits into the broader research priority goals of the SC CSC enterprise and its eventual applicability to end user needs across the region. This experience also removed some of the institutional barriers, or “silos,” at an influential time in the development of these professionals so that they can better navigate multi-institutional and multi-or inter-disciplinary research. Because of the high quality of the early-career participants, they are already taking a leadership role in communicating science amongst the consortium members, Landscape Conservation Cooperatives (LCCs), and their partners and contributing to the development of better communication and collaboration practices for the long-term benefit of the SC CSC enterprise. In fact, a group of Louisiana State University participants already assisted faculty in the planning and implementation of a one-day workshop with the Gulf Coast Prairie and Gulf Coastal Plains and Ozarks LCCs focused on determining shared science priorities and

developing new options for future collaborative science needs. In addition, six participants attended the 2014 annual SC CSC research workshop held in Grapevine, TX, and worked to brainstorm future proposal ideas, both for the CSC solicitation and for outside funding opportunities. Other participants have been interacting directly with our NOAA consortium member as well as authoring or co-authoring papers and proposals at their respective institutions.

4. PURPOSE AND OBJECTIVES:

4.1 Project Intent

The Department of the Interior Climate Science Centers were established under Secretarial Order 3285 (2010) with the purpose of addressing the impacts of climate change on America's water, land, and other natural and cultural resources. This Order states that it is imperative that "scientists work in tandem with those managers who are confronting climate change impacts." These Climate Science Centers established a new paradigm for conducting actionable research through interdisciplinary collaborations, and the community that this funded project served was early-career researchers, who were educated to operate within this paradigm from the start of their careers.

There are many challenges to conducting inter- or multi-disciplinary research because basic research, applied research, management processes, disciplines, and even sub-disciplines have been "siloeed" for so long that many research and management professionals find it difficult to communicate common interests and research needs. It is clear that the next generation of researchers must overcome these disciplinary biases and engage in more open dialogue with other disciplines and the management community in order to be better positioned to collaborate, speak a common language, and understand each other's needs.

Through this workshop, early-career researchers in natural and social sciences (as related to climate) met and interacted with high quality established researchers as well as their fellow peers involved in a diverse array of fields and managers and other potential end-users of their research. We educated researchers early in their careers on how to overcome the identified challenges in conducting "actionable" research and help them to build a network of peers through which they could continue to pursue collaborations. The workshop has contributed substantially to developing better communication and collaboration practices for the long-term benefit of the CSCs, LCCs, and their partners.

4.2 Original Objectives

The primary, original objective of this project was to develop and implement a workshop for graduate students, post docs, and early-career researchers within the SC CSC region. The one-week workshop was to focus on professional development of a cohort of early-career professionals who could continue networking through their research pathways and who could understand and eventually lead outcome-oriented, interdisciplinary research. A high priority was to invite a group of participants diverse in research topics, disciplines, gender, ethnicity, cultural backgrounds, and geographic location within the SC CSC region. The four major goals of this project are described above in Section 3 of this report. We met our objectives by hosting an one-week workshop from June 15-20, 2014 in Norman, OK, with 28 attendees (disaggregated as: 20 White, 2 Asian, and 6 unspecified; 20 Not Hispanic or Latino, 3 Hispanic or Latino, and 5 unspecified; 13 female and 15 male) from the four consortium universities, New Mexico State

University, NOAA Geophysical Fluid Dynamics Laboratory, and USDA Grazinglands Research Laboratory.

All major objectives were met – as described in further detail in Sections 5 and 6 of this report – with a few small alterations deemed appropriate for an improvement in the overall quality and effectiveness of the workshop and approved by Dr. Kim Winton, Director of the SC CSC (see Section 4.3 below).

4.3 Alterations to Original Objectives

One small alteration made to the original objectives was an adjustment to the participant research presentations. Instead of having some participants give longer oral presentations and some give poster presentations, we decided to have all participants give a five-minute oral presentation to introduce themselves and outline their research using a single PowerPoint slide. This allowed all participants the opportunity to give oral presentations about their research and not require extended poster sessions throughout the week that would have reduced the amount of time available for other workshop activities.

Another alteration made was to the small group activity associated with one of the three identified deliverables (i.e., small group project outlines). Instead of having participants work on a specific research problem, participants were assigned to groups and asked to work together to build a research team to address an example interdisciplinary request for proposals (for the National Science Foundation Coupled Human-Natural Systems program). Each participant was to develop a self-introduction to their small group as if they were considering joining an interdisciplinary team building a proposal. Therefore, they would need to identify the best way to explain their research interests and strengths to a group consisting of a variety of disciplines. Disciplinary diversity within each group was intentionally created, and participants were encouraged to work together with one another throughout the week to help develop their ideas. At the end of the workshop, each group presented their individual introductions and all but one group were able to generate a proposal idea that encompassed each group member's research expertise. We felt this type of activity would be a unique opportunity to practice skills that are often not addressed in typical academic training environments and offer participants a safe environment in which to learn about communicating their research to a multidisciplinary group of researchers conducting similar research but not necessarily from their same field of study.

5. ORGANIZATION AND APPROACH:

The Early Career Researcher Workshop was held on June 15-20, 2014 at the SC CSC main office on the Research Campus of the University of Oklahoma in Norman, OK because of its central location within the SC CSC region and its consortium and partner institutions (http://www.southcentralclimate.org/index.php/pages/about_us) and adjoining LCCs – four of the six LCCs were within driving distance, providing for a rich diversity in landscape types and management agencies and organizations within a nearby region.

A competitive application process was used for selecting the workshop participants with a requirement that applicants be graduate students, post-docs, or early career faculty within five years of having graduated and actively conducting research or synergistic activities applicable to

the South Central U.S. region. Applicants were asked to provide a description of their research, synergistic activities, and background with a requirement that their research focus be associated with at least one of the four science priorities outlined in the FY 2013 RFP for the SC CSC: regional and physical climate variability and trends, ecosystems and landscapes, human dimensions as they relate to climate change and precipitation variability, and conservation and water governance. Applications were graded by two independent reviewers using multiple metrics to identify the most competitive applicants.

A high priority was to invite a group of participants diverse in research topics, disciplines, gender, ethnicity, cultural backgrounds, and geographic location within the SC CSC region. When appropriate, priority was given to applicants from SC CSC consortium institutions and CSC- or LCC-funded projects. There were 41 applications received, of which 28 participants were chosen (refer to supplementary document *Participant_List.pdf*), which included representation from the University of Oklahoma (5), Oklahoma State University (9), Louisiana State University (4), Texas Tech University (5), New Mexico State University (3), NOAA Geophysical Fluid Dynamics Laboratory (1), and USDA Grazinglands Research Laboratory (1). This set of participants included different ethnicities, were split equally between female and male trainees, represented 17 different disciplines, and were at various stages in their career – Masters (7), Ph.D. (8), Postdoc (10), and junior faculty (3).

The one-week workshop consisted of a series of instructional presentations organized into themed sessions, two keynote addresses by nationally/internationally renowned figures to provide a broader perspective of stakeholder-based climate science research, a real-world case study showcasing how scientific results are used in the decision-making process, participant research presentations, a small group interdisciplinary activity, and field trips relevant to the major themes of the SC CSC. The agenda is summarized below and provided in full in a separate document (see supplementary document *ECRW_Agenda.pdf*) and a list of the workshop instructors can be found in supplementary document *Instructor_List.pdf*.

Day 1 (evening)

- Keynote Address #1: Dr. William Hooke, Senior Policy Fellow at the American Meteorological Society – Early career professional development, science/policy interface

Day 2

- Introduction to SC CSC, its partner members, and its context within the U.S. Dept. of Interior
- Field Trip – National Weather Center, Norman, OK
- Early Career Development / Interdisciplinary Research
- Participant Presentations (Biographical and Research Introductions)

Day 3

- Keynote Address #2: Dr. Virginia Burkett, Chief Scientist for Climate and Land Use Change at USGS – Climate change impacts, IPCC Working Group II
- Climate Change Impacts
- State of Climate Change Science
- Global and regional climate modeling
- Field Trip – Sam Noble Museum of Natural History, Norman, OK

Day 4

- Field Trip – Chickasaw National Recreational Area and the Chickasaw Cultural Center (hands on experience in region discussed in Case Study on Day 5)
- Indigenous Knowledge and Climate Change

Day 5

- Climate Science Communication
- Case Study – Turning Science into Policy: Arbuckle-Simpson Aquifer Water Rights

Day 6

- National Science/Policy Landscape
- Human Impacts from Climate Change
- Participant Small Group Presentations (describing research interests to mock interdisciplinary group attempting to develop a proposal)

6. PROJECT RESULTS:

As stated in Section 3, the major result of this project was the development of a cohort of early-career professionals who can continue networking through their research pathways and who can understand and eventually lead outcome-oriented, interdisciplinary research. The participants themselves deemed the workshop as extremely successful with an abundance of positive comments and feedback. Evaluation forms (completed by 27 of the 28 participants) contained high marks as summarized in Table 1. Participants provided high praise in the written feedback portion which can be summarized by the following selected quote: “The quantity and quality of the speakers was mind-blowing and personally a career altering experience. I can’t wait to collaborate with several of the individuals I’ve met. . . . I would highly recommend this to others who incorporate any aspect of climate into their research.” Texas Tech University (TTU) professor and workshop instructor Dr. Katharine Hayhoe provided this comment: “I just wanted to let you know (from my perspective back here in Texas) what a great job you guys did with the workshop the other week. Our TTU attendees came back so energized and glowing we practically have to anchor them to the ground. It is so exciting and encouraging to see the enthusiasm generated by this event.”

Table 1: Participant evaluation form scores (out of 5.0) as completed by 27 of 28 participants.

CATEGORY	SCORE
Instructor Presentations	4.3
Small Group Activities	4.3
Case Study	4.4
Field Trips	4.5
Facilities / Location	4.9
Organization	4.9
Usefulness	4.8
Hotel	4.7

Watch this short video (<http://youtu.be/PNOFVnvHogg>) for some interview responses from workshop attendees. A doctoral student who participated in the workshop independently created this video based on his interactions and conversations with the instructors and the other participants.

The first main deliverable generated from this workshop is a set of digitally recorded presentations from instructors who authorized recordings (refer to supplementary document *Instructor_Video_Presentation.pdf* as well as <https://www.youtube.com/playlist?list=PLeQQSAEHE5Pp7ZgYU3wpN0Hbh4N12x8PT>) which are grouped into two general categories. The first includes introductory presentations providing information on the SC CSC, its partner members, and its context within DOI and the larger USGS nationwide CSC network. The second includes presentations given by research experts highlighting cutting-edge research underway across the region as well as recent advancements at the national and international level. These recorded presentations not only will give participants a resource to revisit as they continue their research but also will provide non-participants, future students and post-docs, and stakeholders across the region (e.g., natural resource management organizations) an opportunity to learn about the SC CSC enterprise and innovative research taking place across the region.

The second main deliverable generated was a “how to” guide that provides lessons learned on developing and implementing an early-career researcher-based workshop, including integrating educational sessions on interdisciplinary topics with the exploration of collaborative research in an informative and fruitful manner (refer to supplementary document *How_To_Guide.pdf*).

7. ANALYSIS AND FINDINGS:

The project team accomplished its goals and objectives through extensive preparation, a strong commitment to the workshop attendees during the workshop, creating specific deliverables to extend the workshop lessons beyond the one-week period, and follow-up opportunities at our annual SC CSC research meeting and aid for attendees who were developing CSC-related proposals. The early career workshop developed for this project was found to be an excellent means for facilitating interdisciplinary interactions, fostering collaborative opportunities, and aiding in the professional development of researchers in the early stages of their career. While not necessarily “innovative,” the project team made a concerted effort to develop an open, safe, collegial environment for the early-career researchers to network and ask questions. This effort was aided by providing social time throughout the week and strongly encouraging all attendees to participate. As a result, the researchers bonded quickly and continue their networking even after only one week together during June.

The project team developed a “how to” guide (see supplementary document *How_To_Guide.pdf*) that can serve as a “best practices” for those wanting to conduct a similar professional development workshop for early career researchers.

In terms of management applications, the digitally recorded presentations will be a valuable resource for end users across the region (e.g., managers, stakeholders, or farmers; and federal, state, Tribal, or local agencies or other private and non-governmental entities) to learn about the SC CSC enterprise and the innovative research being conducted. Also, it is anticipated that this experience will help the early-career participants better understand the unique challenges that natural and cultural resource managers and other stakeholders face when conducting and developing their own outcome-oriented, interdisciplinary research – providing more useful and applicable results to the end user community.

8. CONCLUSIONS AND RECOMMENDATIONS:

There are five main recommendations that our team has after conducting this workshop, with a number of other recommendations and useful information for holding a similar early-career workshop in the “how to” guide (see supplementary document *How_To_Guide.pdf*). The first recommendation is to include end users within the activities throughout the workshop (e.g., managers, stakeholders, or farmers; and federal, state, Tribal, or local agencies or other private and non-governmental entities) so participants better understand the unique challenges that natural and cultural resource managers and other stakeholders face. Our workshop participants highly valued these interactions. The second recommendation is to separate early-career researchers into two groups – Masters/Ph.D. graduate students and postdocs/early faculty – and either focus the workshop on one of these groups or hold two parallel tracks with mostly independent sessions combined with a few that are overlapping. We found that while including such a large spectrum of early career stages had a number of benefits (e.g., mentoring/learning opportunities), it was challenging to develop content able to interest and benefit everyone. The third recommendation is to have communication, economic, and social science disciplines involved with the natural and physical sciences throughout the workshop. These are challenging to integrate into a researcher’s thinking unless they have an opportunity early in their careers to see the importance of these fields. The fourth recommendation is to provide opportunities to socialize outside of the workshop activities (e.g., at the hotel in the evening or a local restaurant) so participants have additional networking opportunities in a more informal setting. We felt having this additional social time opportunity led to much of the success of the workshop. The fifth recommendation is to mix up classroom lectures with other activities outside the classroom such as field trips or small group activities. A good variety of activities throughout the day keeps the participant’s minds fresh and more likely to become engaged with a given portion of the workshop.

9. OUTREACH:

This workshop was discussed and the short video presented at the November 20-21, 2014 SC CSC Research Workshop in Grapevine, TX. It also was presented by Co-PI Bamzai as part of her talk “The use of student-driven video projects as an educational and outreach tool.” at the 2014 American Geophysical Union (AGU) 2014 Fall Meeting held in San Francisco, CA on December 15-19. A draft version of the student-developed video (*South Central Climate Science Center: Early Career Researcher Workshop 2014*) was shown by PI McPherson at the USGS Climate Science Centers Annual Meeting in Minneapolis, MN, on June 24-26, 2014. After closed captioning of the video is completed, it will be posted on the SC CSC web site at <http://southcentralclimate.org> and Facebook page at <https://www.facebook.com/SouthCentralCSC> as well as being distributed to the USGS for their public relations distribution.

It is anticipated that Co-PI Rosendahl will present on the workshop during an education-related session at the 2015 AGU Fall Meeting. It also is anticipated that a publication will be produced based on the workshop in an appropriate journal, such as *EOS, Transactions American Geophysical Union*.