
South Carolina Drought and Water Shortage Tabletop Exercise

Summary Report

September 27, 2017
South Carolina Emergency Operations Center
West Columbia, SC

Prepared by
Ekaterina Altman and Kirsten Lackstrom
Carolinas Integrated Sciences & Assessments (CISA)
April 2018



SCEMD



Table of Contents

MEETING SUMMARY	3
PLANNING TEAM	4
ONLINE RESOURCES	5
ACKNOWLEDGMENTS.....	6
INTRODUCTION: DROUGHT IN SOUTH CAROLINA	7
DROUGHT RESPONSE AND PLANNING	8
THE SOUTH CAROLINA DROUGHT RESPONSE PROGRAM	8
LOCAL DROUGHT PLANS AND ORDINANCES	11
SOUTH CAROLINA DROUGHT RESPONSE PLAN, APPENDIX 10 OF THE EMERGENCY OPERATIONS PLAN.....	12
BASIN-LEVEL RESPONSE AND PLANNING.....	13
SOUTH CAROLINA DROUGHT AND WATER SHORTAGE TABLETOP EXERCISE	14
GOALS AND OBJECTIVES	14
OVERVIEW OF THE EXERCISE.....	15
<i>Time Point 1: Moderate Drought Statewide</i>	18
<i>Time Point 2: Severe Drought Statewide</i>	21
<i>Time Point 3: Extreme Drought Statewide</i>	24
<i>Time Point 4: Extreme Drought Intensifies</i>	28
<i>Time Point 5: Activation of the Emergency Operations Plan</i>	31
KEY THEMES AND PRIORITIES IDENTIFIED AT THE EXERCISE	33
PLANS AND PROCEDURES.....	33
COMMUNICATIONS.....	33
EDUCATION AND AWARENESS	34
DATA AND INFORMATION	34
POST-EXERCISE SURVEY	36
VALUE OF THE EXERCISE	36
ACTION ITEMS AND FUTURE EXERCISES	38
NEXT STEPS	39
APPENDIX A: PARTICIPANT LIST	40
APPENDIX B: AGENDA	42
APPENDIX C: DISCUSSION QUESTIONS	43

Meeting Summary

Many entities across South Carolina have responsibilities for drought response and planning, contributing to a complex landscape of plans, procedures, and stakeholders. Recent droughts have demonstrated the importance of working together and highlighted aspects of drought response and planning that could be reviewed to ensure that relevant processes and information remain current and continue to meet the needs of water resource managers and users. However, while recent droughts have provided opportunities to use and implement state and local plans, there has not been a systematic effort to review and assess their effectiveness.

On September 27, 2017, the South Carolina Drought and Water Shortage Tabletop Exercise gathered 80 participants representing 40 organizations at the South Carolina Emergency Operations Center in West Columbia, SC, to review plans and procedures that govern responses to drought and water shortages on state, basin, and local levels. Attendees from state and federal agencies, local water utilities, reservoir managers, and the State Emergency Response Team (SERT) walked through a series of gradually worsening drought scenarios to exercise drought response and an activation of the Emergency Operations Plan (EOP).

The exercise helped to identify strengths and areas for improvement of the State's drought response. Key needs and action items identified by participants include:

1. **Updated drought response plans and procedures** to ensure a coordinated and timely response to droughts;
2. **Greater educational opportunities** to enhance agencies' familiarity with the Drought Response Program and their role in drought response and mitigation;
3. **More effective communications** before, during, and after drought events, across agencies and with the public;
4. **Enhanced data and information products** that can be used to build common understanding of drought risks, impacts, and vulnerabilities.

Participants represented a variety of agencies as well as different drought roles (i.e., management and planning, monitoring, and research) and the tabletop exercise created an opportunity for participants to connect face-to-face which will help in future collaboration efforts. The exercise also provided an opportunity for learning and building participants' awareness about drought response and responsibilities.

This report provides an overview of the South Carolina's drought response plans and procedures, as well as a summary of the activities and lessons learned from the State's first drought tabletop exercise.



South Carolina Drought and Water Shortage Tabletop Exercise at the South Carolina Emergency Center on September 27, 2017, in West Columbia, SC. Photo courtesy of CISA.

Planning Team

Jeff Allen

Director
SC Water Resources Center
Clemson University

Ekaterina Altman

Research Assistant
Carolinas Integrated Sciences & Assessments
University of South Carolina

Robert Burton

Plans Manager
SC Emergency Management Division

Amanda Farris

Program Manager
Carolinas Integrated Sciences & Assessments
University of South Carolina

Kirsten Lackstrom

Research Associate
Carolinas Integrated Sciences & Assessments
University of South Carolina

Hope Mizzell

SC State Climatologist
SC Department of Natural Resources

Marshall Sykes

Dam Safety Coordinator
SC Emergency Management Division

Dawn White

Program Manager
SC Water Resources Center
Clemson University

Online resources

Supporting materials for the South Carolina Drought and Water Shortage Tabletop Exercise are available on the South Carolina State Climatology Office and Carolinas Integrated Sciences and Assessments (CISA) websites.

South Carolina Department of Natural Resources State Climatology Office

http://www.dnr.sc.gov/climate/sco/Drought/drought_current_info.php

CISA's Support for South Carolina's Drought Response Program

http://www.cisa.sc.edu/projects_drought-response.html



The screenshot shows the CISA website header with the logo and navigation menu. The main content area features a title 'Support for South Carolina's Drought Response Program' and a paragraph explaining the project's goal. A photograph of a person in a field is included, with a caption below it.

CISA
Integrating Climate Science & Decision Making in the Carolinas

About+ Outreach+ Projects+ Resources+

 CISA
Carolinas Integrated Sciences and Assessments
A NOAA RISA TEAM

Home | Current Projects | Drought | Drought Response

Support for South Carolina's Drought Response Program

CISA and the South Carolina State Climatology Office (SC SCO) initiated this project in 2017 with the overarching goal of enhancing the State's Drought Response Program and improving drought preparedness and response.



Disappearing Irrigation pond during the 2002 drought.
Courtesy of The State

Informational Materials for the 2017 South Carolina Drought Tabletop Exercise

- [2017 SC Drought Tabletop Executive Summary](#)
- [SC Drought Tabletop Exercise Agenda, September 27, 2017](#)
- [South Carolina Drought Overview Presentation](#)
- [Drought Scenarios for Tabletop Exercise](#)
- [SC Drought Response Action and Tabletop Discussion Questions](#)
- [SC Drought Response Act](#)
- [SC Drought Response Plan, Appendix 10 of the Emergency Operations Plan](#)
- [SC Drought Regulations](#)
- [SC Model Drought Management Plan and Ordinance](#)
- [SC Surface Water Withdrawal, Permitting Use, and Reporting Act](#)
- [SC Surface Water Withdrawal, Permitting, and Reporting Regulations](#)
- [Proposed Drought Update for the SC Hazard Mitigation Plan](#)

Acknowledgments

The planning team thanks Scott Harder (South Carolina Department of Natural Resources) and Darryl Jones (South Carolina Forestry Commission) for their assistance with the development of graphics and information for the drought scenarios.

The planning team also acknowledges the South Carolina Emergency Management Division leadership and staff for their participation and providing the Emergency Operations Center for the exercise.

Funding for CISA's involvement in this project comes from the National Oceanic and Atmospheric Administration's (NOAA) Climate Program Office (Grant Nos. NA11OAR4310148 and NA16OAR4310163).



Attendees of the event exercised state-, basin-, and local-level response to drought and water shortage. Photo courtesy of CISA.

Introduction: Drought in South Carolina

The South Carolina Drought Response Act¹ defines drought as “a period of diminished precipitation which results in negative impacts upon the hydrology, agriculture, biota, energy, and economy of the State.” Droughts happen frequently in South Carolina. Historical records show that South Carolina experienced more droughts during the last twenty years when compared to the longer observational record (Figure 1). South Carolina experienced periods of severe and extensive droughts in the 1920s, 1930s, 1950s, and 1980s. During the last two decades, statewide droughts persisted in 1998-2003, 2007-2009, 2010-2013, and extreme drought affected the Upstate region in 2016-2017.

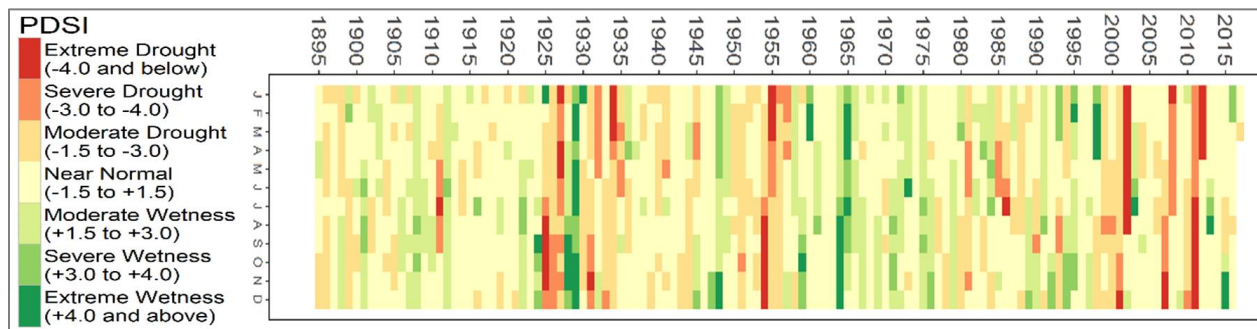


Figure 1: South Carolina Palmer Drought Severity Index 1895-2016 (Source: [Carolinas Precipitation Patterns & Probabilities: An Atlas of Hydroclimate Extremes](#))

Droughts are unlike other natural hazards, due to their expansive temporal and spatial scale and wide-ranging impacts (Table 1). They can adversely affect water resources, ecology, and public health. Droughts impact water-dependent sectors including agriculture, forestry, energy production, tourism and recreation, and other industries.

Table 1: Droughts affect multiple sectors and resources.²

Sector	Affected Resources
Agriculture	Farming, aquaculture, horticulture, forestry, and ranching
Business and Industry	Non-agriculture businesses
Energy	Power production and demand
Fire	Forest, range, and urban fires that occur during drought events
Plants and Wildlife	Biota, fisheries, forests, other fauna and flora
Society and Public Health	Changes in public behavior and human health effects
Tourism and Recreation	Aesthetics and leisure activities
Water Supply and Quality	Surface or subsurface water supplies

¹ South Carolina Drought Response Act. Code of Laws of South Carolina. 1976. § 49-23-10 et seq., as amended.

² Drought Impact Reporter, National Drought Mitigation Center, <http://droughtreporter.unl.edu/map/>.

Drought Response and Planning

The South Carolina Drought Response Program

Formal plans and procedures help water resource managers, and other decision-makers, minimize impacts associated with drought while protecting and extending water supplies during severe and prolonged events. South Carolina has a long history of state-level drought response and management, with early efforts initiated after a severe drought in the 1980s.³ The South Carolina Drought Response Program consists of legislation, regulations, and procedures that establish recommended and required response at moderate, severe, and extreme drought alert phases (Figure 2).

The **South Carolina Drought Response Act**⁴ and the supporting regulations⁵ formally establish and describe the responsibilities of the **South Carolina Drought Response Committee (DRC)**, the major drought decision-making entity in the State. The DRC is composed of statewide and local members. **State agency members** include the Emergency Management Division, the Department of Health and Environmental Control, the Department of Agriculture, the Forestry Commission, and the Department of Natural Resources.

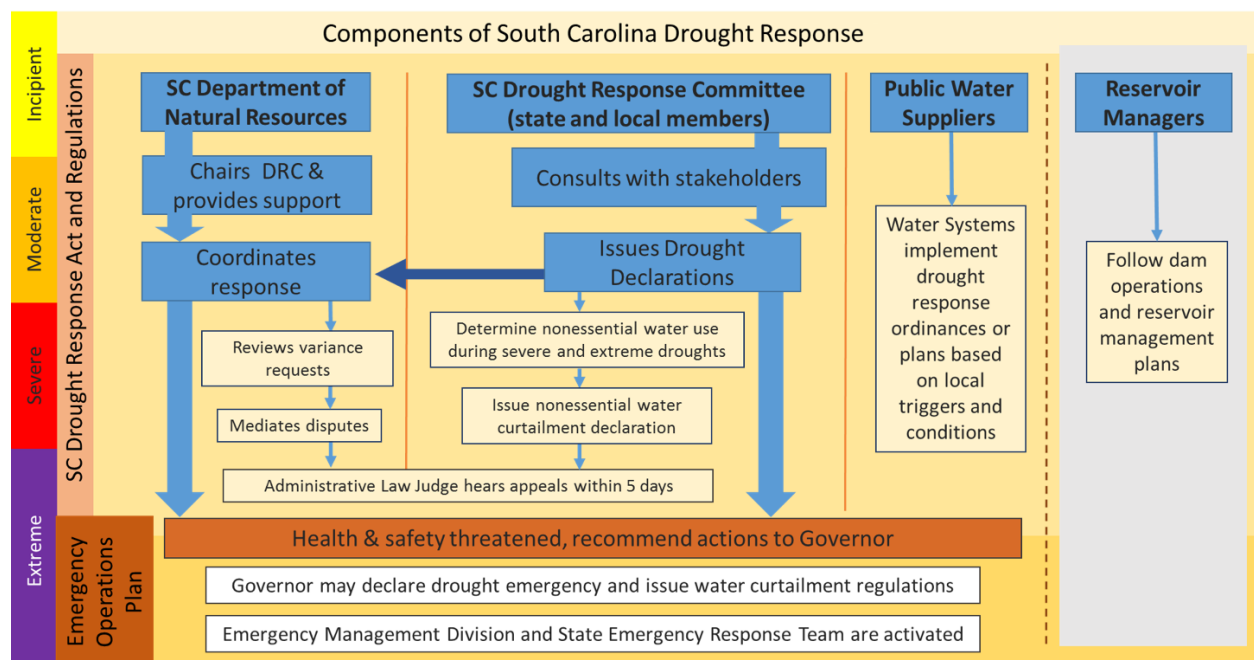


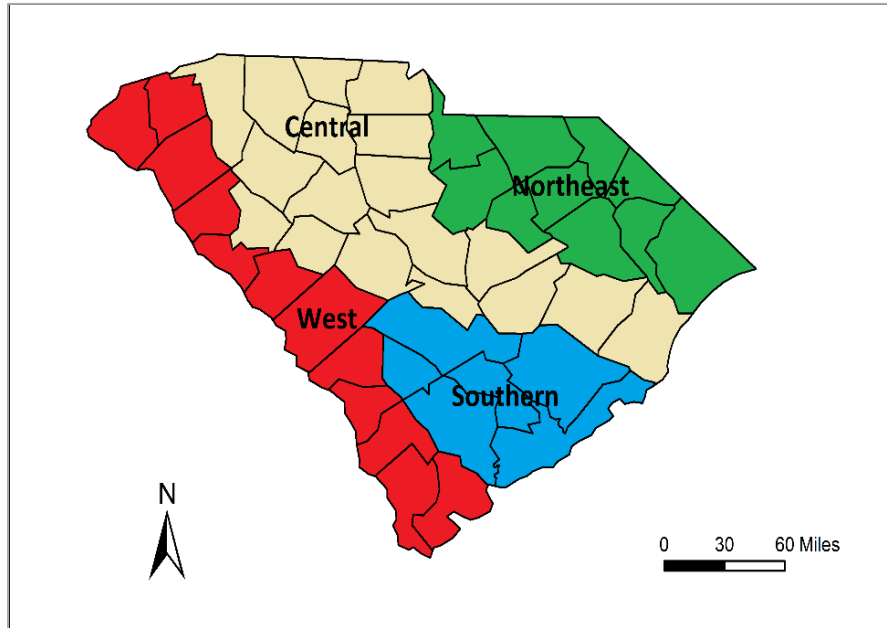
Figure 2: Components of South Carolina Drought Response and flowchart of responsibilities and actions at different stages of drought.

³ Mizzell, H. P. and V. Lakshmi. 2003. Integration of Science and Policy During the Evolution of South Carolina’s Drought Program. In R. Lawford, D. Fort, H. Hartmann, and S. Eden (Eds.), *Water: Science, Policy, and Management: Challenges and Opportunities*, pp. 311-340. Washington, DC: American Geophysical Union.

⁴ South Carolina Drought Response Act. Code of Laws of South Carolina. 1976. § 49-23-10 et seq., as amended.

⁵ South Carolina Drought Response Regulations 121-11.1 - 121-11.12, for §49-23-10 et seq., S.C. Code of Laws.

Local members are organized according to Drought Management Areas (Figure 3) and represent counties, municipalities, public service districts, private water suppliers, agriculture, industry, domestic users, councils of government, commissions of public works, power generation facilities, special purpose districts, and Soil and Water Conservation Districts.



DMA	South Carolina Counties
West	Abbeville, Aiken, Allendale, Anderson, Barnwell, Beaufort, Edgefield, Hampton, Jasper, McCormick, Oconee, Pickens
Central	Calhoun, Cherokee, Chester, Clarendon, Fairfield, Georgetown, Greenville, Greenwood, Laurens, Lexington, Newberry, Richland, Saluda, Spartanburg, Sumter, Union, Williamsburg, York
Northeast	Chesterfield, Darlington, Dillon, Florence, Horry, Kershaw, Lancaster, Lee, Marion, Marlboro
Southern	Bamberg, Berkeley, Charleston, Colleton, Dorchester, Orangeburg

Figure 3: South Carolina Drought Management Areas and Counties.

Roles and Responsibilities. In coordination with the South Carolina Department of Natural Resources (DNR) and State Climatology Office (SCO), the DRC monitors and evaluates drought-related data and information, consults with stakeholders about conditions and impacts, designates drought levels at the county level as defined by the Drought Response Act, and disseminates drought status information to the public.

Monitoring Drought. Multiple drought indicators and indices are used to assess drought (Table 2). *Indicators* are values used to describe drought conditions, using precipitation, stream flow, groundwater and reservoir levels, or soil moisture information. *Indices* are computed numerical representations of drought severity, using climatic or hydrological data as inputs. Some indices were developed for specific purposes. For example, the Crop Moisture Index measures agricultural drought during the growing season and the Keetch-Byram Drought Index is widely used to measure forest fire potential. Indicators and indices are not anticipated to be a perfect match to each other or to all conditions.⁶ Therefore, multiple indicators and expert judgment are required to evaluate droughts and drought impacts.

Table 2: South Carolina drought indices and indicators as outlined in the regulations for the Drought Response Act.

Indicators and Indices	Description	Data Inputs	Drought Type and Application
Palmer Drought Severity Index (PDSI)	Depicts prolonged (months, years) abnormal dryness or wetness	Monthly temperature, precipitation, and soil moisture	Meteorological, Agricultural
Crop Moisture Index (CMI)	Depicts short-term (up to 4 weeks) abnormal dryness or wetness	Weekly precipitation, mean temperature, and previous week's CMI value	Meteorological, Agricultural
Standardized Precipitation Index (SPI)	Compares observed precipitation amount (from 1- to 24-month periods) with long-term averages for the same period	Precipitation	Meteorological (≤ 3 months) Agricultural (≤ 6 months) Hydrological (> 6 months)
Keetch-Byram Drought Index (KBDI)	Depicts moisture deficiencies in the upper layers of the soil; used to monitor fire danger	Daily maximum temperature, daily precipitation	Meteorological, Agricultural
U.S. Drought Monitor (USDM)	A weekly product that uses a variety of drought indicators and indices; designed to provide a national-scale view of drought extent and severity	Multiple (climatological, hydrological, soil moisture, and others)	Multiple
Average daily streamflow	Considers average streamflow over two consecutive weeks, as compared to historic minimum flows for those same weeks	Streamflow	Hydrological
Ground Water, static water level in an aquifer	Considers groundwater levels over two consecutive months, as compared to historic levels for those same months	Groundwater	Hydrological

⁶ World Meteorological Organization (WMO) and Global Water Partnership (GWP). 2016. Handbook of Drought Indicators and Indices (M. Svoboda and B. A. Fuchs). Integrated Drought Management Program (IDMP), Integrated Drought Management Tools and Guidelines Series 2. Geneva.

Water Use during Drought. The DRC may recommend the curtailment of nonessential water use during severe and extreme droughts if such action is considered necessary to ensure adequate supplies of water (SC Code Ann. §49-23-70). The DRC is also responsible for reviewing and determining which nonessential water uses should be curtailed (Table 3). DNR is responsible for issuing and disseminating a curtailment declaration, reviewing variance requests, and mediating disputes arising from competing demands for water. In addition, any entity affected by a DRC declaration has the right to appeal to the Administrative Law Court, within five days of the declaration. The Court must hear appeals within five days of the filing.

Table 3: Essential and nonessential water use categories as outlined in the SC Drought Response Act and supporting regulations. The curtailment of water use may involve adjusting the quality of water to meet the water use, adjusting the time of water use, and/or utilizing different sources of water.

Essential Water Use Categories	Nonessential Water Use Categories
<ul style="list-style-type: none"> • Firefighting purposes • Health and medical purposes • Agricultural operations for food production • Minimum streamflow requirements • Water levels in the potable drinking water supplies* above and below groundwater tables • Use of water to satisfy federal, state, or local public health and safety requirements* 	<ul style="list-style-type: none"> • Agricultural use <ul style="list-style-type: none"> - Irrigation • Commercial use <ul style="list-style-type: none"> - Commercial domestic use - Commercial process use • Domestic use <ul style="list-style-type: none"> - Inside use - Outside use • Electric Power Generation • Industrial use <ul style="list-style-type: none"> - Industrial domestic use - Once through cooling - Industrial process use • Institutional use • Recreational use

* The highest priority in the essential water category

Local Drought Plans and Ordinances

The Drought Response Act requires all public water suppliers to develop and implement local drought plans and ordinances. **The Drought Regulations recognize that local governments have primary responsibility for alleviating drought impacts and encourage cooperation among neighboring water systems.** DNR created a sample drought plan and ordinance for local governments and water systems to use in developing their own documents.

South Carolina Drought Response Plan, Appendix 10 of the Emergency Operations Plan

The South Carolina Drought Response Plan is located in Appendix 10 of the State’s Emergency

Operations Plan (EOP). The plan directs state agencies and local responders during natural, technological, or human-made disasters with the goal of ensuring a coordinated and effective response in the State. It describes actions when drought conditions have reached a level of severity beyond the scope of the DRC and local communities. The EOP is regularly updated; the drought appendix was most recently updated in June 2017.

The **South Carolina Emergency Management Division (EMD)** maintains the EOP and leads multi-agency response to hazard events. Upon an activation of the EOP, EMD and the State Emergency Response Team (SERT) assemble in the South Carolina Emergency Operations Center to coordinate the State’s response. Table 4 lists the Emergency Support Functions (ESFs) and the agencies with primary responsibility to support response and recovery efforts.

Table 4: South Carolina’s Emergency Support Functions and Lead State Agencies.

ESF Number and Title		Lead State Agency
1	Transportation	Department of Transportation
2	Communications	Budget and Control Board, Division of Technology Operations
3	Public Works and Engineering	Budget and Control Board, Division of Procurement Services
4	Firefighting	Forestry Commission (Wild Fires) Department of Labor, Licensing and Regulation, Division of Fire and Life Safety (Structural Fires)
5	Information and Planning	Emergency Management Division
6	Mass Care	Department of Social Services
7	Resource Support	Emergency Management Division
8	Health and Medical Services	Department of Health and Environmental Control
9	Search and Rescue	Department of Labor, Licensing, and Regulation, Division of Fire and Life Safety
10	Hazardous Materials	Department of Health and Environmental Control
11	Food Services	Department of Social Services
12	Energy	Office of Regulatory Staff
13	Law Enforcement	Law Enforcement Division
14	Long Term Recovery and Mitigation	Emergency Management Division
15	Public Information	Emergency Management Division
16	Emergency Traffic Management	Department of Public Safety
17	Animal/Agriculture Emergency Response	Clemson University Livestock - Poultry Health
18	Donated Goods and Volunteer Services	Budget and Control Board, General Services Division
19	Military Support	National Guard
24	Business and Industry	Department of Commerce

The EOP (Drought Response Plan) may be activated when drinking water supplies are at risk of being depleted; public health, safety, and welfare are threatened; local resources and actions are unable to provide for citizens' safety; or state-level actions and resources are necessary to provide relief from impacts. Upon determining that state-level response is needed, the DRC would recommend EOP activation to EMD and the Governor. This activation would trigger a series of response measures and actions, for example:

- **The Governor** may declare a State of Emergency or a Drought Emergency by Executive Order, issue emergency curtailment of water withdrawals and use, or seek a federal disaster declaration.
- **State agencies** (including those on the DRC and SERT) will coordinate on disseminating information to the public, implementing measures to secure and distribute water supplies, and providing relief or assistance to affected sectors and communities.
- **Federal agencies** (e.g., U. S. Army Corps of Engineers [USACE], National Oceanic and Atmospheric Administration [NOAA], U. S. Department of Agriculture [USDA]) will be asked to assist with providing drought relief and informational resources.

Basin-Level Response and Planning

Hydroelectric dam and reservoir managers play a critical role in water resource management. Two examples of basin-level drought planning and response were discussed at the tabletop exercise. First, Duke Energy projects located in the Catawba-Wateree, Keowee-Toxaway, and Yadkin-Pee Dee basins utilize Low Inflow Protocols (LIPs) to guide dam releases and other actions at different stages of drought. In the Catawba-Wateree, public water systems and other major water users participate in that basin's [Drought Management Advisory Group](#). Member organizations share responsibility for water conservation and work together to follow the LIP triggers and conservation measures.

Second, the United States Army Corps of Engineers (USACE), Savannah District, manages a series of dams and reservoirs in the [Savannah River Basin](#). Drought in the 1980s led to the development of the first Savannah River Basin Drought Plan. Subsequent droughts have led to a series of plan reviews and revisions to improve the management of water resources and balance needs for hydropower generation, recreation, navigation, water supply, flood risk management, and the environment.^{7,8}

⁷ U.S. Army Corps of Engineers. 2012. *Savannah River Basin Drought Management Plan*. <http://water.sas.usace.army.mil/DroughtPlan/SRBDMMP.pdf>

⁸ U. S. Army Corps of Engineers. 2017. *Savannah River Basin Comprehensive Study, GA & SC. Interim Study 2. Integrated Feasibility Report and Environmental Assessment For the Drought Contingency Plan Update*.

South Carolina Drought and Water Shortage Tabletop Exercise

Goals and Objectives

Existing drought plans, ordinances, and procedures are important tools in guiding state-, basin-, and local-level response to drought. South Carolina has experienced several droughts over the past two decades, highlighting the need for multiple agencies and organizations to work together to effectively manage water resources during these events. The goal of this exercise was to generate ideas that will be used to enhance South Carolina's drought response and preparedness and the State's capacity to address a water shortage situation. Specific objectives were as follows:

1. Identify and understand the strengths and breaking points in the [SC Drought Response Act](#), [SC Drought Regulations](#), [SC Emergency Response Plan Drought Annex](#), and [local drought plans and procedures](#)
2. Improve awareness of local, state, and federal players in South Carolina's drought response
3. Identify key mission areas for each State Emergency Support Function
4. Collect ideas and strategies for future exercises

Overview of the Exercise

The tabletop exercise took place at the Emergency Operations Center in West Columbia, SC, on September 27, 2017. The event convened over 80 representatives from various agencies and organizations responsible for drought response (Appendix A).

Prior to the exercise, the planning team developed a multi-year drought scenario to provide a realistic depiction of gradually intensifying drought conditions and impacts on water resources, energy production, agriculture, forestry, public health, and other sectors (Figure 4).⁹ While South Carolina has never activated the Emergency Operations Plan for drought, the “Extreme Drought Intensifies” and “Activation of the Emergency Operations Plan” stages were designed to be plausible scenarios by augmenting previous droughts’ duration and intensity. Five time points in the drought scenario were used for discussion:

1. Moderate Drought Statewide, July-August 2021
2. Severe Drought Statewide, December 2021
3. Extreme Drought Statewide, July-August 2022
4. Extreme Drought Intensifies, January 2023
5. Activation of the Emergency Operations Plan, February-April 2023

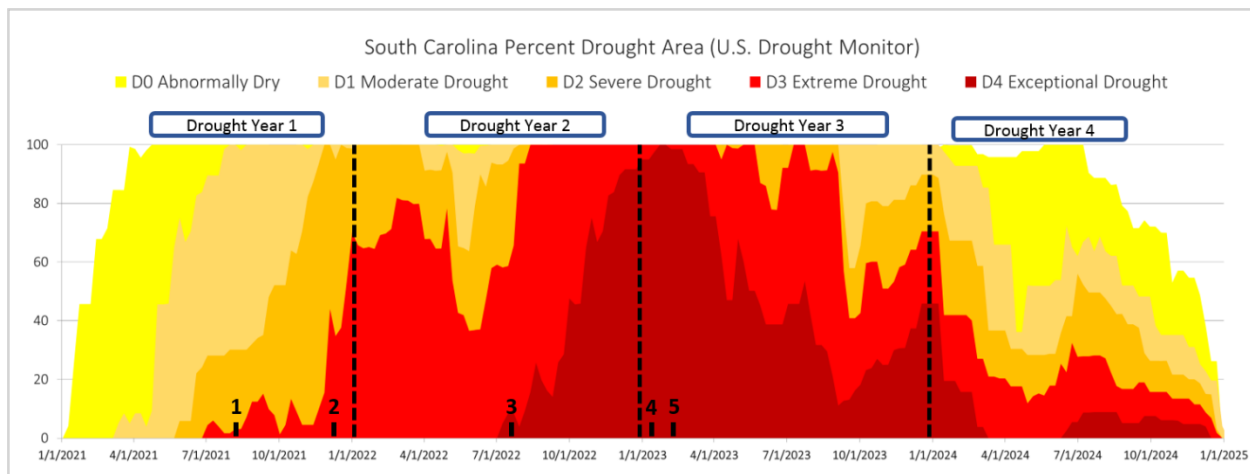


Figure 4: Timeline for the SC Drought and Water Shortage Exercise. The figure shows a hypothetical four-year drought, modeled after the United States Drought Monitor, with the five scenario time points noted on the graph.

⁹ The planning team consulted and adapted some of the materials developed by the University of Nebraska for the North Platte Natural Resources District Invitational Drought Tournament. For more information about the Nebraska project, see <http://droughtthira.unl.edu/index.php>.

During the exercise, activities were divided into several components. (See Appendix B for the agenda.) First, the planning team introduced attendees to the objectives and purpose of the exercise and provided an overview of relevant water and drought legislation.

Next, participants walked through the multi-year drought scenario. At each time point, maps, graphs, and other visualizations were presented to show drought conditions, impacts, and response. Drought conditions were shown using drought indicators and indices described in the State’s Drought Regulations (Table 5). Figures showing worsening wildfire and hydrological (i.e., streamflow, groundwater, and lake levels) impacts were similar to those typically presented at SC DRC meetings. Response actions were based on those outlined in South Carolina’s Drought Response Act and Regulations, as well as other plans operating in the State.

Table 5: Drought Indices and trigger levels from the South Carolina Drought Response Act and supporting regulations.

Indicator	Drought Phase			
	Incipient	Moderate	Severe	Extreme
Palmer Drought Severity Index (PDSI)	-0.50 to -1.49	-1.50 to -2.99	-3.00 to -3.99	≤ -4.00
Crop Moisture Index (CMI)	0.00 to -1.49	-1.50 to -2.99	-3.00 to -3.99	≤ -4.00
Standardized Precipitation Index (SPI)	0.00 to -0.99	-1.00 to -1.49	-1.50 to -1.99	≤ -2.00
Keetch-Byram Drought Index (KBDI)	300 to 399	400 to 499	500 to 699	≥ 700
U.S. Drought Monitor (USDM)	D0	D1	D2	≥ D3

The attendees were asked questions designed specifically to initiate discussion about the strengths and areas for improvement during each drought stage (Appendix C). Two questions were asked at each time point: one centered on communications and the other on organizational resources and capacity. Table 6 shows the main topics and questions discussed throughout the exercise.

The “hot wash” session, the final session of the exercise, provided time for the participants to review and reflect on what they learned and express suggestions for the next steps.

Table 6: Discussion questions for each time point in the multi-year drought scenario.

All Time Points and Drought Stages
<ul style="list-style-type: none"> • What, and how, is your organization communicating with the public? • What would help your organization more effectively respond to and prepare for drought?
Time Point 1: Moderate Drought Statewide (July-August 2021)
<ul style="list-style-type: none"> • Does your organization have a plan for monitoring, responding to, and preparing for drought? • Are drought response plans and ordinances up-to-date and current?
Time Point 2: Severe Drought Statewide (December 2021)
<ul style="list-style-type: none"> • How do inconsistencies at different levels (state, local, or basin) affect response and communications? • Are local ordinances and plans consistent with other drought plans in neighboring areas?
Time Point 3: Extreme Drought Statewide (July-August 2022)
<ul style="list-style-type: none"> • How do inconsistencies at different levels (state, local, or basin) affect response and communications? • Are local ordinances and plans consistent with other drought plans in neighboring areas? • As the DRC begins to evaluate conditions to determine if State action is needed, are existing plans and procedures effectively guiding the transition from local to state-level response?
Time Point 4: Extreme Drought Intensified (January 2023)
<ul style="list-style-type: none"> • What resources, information, or additional capacity does the DRC need to assess non-essential water use and curtail certain uses? • How will appeals to the Administrative Law Judge affect the timeliness of conservation and response efforts? • When exactly, and for how long, will the Emergency Operations Plan and State Emergency Response Team (SERT) be activated?
Time Point 5: Emergency Operations Plan is Activated (February-April 2023)
<ul style="list-style-type: none"> • Are the necessary resources, expertise, and capacity available? • What tasks or actions are not listed in the EOP, but should be included? • How will South Carolina coordinate with other states?

Time Point 1: Moderate Drought Statewide

The Scenario

South Carolina is experiencing a gradually worsening statewide drought (Figures 5 and 6). The Department of Natural Resources, the State Climatology Office, and the Drought Response Committee monitor conditions and disseminate information to water suppliers and the public. Other state agencies also monitor conditions and take actions to address emerging impacts.

Drought Conditions and Impacts

- La Niña contributes to lack of rain during winter-spring.
- Abnormally high temperatures and increased evaporation contribute to ‘flash drought’ situation; water demands and use increase.
- Most streams are at some stage of drought, leading to concerns about the declining trend toward extreme levels and potential water quality effects.
- Reservoir managers reduce releases from lakes to maintain storage; some lakes are below target level.
- Increased wildfire danger, higher than normal activity, on average >30 Class C (10-99 acres) wildfires per day. Concerns about negligent burning and seedling survival.
- Crops are withering, indicators show low soil moisture conditions, some areas are using irrigation earlier than normal. Lower-than-normal crop yields are expected.

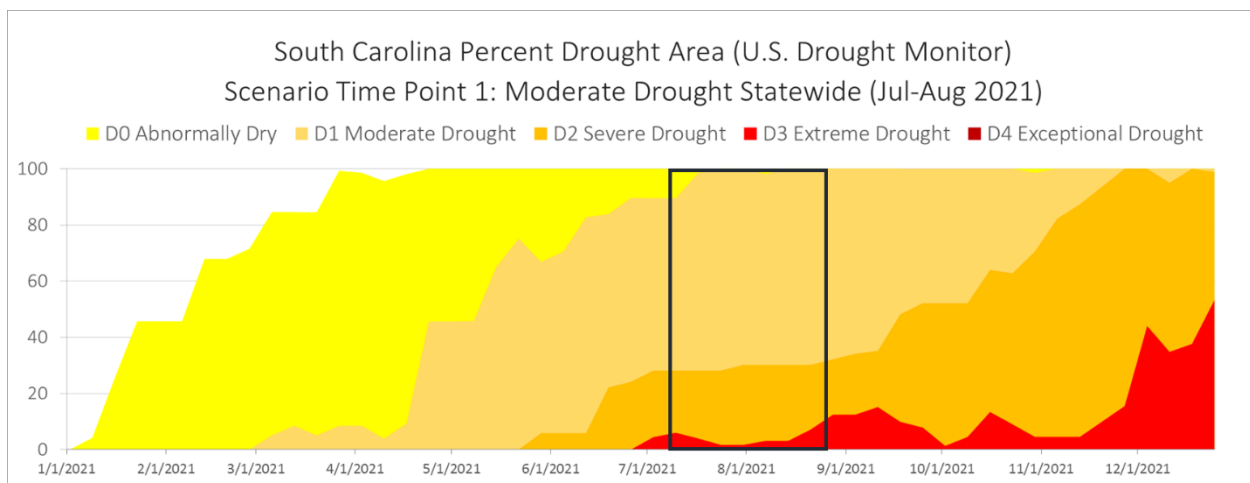
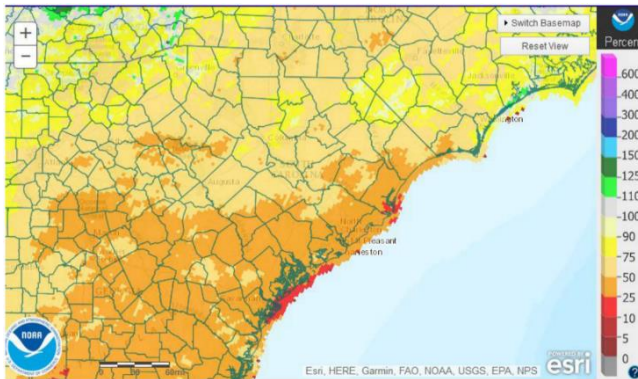
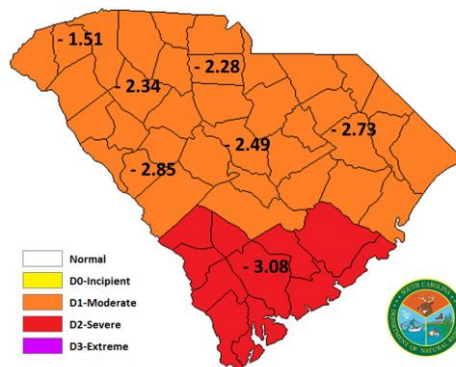


Figure 5: Percent area in drought at the Time Point 1, Moderate Drought Statewide.

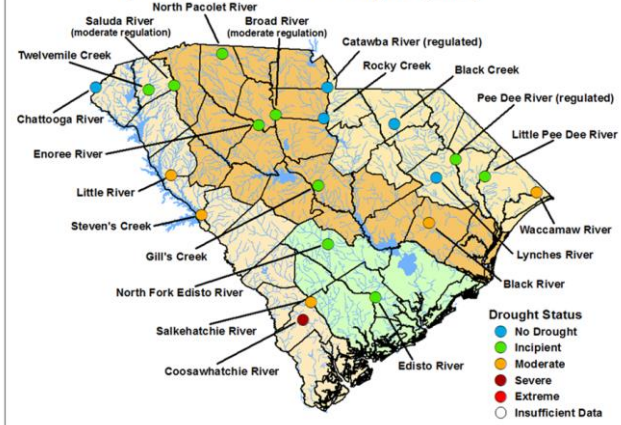
60-Day Departure from Normal Rainfall



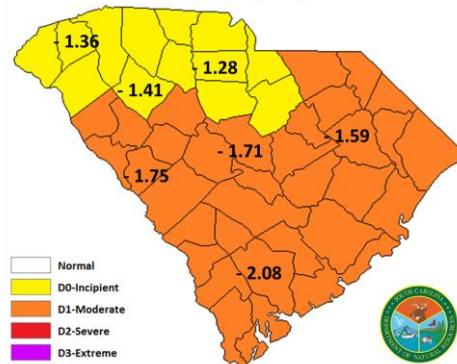
PALMER DROUGHT SEVERITY INDEX Week ending August 1, 2021



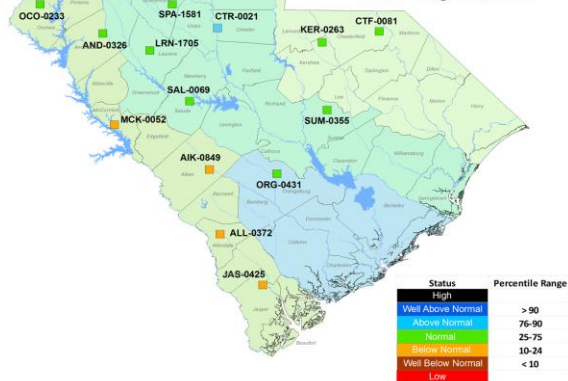
Stream Gage Drought Status (14-Day average streamflow August 1, 2021)



CROP MOISTURE INDEX Week ending August 1, 2021



SOUTH CAROLINA GROUNDWATER-DROUGHT MONITORING NETWORK Status - August 1, 2021



KEETCH-BYRAM DROUGHT INDEX August 1, 2021

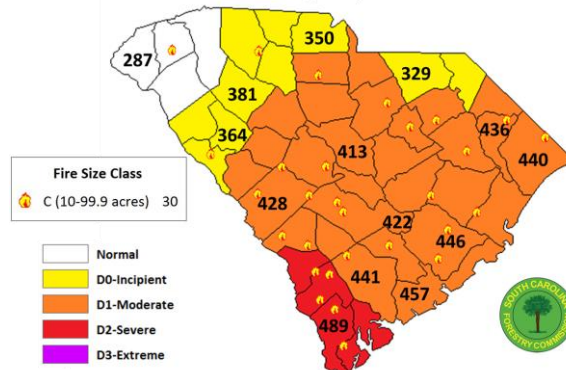


Figure 6: Drought indices and indicators for Time Point 1, Moderate Drought Statewide.

Response Actions

On the **state level**, DNR, SCO, and the DRC monitor climatic conditions, communicate and disseminate information, and make recommendations to assist water suppliers and users manage drought. Other state agencies monitor conditions and perform activities to address and/or alleviate impacts (e.g., agriculture, fire risks). The Forestry Commission issues Red Flag Fire Alerts for areas with higher wildfire risks. **Water suppliers** review plans and ordinances. Some may request voluntary water use restrictions. At the **basin-level**, the USACE Savannah River Basin Drought Contingency Plan is in place. Duke Energy implements LIPs for their hydropower projects.

Main Discussion Questions

- Does your organization have a plan for monitoring, responding to, and preparing for drought?
- How current and up-to-date are plans, ordinances, and processes?

Participant Reactions and Comments

Most documents supporting the SC Drought Response Program have not been updated for many years. This was one of the first issues identified by participants. They discussed the **need for updated plans and ordinances**, especially state and local drought documents, to reflect the latest knowledge and expertise to guide drought response.

A second important issue was the **large number of vacancies** on the Drought Response Committee. The complex and rigid appointment process and overall committee structure are weak points. The Governor's Office took interest in this issue.

Effective communications and messaging of drought information was a recurring theme during the exercise. It is a challenge for water utilities to communicate with the public and determine the most effective actions, particularly at early stages of drought when conditions may be fluctuating. The State expectation is that local level response is implemented effectively at this stage; however, there may be opportunities for the DRC or state agencies to assist with updating local plan triggers, response, and communications strategies.

Drought response in the Catawba-Wateree Basin was cited as a **"best practice" example** for its staged approach, coordination across water utilities and other users, and focus on public communications. One challenge is that the basin-level triggers and response actions may not always correspond to those in neighboring basins or those recommended by the DRC.

Time Point 2: Severe Drought Statewide

The Scenario

The severity of the drought has increased, contributing to declining water levels, growing wildfire risks, and poor grazing and agriculture conditions (Figures 7 and 8). State agencies increase monitoring and communications. Affected sectors (e.g., agriculture, forestry, industry) start to request assistance to reduce or manage impacts. Water systems review plans and ordinances and more require voluntary or mandatory water conservation.

Drought Conditions and Impacts

- Streamflows are <10% of normal for this time of year, unregulated streams are at or near record lows.
- Groundwater monitoring wells show continued declines; private well owners encouraged to secure alternate supplies if below-normal rainfall continues.
- Reservoir levels continue to drop, all major lakes are below target levels.
- Prolonged dry weather is expected to increase fire risk during peak fire season (February-April); increased number of fires and more intense fires require more personnel and equipment to control.
- Agricultural impacts include poor grazing conditions, lack of feed and forage for livestock, farmers purchasing hay, and low levels in irrigation ponds.
- DRC cautions about water hazards and navigating on lakes and rivers due to low levels.

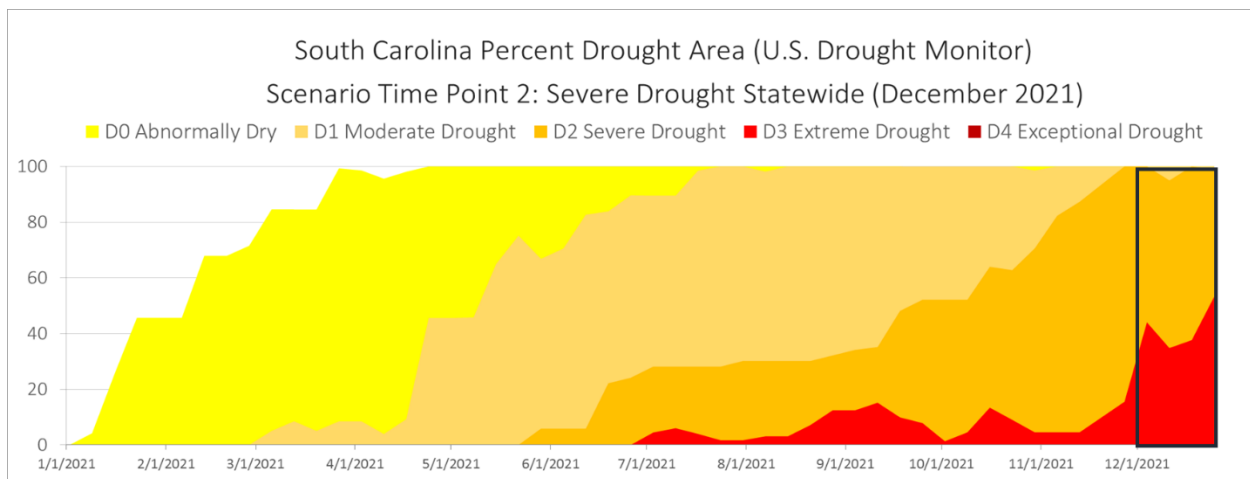
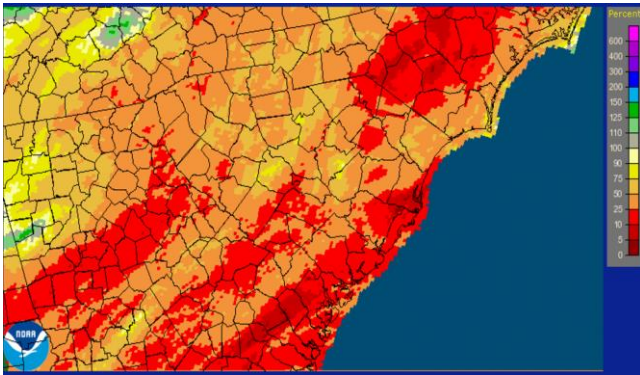
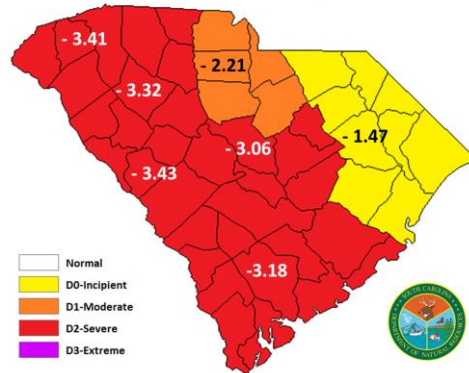


Figure 7: Percent area in drought at the Time Point 2, Severe Drought Statewide.

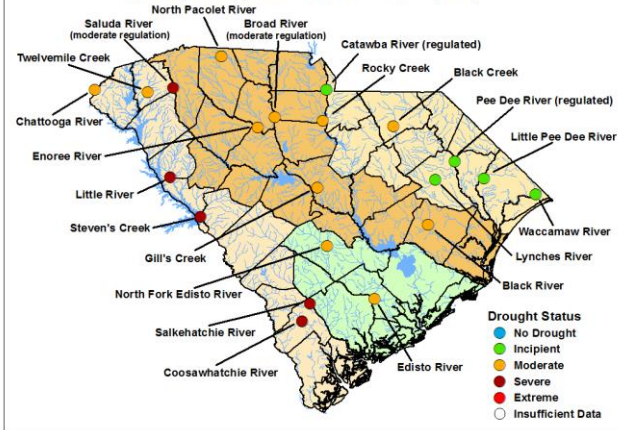
60-Day Departure from Normal Rainfall



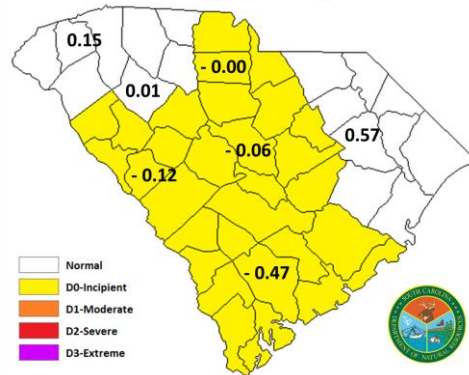
PALMER DROUGHT SEVERITY INDEX Week ending December 5, 2021



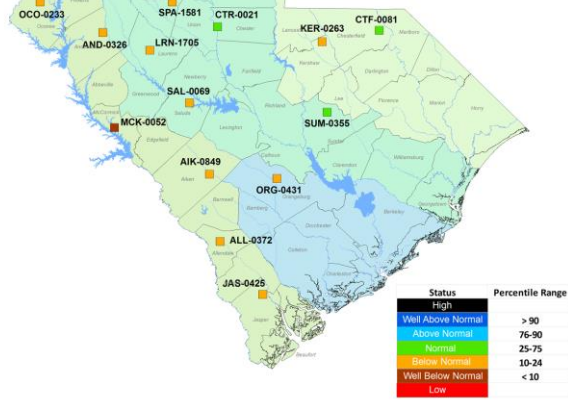
Stream Gage Drought Status (14-Day average streamflow December 5, 2021)



CROP MOISTURE INDEX Week ending December 5, 2021



SOUTH CAROLINA GROUNDWATER-DROUGHT MONITORING NETWORK Status - December 5, 2021



KEETCH-BYRAM DROUGHT INDEX December 5, 2021

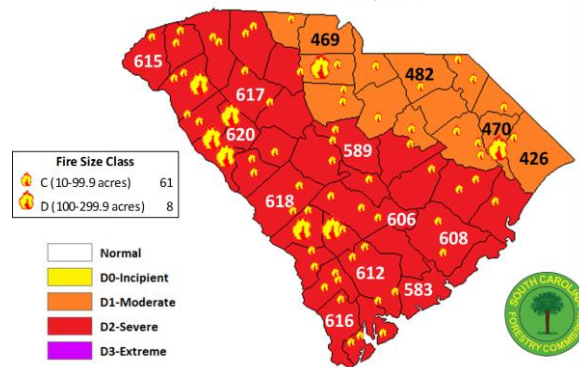


Figure 8: Drought indices and indicators for Time Point 2, Severe Drought Statewide.

Response Actions

At the **state level**, DNR, SCO, and the DRC continue to monitor conditions, communicate and disseminate information, and make recommendations to assist water suppliers and users in managing their drought response. The DRC, with DNR, requests that ESF-15 (Public Information) initiate a public information campaign. The Governor encourages awareness and voluntary conservation in a press release. Other state agencies monitor conditions and implement activities to address and/or alleviate impacts (e.g., agriculture, fire risks, and water supplies). **Water suppliers** review plans and ordinances. Some systems request mandatory conservation (~25%); some request voluntary conservation (~50%). At the **basin-level**, the USACE Savannah River Basin Drought Contingency Plan is in place. Duke Energy implements LIPs for their hydropower projects.

Main Discussion Questions

- How do inconsistencies at different levels (state, local, and basin) affect drought response and communications?
- Are local ordinances and plans consistent with other drought plans in neighboring areas?

Participant Reactions and Comments

The discussion highlighted issues that result from the **varied impacts, responses, and messaging** that occur at this stage. This is attributable to the disparate and disproportionate manner in which different areas, sectors, and systems are vulnerable to drought. Agriculture and forestry are likely to be adversely impacted during the earlier drought stages. Participants representing agriculture, forestry, and fire agencies elaborated on the significant impacts experienced by those sectors and their needs for assistance.

Meanwhile, local water systems and communities are also experiencing **water supply and quality impacts disproportionately**. As one attendee noted, some systems and sectors are better, and some are worse, than others in responding to drought. Mandatory restrictions are very difficult to implement. Local systems and boards are reluctant to issue restrictions, especially if their water supply is adequate.

A related challenge is the current **representation on the DRC**. Many active members are from larger water systems that are unlikely to experience a water supply shortage. Balancing the committee with representation from other sectors may help to broaden the impacts data and information considered at DRC meetings.

Overall, there is **divergent messaging** across the state: some sectors and communities may be severely affected while others have ample water resources. To enhance communications, one suggestion was for the DRC to conduct more frequent meetings and possibly public forums. This would support the dissemination of clear, consistent, and current drought information to water users and the general public.

Time Point 3: Extreme Drought Statewide

The Scenario

Widespread impacts to agriculture, forestry, water systems, and water-dependent businesses are occurring (Figures 9 and 10). Reservoir levels continue to drop, and major lakes are below target levels, reducing recreation opportunities and affecting local businesses such as marinas and outfitters. The U. S. Department of Agriculture declares 27 counties federal disaster areas. The Forestry Commission reports a higher-than-normal number of wildfires and consequently requests that the Governor activate the National Guard to assist with fire suppression. To encourage water conservation, the Governor issues a press release requesting that the public reduce water use. More water systems require water conservation for their customers.

Drought Conditions and Impacts

- Streamflow gauges show extreme drought levels and record lows.
- Reservoir levels continue to drop; all major lakes are below target levels.
- The Forestry Commission reports a higher-than-normal number of wildfires (24 Class D and 200 Class C wildfires, 15,000 acres burned) and several damaged or destroyed structures.
- Cattle producers bring in hay to feed cattle, USDA declares 27 counties federal disaster areas; 30% of corn, hay, and pasture crops are already lost.
- Some water systems and dischargers report water supply and quality concerns.
- Low water levels reduce recreational opportunities, affecting local businesses (e.g., marinas, outfitters).

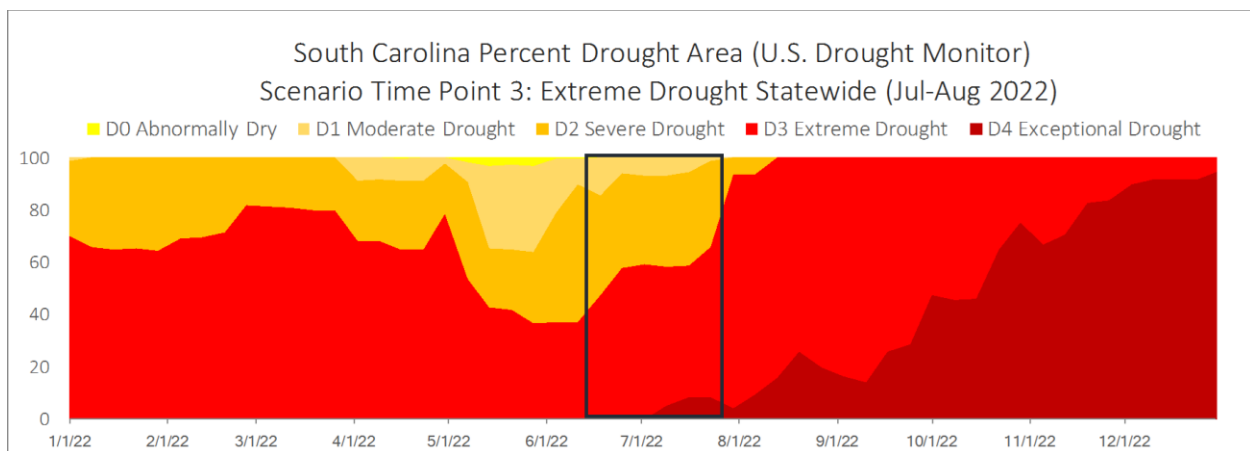
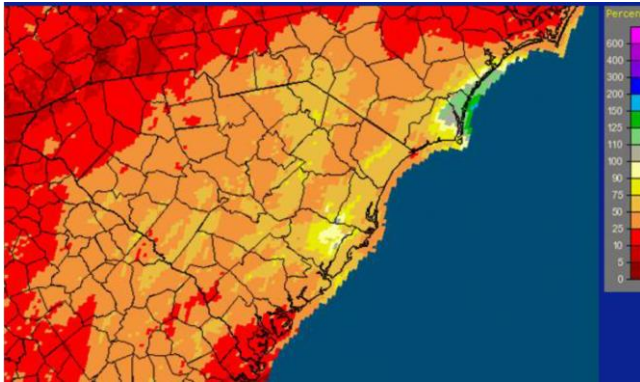
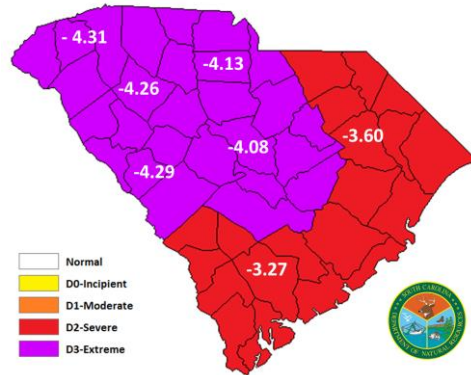


Figure 9: Percent area in drought at the Time Point 3, Extreme Drought Statewide.

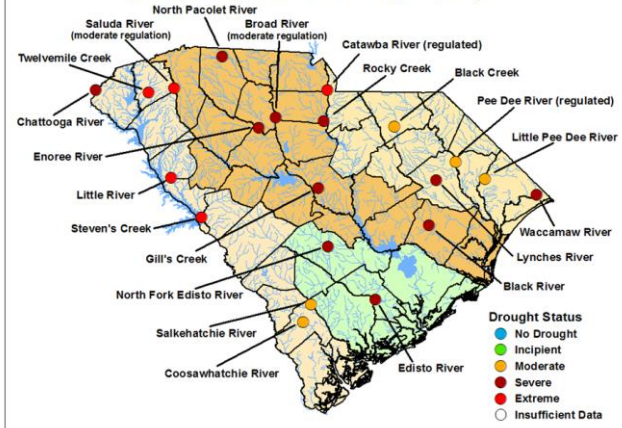
60-Day Departure from Normal Rainfall



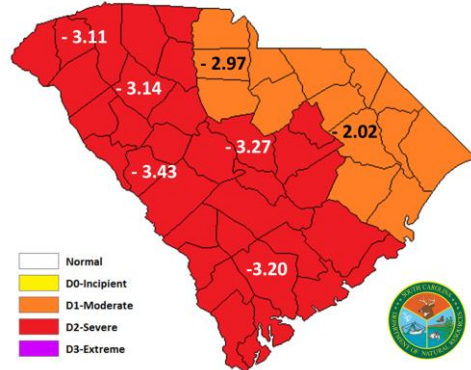
PALMER DROUGHT SEVERITY INDEX Week ending August 7, 2022



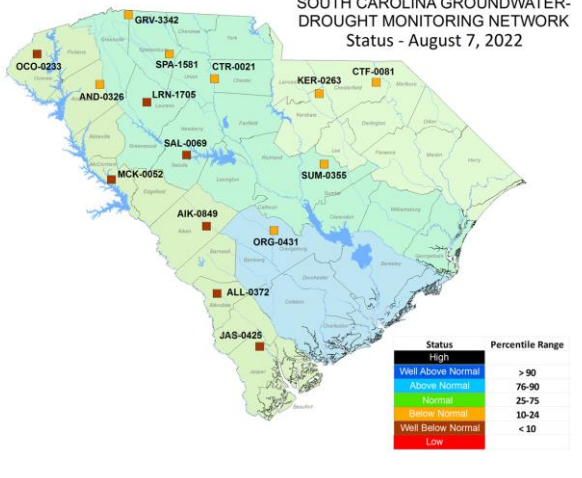
Stream Gage Drought Status (14-Day average streamflow August 7, 2022)



CROP MOISTURE INDEX Week ending August 7, 2022



SOUTH CAROLINA GROUNDWATER-DROUGHT MONITORING NETWORK Status - August 7, 2022



KEETCH-BYRAM DROUGHT INDEX August 7, 2022

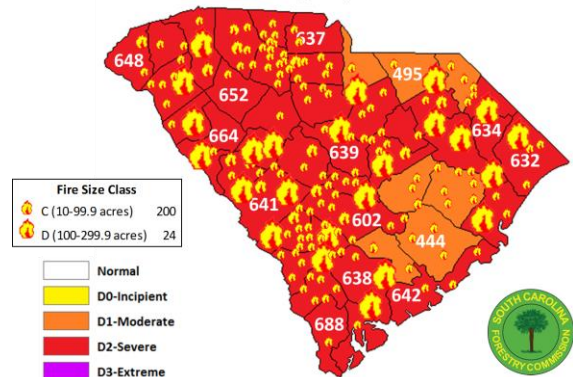


Figure 10: Drought indices and indicators for Time Point 3, Extreme Drought Statewide.

Response Actions

On the state level the DRC and DNR require mandatory reduction or curtailment of non-essential water use. They also recommend that the Governor issue a public statement that an extreme drought situation exists and that appropriate restrictions be imposed. DNR reviews and makes a determination on variance requests and mediates disputes regarding competing water demands. State agencies monitor conditions, collect information about impacts, and execute activities to address impacts.

Water suppliers determine if mandatory restrictions are required based on drought and water supply triggers, with a goal of reducing overall water use by 25%. Most water systems have requested voluntary conservation, and approximately 33% are at mandatory. Water suppliers increase their communications to customers, local media, and DNR, and implement additional measures to enforce water restrictions and address variance requests. Some systems initiate projects to secure additional supplies, for example by lowering intakes, deepening wells, expanding retention ponds, and interconnecting with other systems.

At the **basin-level**, the USACE Savannah River Basin Drought Contingency Plan is in place. Duke Energy implements LIPs for their hydropower projects.

Main Discussion Questions

- How do inconsistencies at different levels (state, local, and basin) affect drought response and communications?
- Are local ordinances and plans consistent with other drought plans in neighboring areas?
- As the DRC begins to evaluate conditions to determine if State action is needed, are existing plans and procedures effectively guiding the transition from local to state-level response?

Participant Reactions and Comments

Many concerns articulated at the severe drought stage were further discussed. Water managers expressed a continuing tension. Local water systems and businesses prefer to have a **flexible response to drought**, but a **lack of consistent messaging and actions** (e.g., statewide mandatory water use restrictions) can potentially have a detrimental effect on the long-term sustainability of water resources during an extended or extreme event.

The message to the public should be clear at this point that water resources need to be conserved and protected. However, low awareness of drought impacts, and the lack of consistent, clear messages, can hinder compliance with plans and procedures. Business and industry are not required to have plans, making it particularly difficult to **develop consistent response actions and communications** within an individual community or across a particular sector.

Participants suggested that the State ramp up statewide conservation measures prior to this level. They also identified a need to **record and document drought impacts**, especially any financial effects on systems implementing mandatory restrictions. Such information could help inform this transition period,

which currently goes from no actions required from the public to an impending emergency and mandatory water restrictions.

Greater efforts to **communicate with different groups, geographies, and regions** are necessary before and during this point. Since response at the extreme drought stage may begin to bring in emergency managers, SERT members, and the Governor's Office, they should be better informed about conditions prior to the extreme drought stage.

Time Point 4: Extreme Drought Intensifies

The Scenario

The State is approaching the third year of drought (Figures 11 and 12). Conditions are deteriorating, threatening public safety, health, and welfare.

Drought Conditions and Impacts

- Many water resource indicators (streamflow, reservoirs, ground water) show record lows.
- Wildfire risks continue to increase. There are 29 Class D (100-299 acres) and 400 Class C (10-99 acres) fires. Wildfires are more intense.
- Recreational facilities (e.g., state parks and forests, boat landings) are closed; upcoming events and competitions are being cancelled.
- The number of counties given USDA-disaster declarations increases.
- 60 water systems report water supply and quality concerns; some are in danger of running out of water (i.e., 100 days or less of water supply to meet expected demand).
- 15 water systems report pursuing emergency interconnections, options to increase water storage, and trucking in water. Coastal water supplies are being affected by saltwater intrusion.

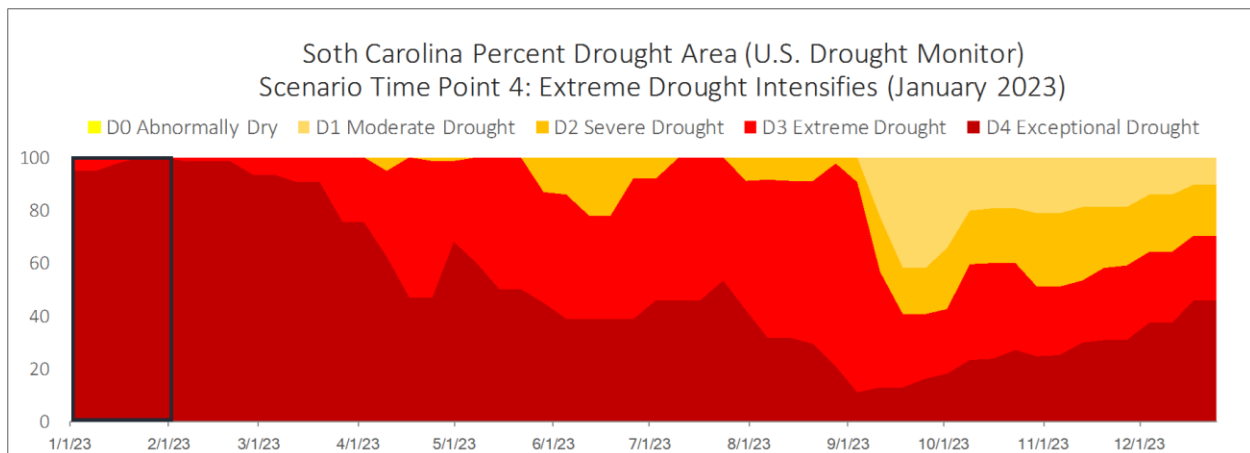
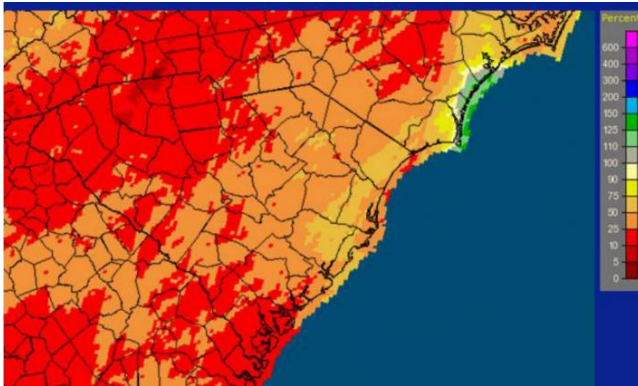
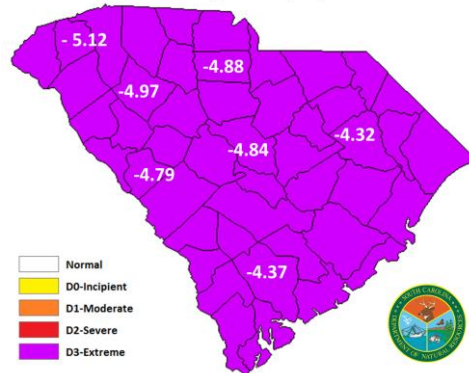


Figure 11: Percent area in drought at the Time Point 4, Extreme Drought Intensifies.

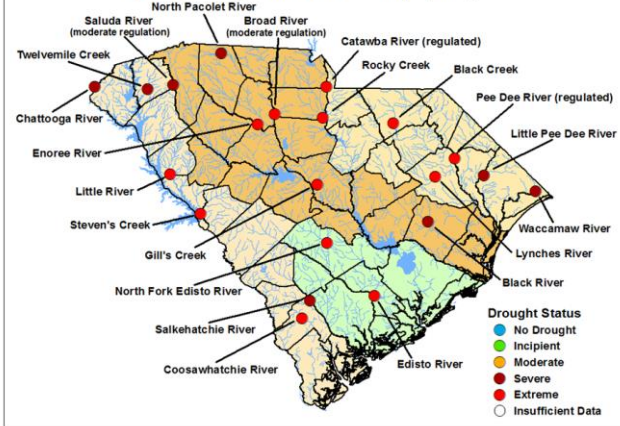
60-Day Departure from Normal Rainfall



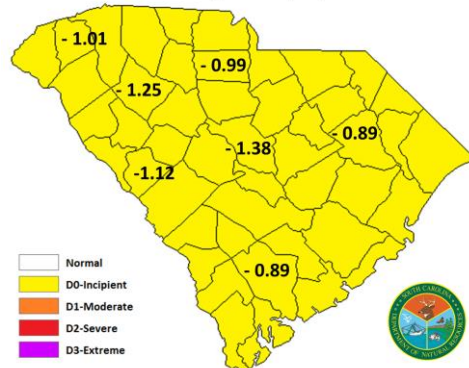
PALMER DROUGHT SEVERITY INDEX Week ending February 12, 2023



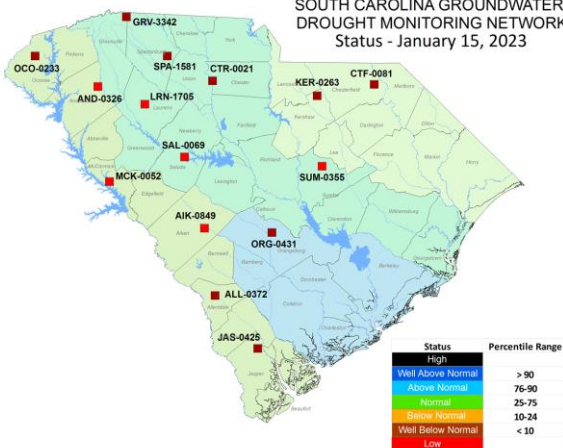
Stream Gage Drought Status (14-Day average streamflow January 15, 2023)



CROP MOISTURE INDEX Week ending February 12, 2023



SOUTH CAROLINA GROUNDWATER-DROUGHT MONITORING NETWORK Status - January 15, 2023



KEETCH-BYRAM DROUGHT INDEX February 12, 2023

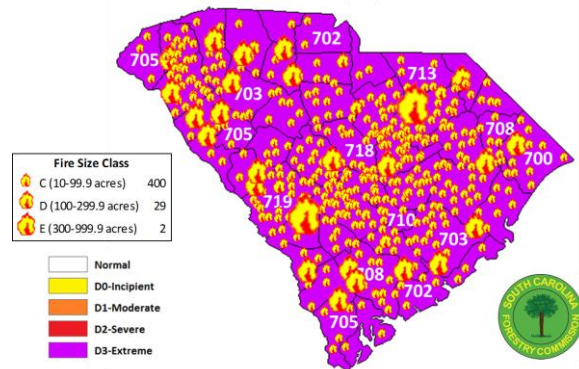


Figure 12: Drought indices and indicators for Time Point 4, Extreme Drought Intensifies.

Response Actions

The DRC evaluates non-essential water use and prepares recommendations for the curtailment of water use (Table 4). These recommendations are submitted to DNR for implementation. The DRC requests public statements from the Governor's office regarding mandatory water use restrictions and EMD assistance to initiate a public information campaign. The first statement recommends voluntary water use and withdrawal conservation. The second statement recommends mandatory restrictions on water use and withdrawals. DRC notifies SCEMD that drought conditions have progressed to a level that requires activation of the Emergency Operations Plan (EOP). Basin-level plans and protocols are at the highest stage of drought severity.

Main Discussion Questions

Specific questions addressed the implementation of State-level measures and initial steps to activate the EOP:

- What resources, information, or additional capacity does the DRC need to assess non-essential water use and recommend curtailment of certain uses?
- How will the equitable allocation of water be determined?
- If the DRC requests mandatory restrictions, will affected parties appeal to the Administrative Law Judge, and how will this affect the timeliness of conservation and response efforts?
- When, and for how long, will the EOP and SERT be activated?

Participant Reactions and Comments

The main challenge at this stage is to **determine "non-essential water use"** and required actions for those organizations and sectors considered "non-essential water use" users. Such a declaration would have severe economic repercussions for individual businesses and their employees. Participants expected that any entity required to curtail their water use would immediately request a stay, which could delay any efforts to extend existing water supplies.

It is extremely important to determine and understand the **legal implications of curtailing water use**. For example, it was uncertain whether water users, who have a right to due process and can appeal to the Administrative Law Judge, would also have that right if the Governor signed a State of Emergency.

Participants recommended that the DRC be more proactive prior to this stage. It could be helpful to look at different basin-level plans in the State and how they approach water use reductions, communications, coordination, and **possible emergency actions** during extreme drought. It was also clear that EMD and many SERT members should be involved in drought response decisions and activities prior to this stage, particularly as some agencies could help to address and mitigate water quality, air quality, and public health vulnerabilities that may be exacerbated by drought and before they reach a critical point. Unlike other disasters, the long-term nature of drought means that SERT activation could last for months, or longer. EMD and SERT members should review the EOP and drought procedures to better understand what might be required of them over an extended period.

Time Point 5: Activation of the Emergency Operations Plan

The Scenario

Statewide, exceptional drought conditions are persisting (Figure 13). Water systems and citizens across the state are without, or losing, access to water.

Drought Conditions and Impacts

- 3,894 wildfires are burning across the State.
- Temporary shelters, bottled water distribution, and other forms of relief are needed for citizens without access to water.

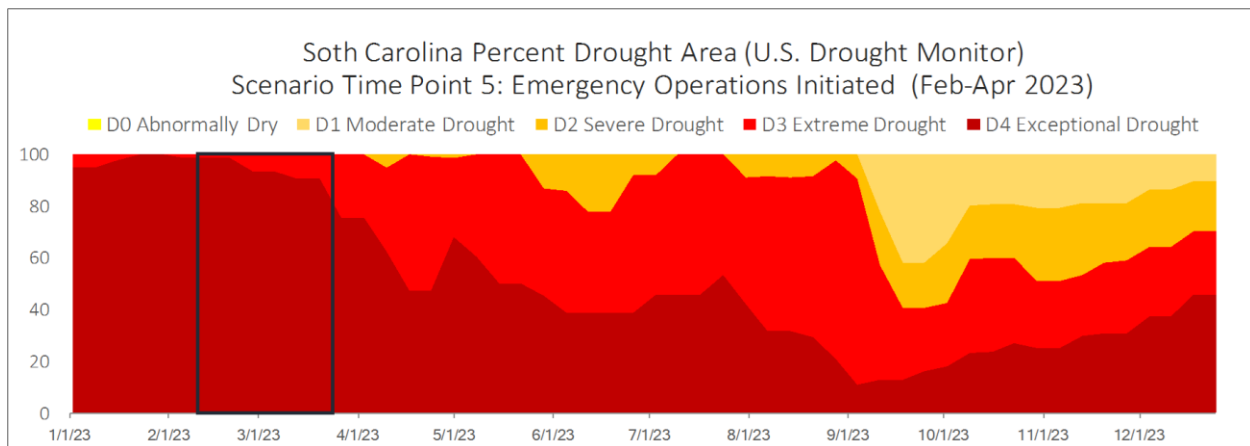


Figure 13: Percent area in drought at the Time Point 5, Emergency Operations Plan is Activated.

Response Actions

The DRC recommends activation of the EOP. The State Emergency Operations Center (SEOC) and State Emergency Response Team (SERT) are activated to lead the state-level response to the water shortage emergency and coordinate federal, state, and local resources. SERT develops a Drought Emergency Executive Order for the Governor to sign. SERT, with the DRC, works with local emergency management directors and water suppliers to develop response and recovery measures. The Governor issues emergency regulations to require curtailment of withdrawals. Each State agency develops a list of actions to conserve internal water usage by 10%. All State agencies are asked to develop and refine drought response measures that they can implement. This would include, for example, developing and recommending changes to current drought legislation, relief support, and tracking impacts. In conjunction with other agencies (e.g., ESFs, FEMA, USACE), the SERT assists with: the distribution of donated or purchased water; projects to drill new water wells and provide desalinization and purification equipment; and providing relief assistance to affected communities and individuals.

Main Discussion Questions

- Do SERT members, and other state and federal agencies included in the EOP, have the necessary resources, expertise, training, and capacity to address a drought and water shortage emergency?
- What is missing from the EOP?
- How will South Carolina coordinate with other states?

Participant Reactions and Comments

As suggested in the previous time point, it was apparent that the activation of the EOP happened too late. Attendees proposed **a partial, and/or earlier, activation of the EOP**. A partial activation leads to questions regarding what agencies and activities would be involved, to what extent (the entire state or a specific region), and for how long. As a next step, the primary entities (DRC, DNR, SCO, and EMD) should review the relevant documents to identify the appropriate place to include and describe those procedures.

Many SERT members noted that they would benefit from not only having a clearer idea about their roles and responsibilities during drought, but also more specific information from the local level about their particular resource, information, and assistance needs. Overall, participants voiced concerns that the State lacks some information and data (e.g., water system interconnections, sector-specific impacts) that would help agencies develop more **comprehensive drought mitigation and preparedness strategies**.

Many participants noted that interstate mechanisms and agreements are already in place and have been used in past emergency response efforts. However, it is important to recognize that most of our immediate neighbors will likely be affected in a multi-year, extreme drought. In that situation, assistance may come from other regions of the country. It may also be beneficial to pursue proactive efforts to **develop regional communications and response plans** and look to other states for good examples of drought and water conservation messaging.

Key Themes and Priorities Identified at the Exercise

The tabletop exercise provided an opportunity for participants to identify the strengths of South Carolina’s drought response and areas to improve. The final session (“hot wash”) included a dedicated block of time for participants to review what they learned, provide feedback about the event, and recommend next steps. Key themes, priorities, and action items discussed throughout the exercise and during the hot wash, in particular, are presented here and summarized in Table 7. The major topics discussed by the exercise attendees focused on **plans and procedures, communications, education and awareness, and data and information.**

Plans and Procedures

The exercise highlighted the need for regular reviews and updates of drought response legislation, plans, and procedures.

- One concern raised during the exercise was the large number of vacancies on the Drought Response Committee. This reinforced the need for this Committee to be at full strength, due to its critical role in making statewide drought decisions.
- The Drought Response Act, Regulations, and guidance for local plans were last updated in 2000. Many local plans have not been recently reviewed or revised. The exercise demonstrated that some statewide drought response actions (e.g., earlier activation of the EOP, Governor’s Office involvement) may need to occur earlier than what is specified in the Act and/or Regulations. Developing a process and timeline to conduct updates would help to ensure a coordinated and timely state- and local-level response to drought.
- The Emergency Operations Plan (EOP) is regularly reviewed, but there is no formal guidance for updating the Drought Response Plan component (EOP Appendix 10). In addition, many participants lacked familiarity with the EOP Drought Response Plan. Participants suggested that more time to “exercise” the EOP at this event would have been beneficial. Greater involvement and leadership from drought subject matter expertise (i.e., DNR, State Climatology Office, other state agencies) in EOP Drought Response Plan review and implementation should also be considered.

Communications

The prevalence of formal plans to guide decisions and actions contributes to South Carolina’s capacity to respond to drought events. However, having many different plans can make coordination difficult and hamper the development of consistent and clear public communications.

- Participants recommended that improved information sharing across agencies and with the public will help South Carolina better prepare for and respond to drought events and potential emergencies.
- Drought communications are often inconsistent across different jurisdictions and agencies. The development of clear, consistent messaging for the public could enhance current communications processes.
- Early involvement of the EMD Public Information Officer could help to ensure that communications are timely, efficient, and coordinated at different drought stages.

Education and Awareness

Many different agencies and participants articulated a need for a greater awareness of drought and drought impacts, as well as the plans and procedures that guide drought response.

- Many SERT members noted that their agencies lacked familiarity with the Drought Response Program and were uncertain about their specific role(s) and responsibilities for drought response. The development of additional training or resources would be particularly beneficial for emergency management agencies as they have not been involved in drought response and planning in the past.
- In terms of general public awareness of drought, information and resources are needed to improve understanding of drought's effects on the State's communities and resources and what water conservation actions to take during drought events.

Data and Information

Participants noted needs for information that could enhance drought response and planning. Many new and existing resources and data sources related to drought are available and could be incorporated into existing plans and processes.

- For example, the National Weather Service and other NOAA agencies have developed new tools to assess and forecast drought, weather, and climate events. The Community Collaborative Rain, Hail & Snow Network (CoCoRaHS) is an existing network that can be used to monitor local drought conditions.
- Identifying and sharing information related to water system connections, water demand, and the economic effects of drought would help to build a common understanding of drought risks, vulnerabilities, and possible response actions across different communities, sectors, and regions of the state.

Table 7: Priorities and proposed action items identified at the exercise.

<p>Plans & Procedures</p> <p><i>Ensure a coordinated and timely drought response</i></p>
<ul style="list-style-type: none"> • Fill Drought Response Committee vacancies • Review and update state and local drought documents and procedures, including <ul style="list-style-type: none"> - Drought Response Act - Drought Regulations - State Drought Response Plan, Appendix 10 of the Emergency Operations Plan - Local drought ordinances • Develop standardized process for reviewing and updating the Drought Response Plan
<p>Communications</p> <p><i>Improve information sharing across agencies and with the public</i></p>
<ul style="list-style-type: none"> • Formalize processes to promote information sharing • Enhance awareness of regional and local issues • Facilitate better working relationships across different agencies • Develop clear, consistent water conservation messaging for different stages of drought
<p>Education & Awareness</p> <p><i>Enhance agency familiarity with the Drought Response Program and their role in drought response and mitigation</i></p>
<ul style="list-style-type: none"> • Develop education and training modules about drought for Emergency Managers • Raise agency and public awareness of drought impacts and responses • Conduct future exercises at the state and regional/watershed levels <ul style="list-style-type: none"> - Coordinate future exercises with processes and timelines to review and update plans
<p>Data & Information</p> <p><i>Build common understanding of drought risks</i></p>
<ul style="list-style-type: none"> • Identify and develop information that could enhance drought response and planning <ul style="list-style-type: none"> - Rainfall, weather and climate monitoring tools - Water system intakes and interconnections - Sector-specific impacts - Resources for response and mitigation

Post-Exercise Survey

The planning team circulated an online survey after the exercise to collect feedback about the event and give participants an additional opportunity to share thoughts and ideas. The response rate for the survey was 33% (n=27). The questionnaire consisted of multiple choice and open-ended questions. This section highlights key themes from the survey responses, many of which reiterate priorities and needs discussed at the exercise.

Value of the Exercise

- All (100%) survey respondents found the tabletop exercise to be beneficial.
- The majority of respondents reported that the exercise was relevant to their organization and provided new information. They also suggested what information should be included in the future exercises (Figure 14).
- Some respondents shared additional comments regarding the value of the exercise. Selected responses are shown below.

Value of the Exercise: Selected Survey Responses

“One of the biggest benefits of the exercise was to get this diverse of a group in one room to discuss the Drought Response Plan.”

“[It was] very useful to hear from other entities, especially representatives from the governor's office.”

“As a federal agency in the role of technical specialist, we do not directly come under the impact of state legislation. However, it is important that we understand the consequences of drought so we can interface as effectively as possible with our core partners in the state.”

“As a water utility, it was great to get a perspective from other agencies, such as agriculture, industry, and fire prevention.”

[I learned about] “the wide-reaching effects of an extreme drought across the state; there are sectors that are affected that I had not considered.”

“Understanding how all the different parts are connected and how they are all necessary in a situation like this exercise.”

“This was my first exposure to the Drought Response Plan so it was very informative.”

Question 2. Please rate the different components of the exercise.

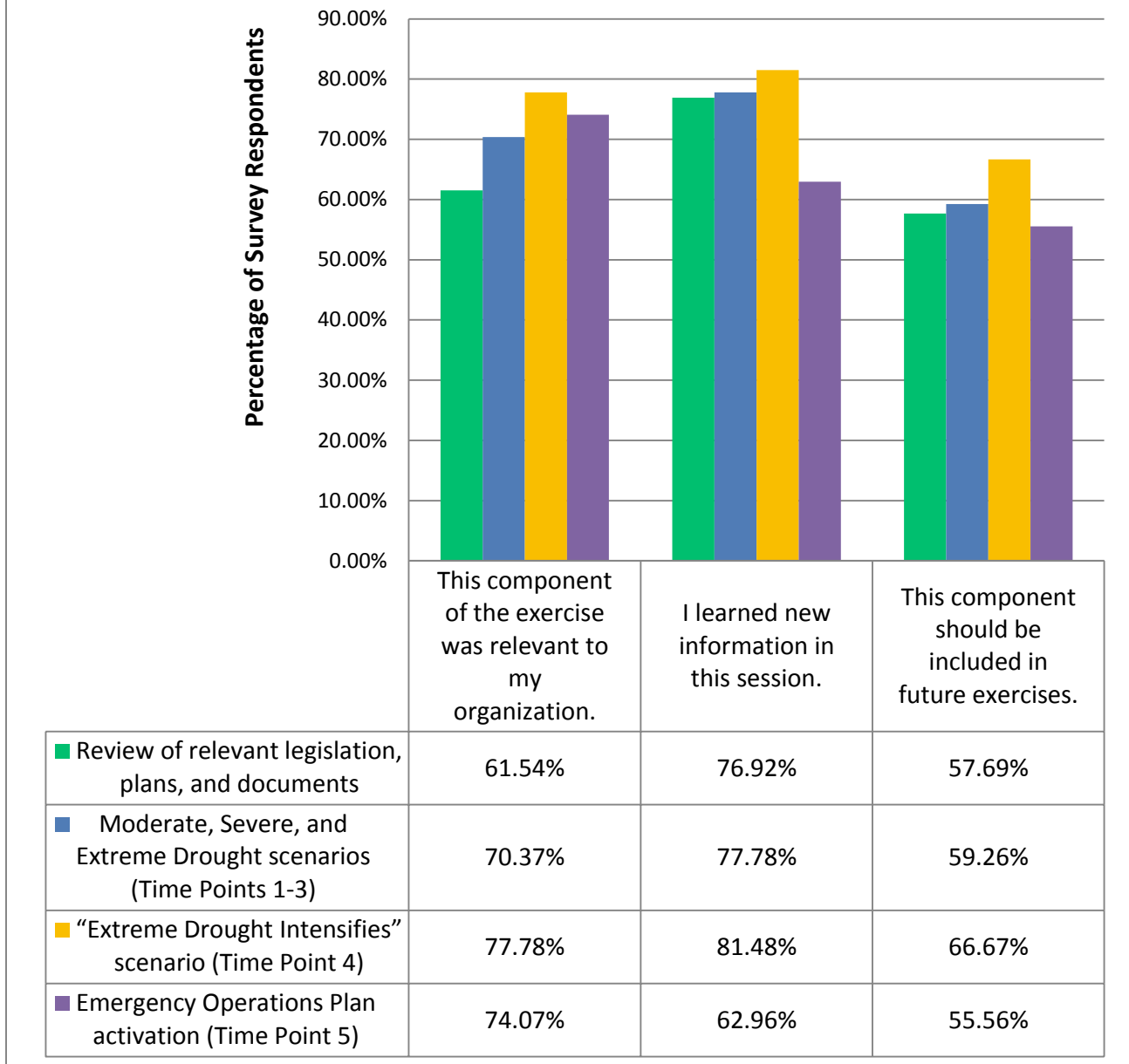


Figure 14: Post-exercise evaluation survey Question 2 responses.

Action Items and Future Exercises

- Respondents suggested several action items for the planning committee to prioritize and address. These include identifying ways to enhance existing public information campaigns and water conservation efforts, increasing Drought Response Committee membership and participation, and assessing the various ways that different sectors and regions are connected and mutually affected by drought.
- More than half (58%) of respondents reported that they identified action items for their own organization as a result of the exercise. Comments suggested that these actions will center on reviewing and updating drought response plans and ordinances.

“In order to determine the effect water use reductions can have we need to model water withdrawals (I think this has been done) and plug in various reductions and shutdowns enacted during the stages of drought.”

- 26 of the 27 respondents (96%) indicated that they would attend a future event to discuss drought planning and preparedness.
- In terms of frequency, 62% of respondents recommended conducting drought and water shortage exercises every two years. 31% of respondents recommended annual exercises.
- Future exercises should consider a wider range of impacts (such as those related to water quality, air quality, public health, agriculture, and water-dependent businesses) and the actions necessary to ameliorate those impacts. In addition, participants recommended conducting future exercises at the regional or watershed level, to allow participants to examine local vulnerabilities and response actions in more depth. As much of this exercise focused on actions specific to water utilities, the Drought Response Committee, and select state agencies, future exercises at the state or regional level could be designed to include a broader list of stakeholders.

“Participation by all stakeholders is key and the future tabletop exercises should focus on ensuring that ALL are present to provide clarity and common understanding of how we would approach plan implementation.”

Next Steps

The South Carolina Drought and Water Shortage Tabletop Exercise was the **first such event focused specifically on reviewing and assessing the various components of the State’s drought response**. The event provided an important opportunity for learning and networking. The exercise advanced dialogue between state and federal agencies, local water systems, reservoir managers, water users, and the State Emergency Response Team (SERT) about such themes as statewide mandatory water use restrictions, curtailment of nonessential water use by the South Carolina Drought Response Committee, and the activation of the Emergency Operations Plan. The exercise helped to identify and provide momentum for actions that the planning team could implement in the near-term. These include:

- Following up with the Governor’s Office to update the Drought Response Committee membership,
- Developing new drought information and communications materials to increase awareness of drought issues, and
- Working with public water suppliers to review local plans and ordinances.

The planning team will also pursue opportunities for future exercises, focusing on recommendations and priorities recommended by participants.



Post-exercise evaluation survey respondents found the tabletop exercise to be beneficial and would attend future, similar events to discuss drought planning and preparedness.

Photo courtesy of CISA.

Appendix A: Participant List

First Name	Last Name	Organization
Jeff	Allen	SC Water Resources Center, Clemson University
Frank	Alsheimer	National Weather Service, Columbia
Ekaterina	Altman	Carolinas Integrated Sciences & Assessments
Johnathan	Ames	Town of Batesburg-Leesville
David	Baize	SC Department of Health and Environmental Control
Steven	Batson	SC Emergency Management Division
Derrec	Becker	SC Emergency Management Division
Gretchen	Birt	SC Emergency Management Division
Shannon	Bobertz	SC Department of Natural Resources
Rebecca	Bowyer	City of Rock Hill
Scott	Brown	SC Emergency Management Division
Jerome	Brown	USDA Natural Resource Conservation Service
Ed	Bruce	Duke Energy
Robert	Burruss	SC Department of Social Services
Robert	Burton	SC Emergency Management Division
Doug	Busbee	Friends of the Edisto
Jane	Byrne	Charleston Water System
Mike	Caston	SJWD Water District
Allan	Clum	Mount Pleasant Waterworks
Whitney	Cofield	SC Department of Health and Environmental Control
Jay	Daniels	SC Department of Health and Environmental Control
Brannon	Davis	SC Emergency Management Division
Rob	Devlin	SC Department of Health and Environmental Control
Robert	Duncan	SC Department of Health and Environmental Control
Lynne	Dunn	Duke Energy
Mike	Elieff	SC Department of Health and Environmental Control
Mitch	Ellenburg	Belton Honea Path Water Authority
Clint	Elliott	Grand Strand Water & Sewer Authority
Ann	English	USDA Natural Resource Conservation Service
Amanda	Farris	Carolinas Integrated Sciences & Assessments
Susan	Featherstone	City of Rock Hill
Kat	Fewsgold	
Beth	Fletcher	American Red Cross
Mark	Forrester	Gilbert-Summit Rural Water District
Charlotte	Foster	SC Emergency Management Division
Dehn	Ganey	Santee Cooper
Col. David	Gayle	SC National Guard
Kerry	Guissepe	Carolinas Integrated Sciences & Assessments
Scott	Harder	SC Department of Natural Resources
Matthew	Holliday	Greer Commission of Public Works

First Name	Last Name	Organization
Blair	Holloway	National Weather Service, Charleston
Tom	Johnson	SC Department of Transportation, Emergency Operations
Ken	Kerber	State Fire Marshal's Office
Darrell	Kershaw	SC Department of Social Services
Tricia	Kilgore	Beaufort-Jasper Water & Sewer Authority
Richard	Kos	SC Department of Health and Environmental Control
Kirsten	Lackstrom	Carolinas Integrated Sciences & Assessments
Brian	Lynch	Santee Cooper
Tim	McCord	SC Emergency Management Division
Thomas	McGill	SC Office of Regulatory Staff
Jill	Miller	SC Rural Water Association
Tommy	Mills	SC Forestry Commission
Hope	Mizzell	SC Department of Natural Resources
Tim	Murphy	SC Emergency Management Division
Jay	Nicholson	Lexington Joint Municipal Water & Sewer Commission
Dan	Niec	USDA Natural Resource Conservation Service
Eric	Odom	Orangeburg Department of Public Works
Mike	Parris	Greer Commission of Public Works
David	Perry	SC Emergency Management Division
Mark	Plowden	Office of Governor Henry McMaster
Melissa	Potter	SC Emergency Management Division
Shannon	Rea	SC Department of Public Safety
Ken	Rentiers	SC Department of Natural Resources
Roger	Riley	Barnwell County
Erik	Simensen	SC Department of Health and Environmental Control
Stanley	Simpson	US Army Corps of Engineers
Dyke	Spencer	Powdersville Water
Tommy	Staton	SJWD Water District
Kim	Stenson	SC Emergency Management Division
Athena	Strickland	Domtar Paper
Marshall	Sykes	SC Emergency Management Division
Eddie	Twilley	Twilley, Fondren & Associates, LLC
Olivia	Vassey	Greenville Water
Leonard	Vaughan	National Weather Service, Columbia
Louis	Walter	SC Emergency Management Division
Richard	Welch	SC Department of Health and Environmental Control
Susan	Welch	Santee Cooper
John	Westcott	Spartanburg Water
Scott	Willett	Anderson Regional Joint Water System
Aaron	Wood	SC Department of Agriculture

Appendix B: Agenda

9:45	Registration
10:00	Welcome – Ken Rentiers, Hope Mizzell Overview of Goals and Objectives for the Exercise – Hope Mizzell
10:10	Review of Relevant Legislation, Plans, and Documents <i>SC Emergency Operations Executive Guide</i> – Marshall Sykes <i>Surface Water Withdrawal, Permitting, Use and Reporting (Act and Regulations)</i> – Jeff Allen <i>Drought Response Act and Regulations</i> – Hope Mizzell <i>Emergency Operations Plan – Appendix 10 (Drought Response Plan)</i> – Hope Mizzell <i>Model Drought Management Plan and Response Ordinance</i> – Hope Mizzell
10:50	Drought Scenarios and Implementation of Plans <i>Group responds to worsening drought conditions at four time points:</i> <ol style="list-style-type: none">1. <i>Moderate Drought Statewide</i> – Hope Mizzell, Kirsten Lackstrom2. <i>Severe Drought Statewide</i> – Hope Mizzell, Kirsten Lackstrom3. <i>Extreme Drought</i> – Widespread impacts to agriculture, fire risks, water systems, and water-dependent industries and businesses – Hope Mizzell, Kirsten Lackstrom4. <i>Extreme Drought Intensifies</i> – Conditions are deteriorating. Safety, health, and welfare are threatened. Drought Response Committee decides that State measures are necessary – Hope Mizzell, Kirsten Lackstrom
12:15	Lunch
1:00	5. Emergency Operations Plan is activated <i>Group implements the SC Emergency Operations Plan. SERT is activated</i> – Marshall Sykes
2:30	Hot Wash <i>Group provides feedback on exercise and suggestions for future activities</i> Closing Remarks – Hope Mizzell
3:00	Adjourn

Appendix C: Discussion Questions

1. Moderate Drought Statewide

a. Questions for local water systems:

- How current is the information in your local drought response plan and ordinance? (For example, water system information, drought triggers and response actions, and contact information)
- What currently works well at this stage?
- What does not work well at this stage?

b. Questions for state agencies and other organizations:

- Does your organization have a plan in place for monitoring, responding to, and preparing for drought?
- What does your organization do at this stage of drought?
- Do you have the necessary information, personnel, and/or resources to respond to this stage of drought?
- If not, what would help your organization more effectively respond to and prepare for drought?

c. What, and how, is your organization communicating with the public?

2. Severe Drought Statewide

a. How do inconsistencies at different organizational levels affect drought response and communications at this stage? For example:

- State level: The Drought Response Committee encourages voluntary conservation and implementation of local ordinances and plans but does not recommend or impose mandatory restrictions.
- Local level: Water systems ask for no, voluntary, or mandatory restrictions.
- Basin level: Many basins have Low Inflow Protocols (LIPs) or other reservoir management plans and procedures, others do not have a coordinated approach.

b. Are local ordinances and plans up-to-date and consistent with other drought plans in your area (i.e., wholesale customers, neighboring communities) or basin (i.e., LIPs)?

- Are actions at the severe drought stage, as outlined in the plans, adequate and effective?
- Are wholesale customers required to implement conservation?

c. How are other sectors (agriculture, forestry, industry) responding to drought?

d. What, and how, is your organization communicating with the public?

e. What challenges are evident at this drought stage?

3. Extreme Drought Statewide

Widespread impacts to agriculture, fire risks, water systems, and water-dependent industries and businesses

- The South Carolina Forestry Commission may request an Executive Order from the Governor to activate the National Guard for state duty, to assist with fire suppression.
- Depending on local response, the Governor may issue a press release requesting voluntary water conservation.

a. How do inconsistencies at different organizational levels affect drought response and communications at this stage?

- State level: The Drought Response Committee does not impose mandatory restrictions, but requests implementation of local ordinances and mandatory restrictions if indicated by plans.
- Local level: water systems and communities are implementing and enforcing water use restrictions.
- Basin level: Plans may be at different levels of drought and response actions.

b. Are local ordinances and plans up-to-date and consistent with other drought plans in your area or basin?

- Are actions at the extreme drought stage, as outlined in the plans, adequate and effective?
- Are there different criteria for wholesale v. individual customers?
- To what extent are ordinances and restrictions coordinated across neighboring water systems and communities?

c. How are the agriculture and forestry sectors being affected and responding? How are aid and assistance programs working?

- What is required to seek assistance from other states?

d. How are industry and individual businesses responding?

- They are not required to have a drought plan, but might be considered a non-essential water use.

e. What, and how, is your organization communicating with the public?

f. What challenges are evident at this drought stage?

4. Extreme Drought Intensifies

Conditions are deteriorating. Safety, health, and welfare are threatened. Drought Response Committee (DRC) decides that State measures are necessary:

- DRC submits recommendations to DNR to alleviate impacts.
- DRC evaluates non-essential water uses that can be curtailed.
- DRC recommends that Governor issue public statements about drought conditions. A first statement may recommend voluntary water use and withdrawal conservation. A second statement may recommend or impose mandatory restrictions on water use and withdrawals.
- DRC notifies SCEMD that drought conditions have progressed to a level that may require activation of the Emergency Operations Plan.

-
- a. *What resources, information, or additional capacity does the DRC need to assess conditions and recommend actions at this drought level?*
 - b. *How will the equitable allocation of water be determined? (Drought Response Act Sec. 49-23-80)*
 - c. *If the DRC requests mandatory restrictions, will affected parties appeal to the Administrative Law Judge, which has 5 days to hear the case?*
 - How will this affect timeliness and effectiveness of conservation and response efforts?
 - d. *When, and how, is your organization communicating with the public?*
 - e. *When exactly will the SC Emergency Operations Plan be activated?*
 - f. *How long will the State Emergency Response Team (SERT) be activated?*
 - For a drought event, activation could last for months, or longer.
 - g. *When is a SCEMD Drought Response Working Group formed to develop response, recovery, and mitigation plans in response to extreme drought conditions?*
-

5. Emergency Operations Plan (EOP) is Activated

Group implements the SC Emergency Operations Plan. The State Emergency Response Team (SERT) is activated.

- SERT develops a Drought Emergency Executive Order for Governor's signature.
- SERT, with the Drought Response Committee, works with local emergency management directors and water suppliers to develop response and recovery measures.
- The Governor may issue emergency regulations to require curtailment of withdrawals.
- State agencies are required to reduce water use by 10%.

Review the agency-specific actions outlined in the EOP:

- a. Are the necessary resources, expertise, and capacity available to fulfill these actions?*
 - b. What tasks or actions are not listed here, but should be included?*
 - c. When, and how, is your organization communicating with the public?*
 - d. What challenges do you foresee in implementing the Emergency Operations Plan?*
 - e. Does the Governor seek a federal disaster declaration? Are Individual and Public Assistance funding programs available?*
 - f. What legislative action might be required?*
 - g. How long will the SERT be activated?*
 - h. How will SC coordinate with other states?*
 - Extreme drought conditions will likely affect our neighbors as well.
-