

# SOUTHEASTERN U.S. SOIL MOISTURE NETWORK BUILD-OUT AND APPLICATIONS

Developing new soil moisture technologies and applications for improving assessments and forecasts of water issues in the Southeast such as flash droughts, floods and ecosystem health

Project Timeline: October 2020 - September 2022



Soil moisture has been recognized as a key variable for assessing the onset and magnitude of both drought and flooding hydro-extremes, but accurately measuring it over a large spatial extent and systematically reporting it have proven to be challenging. In response to this need, Alabama, Florida and Georgia are collaborating on a new project to **enhance the soil moisture monitoring network in the Southeast** and to **improve the application of soil moisture data to decision making** in the region. To achieve this goal, the project will address the following objectives. The states that will be primarily involved in each objective are listed in parentheses; all states will provide supporting data or expertise to complete the project’s objectives. This important project was enabled by cross-NOAA partnerships.

## Project Objectives

- Assess the viability of low-cost soil moisture sensors via test-bed calibration (AL, GA)
- Expand the regional soil moisture network by installing viable versions of low-cost sensors in the existing networks (AL, FL) (Figure 1)
- Perform validation of remote sensing-derived root-zone soil moisture (AL, FL, GA)
- Improve the Cropping Model System and develop additional crop-support tools (AL, GA)
- Ensure accessibility and useability of soil moisture data and products (AL, GA)

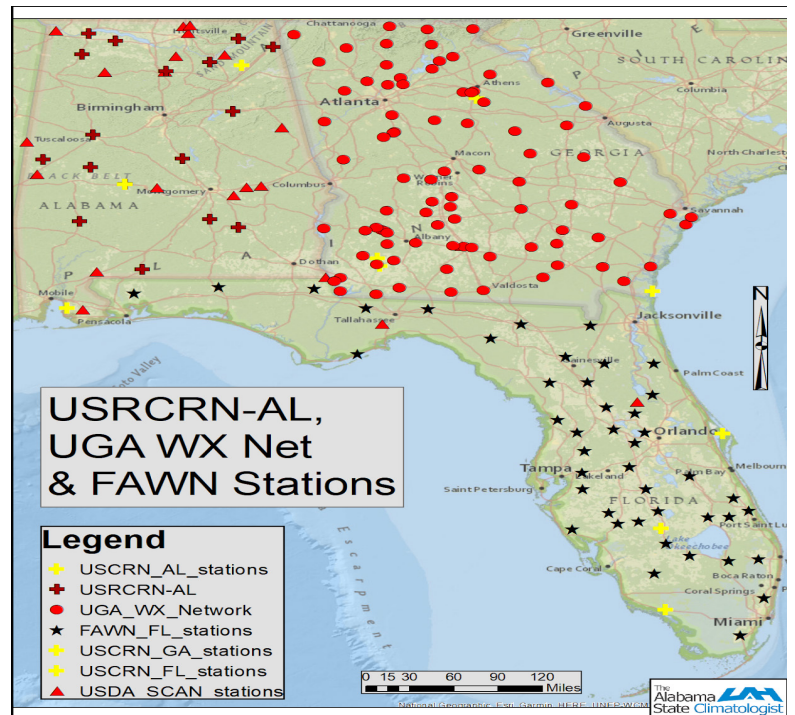
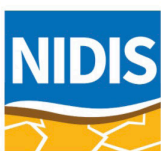
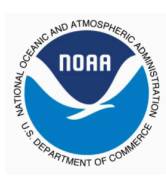


Figure 1: Map of soil moisture stations in Alabama, Florida and Georgia.



## Expected Outcomes

- Expansion of the in situ soil moisture sensor network in Alabama, Florida and Georgia, providing a direct impact on the ability to effectively monitor and report this vital metric in the Southeastern U.S.
- Improvements to regional conditions-monitoring and assessment tools, particularly crop-support products, including the development of a new SmartIrrigation Forages App to support livestock producers and a real-time alert system for drought & flooding using the SmartIrrigation Apps (corn, cotton, soybean, forages) (Figure 2)
- Research to assess and improve the ALEXI (energy balance) model-derived Evaporative Stress Index and root zone soil moisture information using in situ data from the expanded regional network. This will allow for improved high-resolution, daily mapping of soil moisture and attendant products to identify vegetative stress and flash flood potential.
- Research to assess and improve the spatial application of the DSSAT crop model utilizing the RHEAS framework. This will allow for improved basin-level understanding of soil moisture impact on both crops and hydrology.
- Outreach and information transfer of products and enhanced visualization tools to regional stakeholders, working with Extension County Agents and USDA NRCS staff.
- Development of low-cost sensor performance metrics through testbed evaluation, which will be useful to other monitoring networks including NWS COOP.
- Creation of a database of soil moisture sensor data to be included in the National Coordinated Soil Moisture Monitoring Network, a national initiative to build a shared platform for soil moisture data and decision support tools.

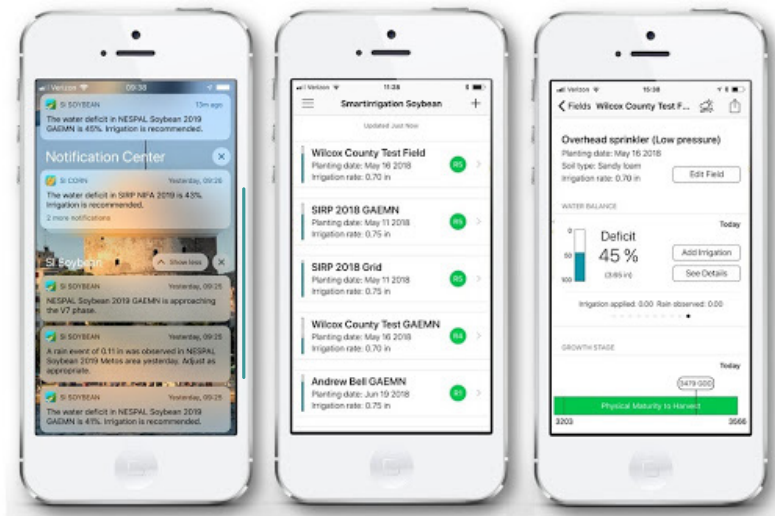


Figure 2: Screenshots of the SmartIrrigation Soybean app: a) Notifications sent to a user (left); b) App front page showing fields registered by this user (middle); c) Single field page showing the soil profile, water deficit, and other crop-specific parameters (right).

All of these activities will support improved forecasts and drought designations, increasing the ability of communities to build resilience and manage/mitigate extreme events.

## Funding and Support

This project is being funded by the NOAA Weather Program Office, with programmatic support provided by the National Integrated Drought Information System (NIDIS) and the National Coordinated Soil Moisture Monitoring Network. This project supports the missions of NIDIS, the National Cooperative Observer Program, the NOAA Water Initiative, and the Weather Research and Forecasting Innovation Act.

### Contact Information:

- NOAA Project Manager: Mark Vincent, OAR Weather Program Office, [mark.vincent@noaa.gov](mailto:mark.vincent@noaa.gov)
- Alabama Project Director: John Christy, the University of Alabama in Huntsville, [christy@nsstc.uah.edu](mailto:christy@nsstc.uah.edu)
- Georgia Project Director: George Vellidis, University of Georgia, [yiorgos@uga.edu](mailto:yiorgos@uga.edu)
- Florida Principal Investigator: William Lusher, University of Florida, [rlusher@ufl.edu](mailto:rlusher@ufl.edu)
- Southeast Regional Drought Information Coordinator: Meredith Muth, NIDIS, [meredith.f.muth@noaa.gov](mailto:meredith.f.muth@noaa.gov)
- National Coordinated Soil Moisture Monitoring Network: Marina Skumanich, NIDIS, [marina.skumanich@noaa.gov](mailto:marina.skumanich@noaa.gov)