

Plan of Work for SERA 43

Southern Region Integrated Water Resources Coordinating Committee

July 1, 2015 through June 30, 2019

Project Number: Southern Extension and Research Activity (SERA) - 43

Requested Duration: July 1, 2015 to June 30, 2019.

I. Activity Title: Southern Region Integrated Water Resources Coordinating Committee

II. Statement of Issues and Justification:

Water has long dictated the distribution of population in the Southern region of the US. Humans have developed elaborate systems of infrastructure, water rights laws, institutions, and corporate entities to govern the use of water for agriculture and urban uses. The resulting modified water system dramatically impacts agroecosystems and their ability to provide food, water, and essential ecosystem services. SERA 43 will advance an innovative transdisciplinary paradigm to transform our understanding and management of coupled social-hydrologic-ecological water systems in the face of changing climate, land use, and populations over the next 50 years. We will work to engage the research, extension, and teaching capacities of the Land Grant University (LGU) system in the Southern US region (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA; Fig. 1) in a collaborative effort that will further strong regional ties between LGUs, decision-makers, and citizens working together to address critical water resource management issues.

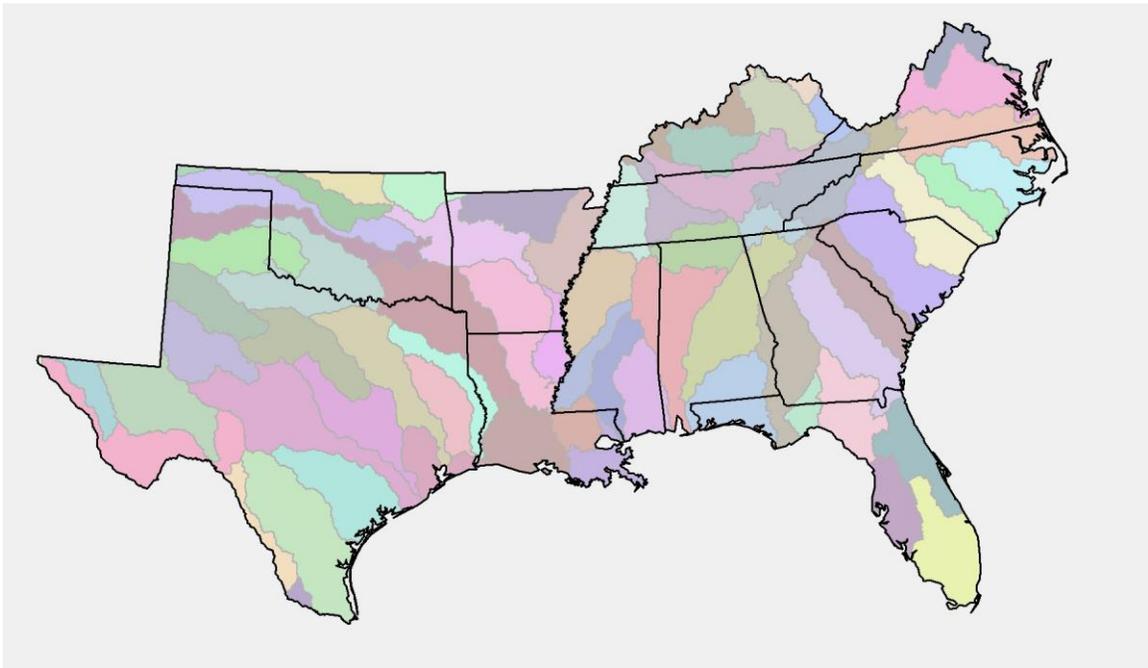


Figure 1. Thirteen southern states in SERA43.

The overall goal of SERA 43 is to better understand and advance progress on a trifecta of water related issues; water security (e.g., supply), water quality (for both agricultural production and human consumption), and provision of ecosystem services that are increasingly recognized as critical socio-economic constraints on agricultural production. Specific goals include: 1) Measure and quantitatively model linkages and feedbacks among key social, built (urban), hydroclimate, and ecological components of representative southern agricultural water ecosystems; 2) Use the integrated field and modeling results to characterize and predict the impacts of altered hydroclimate (e.g., drought, flooding, temperature) on hydrologic flows for agriculture, local communities, and ecosystem services; and 3) Provide suggested adaptation mechanisms for communities and agricultural producers to pave a 'way forward' in the face of present and anticipated future water constraints. These goals will support the science to answer such critical questions as: How can greater understanding of linkages among social, hydroclimate, and ecosystem components of southern water systems improve the ability of decision-makers to balance future agricultural production needs with population growth and ecosystem services in the face of anticipated biotic and abiotic stressors? And, what are the emerging threats and constraints to water availability in the southern region? A cross cutting theme of our work enables development and dissemination of educational modules and technology transfer of lessons learned to stakeholders (e.g., government and non-government institutions, agricultural producers, businesses, citizens, etc.) using multiple venues and tools.

New technologies, best management practice adoption, and improved water policies are needed to meet future water resources challenges. For agriculture, these include developing water-efficient crop varieties and cropping systems, increasing water capture technologies, developing dryland and limited-irrigation strategies, improving water distribution systems and irrigation efficiencies, and developing economic risk assessment tools that enable producers to identify profitable, water-efficient production options. Agriculture also must protect water resources by reducing off-site transport of sediment, nutrients, pesticides, and pathogens. Similar challenges exist for the urban sector to enhance domestic water conservation, improve irrigation efficiency and management, improve landscape design, expand and optimize water reuse, and improve water capture, while at the same time reducing nonpoint source pollution in stormwater runoff. All citizens will be affected by these outcomes and are critical stakeholders in achieving long-term water security.

III. Objectives:

1. Establish and strengthen transdisciplinary and transgeographic LGU relationships to address critical water quality, water quantity, and ecosystem services issues.

- 1) Determine high priority water resource issue and foster multi-state, multi-disciplinary collaboration to address these concerns.
- 2) Develop more effective linkages between LGU extension and research personnel and with external partners by supporting regular communication and collaboration to strengthen multi-state approaches regarding agricultural and environmental research and outreach.
- 3) Encourage intrastate interactions among state agencies, universities, and others to meet state and federal water goals.
- 4) Leverage the synergy of the LGU relationship to seek/secure funding to support multistate initiatives that address SERA 43 goals.

2. Expand the knowledge base for discovery of new tools and practices as well as for the continual validation of recommended practices.

- 1) Strengthen the science base that informs our understanding of the efficacy of nutrient, water and ecosystem management strategies at multiple temporal and spatial scales.
 - 2) Refine and increase use of appropriate nutrient and water decision support tools for better decision-making.
 - 3) Promote environmental assessment research to improve water quantity, quality and ecosystem services.
- 3. Improve coordination and delivery of educational programming and increase implementation effectiveness of water resource management strategies for agricultural and non-agricultural audiences.**
- 1) Customize educational programming (and information sharing) to the learning styles of the various audience segments.
 - 2) Increase the emphasis on social science factors in targeting educational methods.
 - 3) Facilitate collaborative, multi-state proposals and programs to address identified issues.
 - 4) Develop a web-based portal for LGU water programs, curricula, and resources to enhance technology transfer among institutions and to external partners and clientele (sera43.soil.ncsu.edu).
- 4. Co-sponsor re-establishment of a National Water Conference in concert with the Soil and Water Conservation Society, and conduct a biennial, regional water conference to share research, extension, and education resources, and to facilitate broader interaction among faculties and with external partners.**

IV. Procedures and Activities:

Establish and strengthen relationships that can serve the missions of multiple organizations addressing water quality and quantity and ecosystem services.

Thirty-two faculty representing 20 1862 and 1890 institutions participated in the first face-to-face meeting of SERA 43 in Atlanta, Georgia on March 6-7, 2014. Three subject matter workgroups were established to address key issues facing the Southern Region 1) Water Quality, 2) Water Quantity/Availability, and 3) Ecosystem Services (Watershed Restoration and Management). Each team identified critical water resource issues that will be targeted over the next four years through integrated research, teaching, and outreach program efforts. Each of the three workgroups will work toward the first three objectives by focusing on the following potential topics based on realized funding sources.

Water Quality

- 1) Social, economic, and programmatic factors affecting producer adoption of water quality Best Management Practices (BMPs) – Can conservation programs be more effectively designed and delivered.
- 2) Edge-of-field assessment of implemented BMPs: are they being targeted to critical pollutant source areas (CPSAs).
- 3) Innovative management of nutrients, tillage, and drainage management structures that minimize nutrient loss and limit tradeoffs between production and environmental goals.
- 4) Measuring, tracking, and treating emerging contaminants.

- 5) Identification and quantification of legacy phosphorus (P) sources at local and regional scales.
- 6) Use of natural tracers and isotopes to source / date groundwater flows contributing to watershed nutrient discharge at no smaller than a 12 HUC level.
- 7) Assessment of surface water quality parameters for improved watershed decision making in specialty crops production.
- 8) Development of decision support tools to drive real-time and short-term future agricultural management practices.
- 9) Assess the impacts of climate change/variability on nutrient cycling in agroecosystems and nutrient loss to water bodies using modeling and measurement of key water quality indicators.
- 10) Differentiating the drivers of nitrogen (N) and P loss that result from climate change (unmanageable) and land use (manageable).
- 11) Development of science-based climate change curricula to educate youth on the impacts of climate change and climate change induced water resource issues.

Water Quantity

- 1) Identify how spatial and temporal factors influence the value of water and how water rights affect the efficient allocation of resources in the face of binding constraints.
- 2) Determine the impact of climate variability (drought, floods, temperature) on water resources and how sector demands can shift to meet critical needs (e.g., shift from surface to groundwater).
- 3) Assess how markets, policy, and infrastructure investments can be designed to meet the long-term goals of diverse water stakeholders.
- 4) Identify alternative cropping systems that enable economic sustainability in areas where non-agricultural water demands reduce irrigated acreage.
- 5) Explore water rights issues facing agronomic crop production (irrigation) in the southern region.
- 6) Evaluate agronomic and engineering approaches to maximize irrigation water use efficiency in agronomic crop production systems.

Ecosystem Services

- 1) Assess and communicate how human-altered hydrologic flows affect aquatic biota, habitats, and the ecological services they provide.
- 2) Define how agricultural and urban water demands can be most efficiently managed to protect and sustain essential ecosystem services.
- 3) Conduct comprehensive literature reviews to quantify the effectiveness of stream restoration and low impact development in maintaining and restoring ecosystem services on agricultural lands.
- 4) Based on assessments of existing science, develop and enhance stream restoration and low impact development research, education, and outreach programs.

V. Expected Outcomes and Impacts:

Over-arching outcomes to be achieved through SERA 43 include:

- 1) New and innovative multi-disciplinary approaches that solve key water challenges in the South through capacity building between LGU research, teaching, and extension faculty.
- 2) Increased number of cross-institutional research and extension collaborations resulting in more effective planning and action to enhance, conserve and protect water resources.
- 3) More resilient partnerships with key external entities engaged in water resource planning and management, e.g., federal and state water resource agencies, NGOs, business/industry.
- 4) Increased awareness and knowledge of water resource issues and increased adoption of science-based management practices for water conservation and water quality protection by agricultural and urban stakeholders.
- 5) Enhanced ability of the LGU system in the South to identify and proactively address emerging issues related to water resources.

Targeted outcomes will include:

- 1) SERA 43 workgroups and subteams will work together as appropriate to develop and submit multidisciplinary, multi-state research, teaching, and outreach proposals in response to appropriate RFA solicitations from USDA NIFA and other funding sources.
 - A Letter of Intent submitted by SERA 43 to USDA NIFA was accepted and a Coordinated Agricultural Project grant was submitted on Aug 13th 2014 for funding through the AFRI Water for Agriculture Challenge Area. Although the grant was not funded, key issues have been identified and teams formed for collaborative work efforts. This activity targeted Objectives 1, 2, and 3.
 - SERA 43 also submitted a collaborative NIFA AFRI Water for Agriculture Challenge Area conference grant to organize/conduct a national water conference in collaboration with the Soil and Water Conservation Society. Although this was not funded, leadership in SERA43 worked with colleagues in SERA17, WERA103, SERA44 and other water experts around the country to encourage Land Grant personnel to participate. This effort resulted in a strengthening of our domain teams and many new members for SERA 43 (76 to date). A special invitation for Soil and Water Conference participation was sent to attendees of the original Water Conference. Next year a SERA43 member will be program chair for Soil and Water Conference and we will work to include even more Land Grant personnel into this conference to provide research and extension information on water and water related issues. This new Water conference is envisioned as a replacement for the NIFA Water Conference. This activity falls into Objective 1, 3, and 4.
- 2) North Carolina State University will provide leadership for development and management of a SERA 43 website which serves as a clearinghouse for water resources information and tools (<http://sera43.soil.ncsu.edu>) site will include:
 - Relevant information developed from the Southern Region Water Program to preserve existing resources from that 13-year effort.
 - New data and resources developed through SERA 43.
 - A listserv of southern water scientists (research, teaching, extension) to promote collaboration among faculty at participating institutions.

- 3) A biennial regional Water Summit co-sponsored by SERA43 will provide a forum for education on water resource challenges and ways to make a difference at the local level.
 - The 2014 Water Summit (<http://www.h2osummit.org/#/agenda>) engaged 156 faculty/staff from 18 states (AL, AR, DC, FL, GA, KY, LA, MD, MS, NC, NM, OH, PA, SC, TN, TX, VA, and TX) through 33 technical sessions addressing water resource protection and management.
 - The proposed 2016 Water Summit will be hosted by the University of Florida.
- 4) Members representing key water-related disciplines will engage with their professional organizations to expand the development of new technical resources addressing critical water resource issues in the Southern Region and nationally. Examples include:
 - Zach Easton (VA) was a guest editor for a special issue on Drainage Water Management for Phosphorus Control published in the Journal of Environmental Quality. This special issue contained four studies from the southern US out of 16 total, and was identified as a priority area by both SERA 43 and SERA 17, which share a significant number of members.
 - Carmen Agouridis (KY) will be a guest editor for a special issue on Coastal Wetlands for Trans ASABE that will follow from a special session at the ASABE annual meetings in New Orleans, LA in July 2015.
 - Michael Dukes (FL) is serving as the guest editor for Transactions ASABE and Applied Engineering in Agriculture journals as part of the 2015 IA/ASABE Irrigation Symposium.
- 5) Members will develop regionally specific factsheets, and extension/outreach materials for dissemination via the SERA 43 website (<http://sera43.soil.ncsu.edu/publications/>).
 - Currently, 22 regional documents have been uploaded on the website.
 - An additional 20-25 new documents will be produced addressing key multi-state or regional issues.
- 6) Multi-state “Watershed Academies” will be conducted at strategic locations in the region. These 3-day events provide Extension professionals, regulatory agency representatives, non-profit groups, and other interested stakeholders current research on watershed management and best management practice effectiveness.
 - A Watershed Academy hosted by the University of Kentucky was conducted in March 2015 in partnership with University of Alabama and North Carolina State University.
- 7) Workgroups will coordinate and advance P management in the southern region by ensuring that most southern P assessment tools have been tested based on guidance in the 2011 USDA-NRCS 590 standard and compared to water quality data, and that these tools produce more consistent results across physiographic regions in order to promote greater similarity between southern state P Index ratings and recommendations. Models that are being calibrated and validated are TBET, APEX, and APLE. Water quality datasets have been collected from NC, GA, MS, AR, OK, and TX. Multiple presentations have already been made to various groups relative to this work including the Livestock and Poultry Environmental Learning Center (presentations are web-available). In addition, the at least two peer-reviewed publications will be produced, as well as information that allows each of the 13 southern states to review their P Loss Index tools.

- 8) Workgroups will evaluate P Indices using a combination of APEX and SWAT in Texas (Resiel Experimental Watershed), Arkansas (Petite Jean Watershed), and Virginia (Shenandoah Watershed). This project seeks to address results of a survey of P Indices from 12 states that revealed a large diversity in P Index ratings and P application guidelines for similar conditions.
- 9) Joint data collection and modeling efforts will be conducted across the three domains that introduce climate change impacts to water management strategies resulting in improved aquifer health and sustainable agricultural systems.

VI. Educational Plan:

The annual meeting will serve as a venue for sharing information and resources among committee members that will then be communicated and/or distributed by members to all participating states, territories, and partner entities as appropriate. The national and biennial conferences will serve as a broader opportunity to provide training and share information, resources, and lessons learned. The regional website will provide a clearinghouse for water-related resources that can be accessed, adapted, and employed by member institutions, partner entities, and citizen stakeholders throughout the region.

VII. Internal and External Linkages

- 1) SERA 17, Organization to Minimize Nutrient Loss from the Landscape
- 2) SERA 43, Southern Region Integrated Water Resources Coordinating Committee
- 3) SERA 46, Framework for Nutrient Reduction Strategy Collaboration: The Role for Land Grant Universities

VIII. Governance

Dr. Zach Easton (Virginia Tech) was elected as the inaugural chair of SERA 43; Dr. Carmen Agouridis (University of Kentucky) was elected as vice-chair; and Dr. Mark McFarland (Texas A&M University) will serve as past-chair. Elections will occur at each annual meeting (late February/early March) with new officers installed at the conclusion.