# Drought Monitoring & Response in South Carolina













# **SC State Climatology Office Team**



Hope Mizzell South Carolina State Climatologist



Melissa Griffin Assistant State Climatologist



Vacant Water Resource Climatologist





# Climate Office Responsibilities

1

Coordinate and collect weather observations for the purpose of climate monitoring

2

Summarize and disseminate weather and climate information

3

Perform climate and weather impact assessments 4

Demonstrate
the value of
climate
information in
the decisionmaking process

5

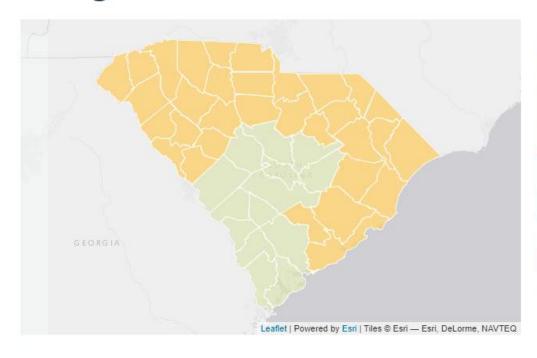
Conduct applied climate research



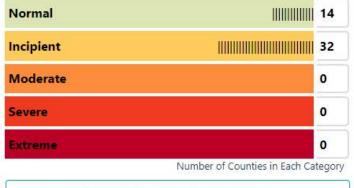


# Drought Monitoring and Response

# **Drought in South Carolina**



# **Current Status**



Latest Drought Committee Meeting: 12-04-2024

<u>Drought Conditions >>></u> Find out more about current drought conditions, how drought status is determined in South Carolina, and view archived drought condition reports.

http://www.scdrought.com

Next Drought Committee Meeting is January 31, 2025

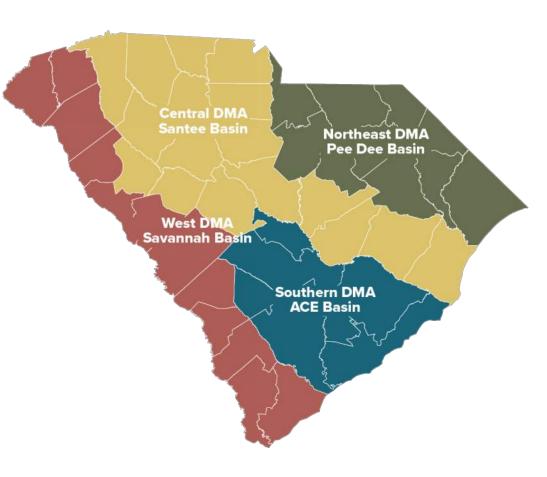


# **Drought Monitoring and Response in SC**

# **South Carolina Drought Response**

**Program** consists of legislation, regulations, and procedures that establish recommended and required response.

The **South Carolina Drought Response Act (2000)** and the **supporting regulations**formally establish and describe the responsibilities of the South Carolina State Climatology Office and the South Carolina Drought Response Committee, the major drought decision-making entities in the State.

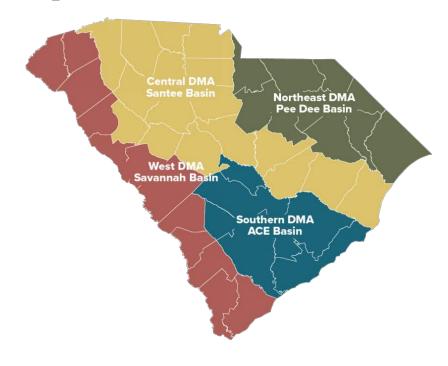


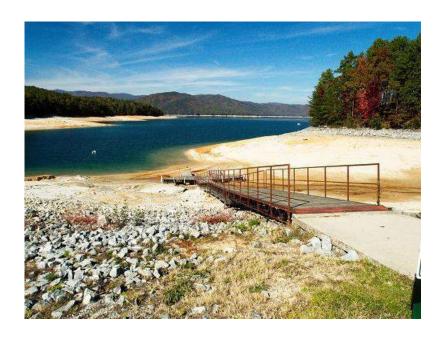


# **Drought Monitoring and Response in SC**

**Why:** To carefully and closely monitor, conserve, and manage the State's water resources in the best interest of all South Carolinians.

**Who:** Drought Response Committee and Department of Natural Resources – State Climatology Office





# **Statewide members**

- Forestry Commission
- Department of Agriculture
- Emergency Management Division
- Department of Environmental Services
- Department of Natural Resources

# **Local members (12 per DMA)**

- Agricultural
- Industry
- Water Utilities
- Regional Council of Governments
- Power Generation Facilities
- Soil and Water Conservation Districts





Local Drought Response Committee				
West Savannah		Group	Central Santee	
Reg Williams	Edgefield	Agriculture	John Irwin	Laurens
Cheryl Daniels	McCormick	Comm of Public Works	Ken Tuck	Spartanburg
Mark Warner	McCormick	Counties	Peggy Swearingen	Fairfield
Eric Carrier	Aiken	Domestic User	Christy Jones	Richland
David Evans	Pickens	Industry	Ed Holder	Greenville
Lynn McEwen	Barnwell	Municipalities	James Bagley	York
Preston Pierce	Oconee	Power Generation	Alan Stuart	York
Scott Willett	Anderson	Private Water Supplier	Brad Powers	Spartanburg
Chris Rasco	Anderson	Public Service District	Vacant	
Rick Green	Edgefield	Reg. Council of Government	Gregory Sprouse	Richland
Yvonne Kling	Aiken	Soil and Water Conservation	John Rivers	Sumter
Brian Chemsak	Beaufort	Special Purpose District	Fred Castles	Chester







Local Drought Response Committee				
Southern ACE		Group	Northeast Pee Dee	
Landrum Weathers	Orangeburg	Agriculture	Caleb Miller	Dillon
Jason Thompson	Charleston	Comm of Public Works	Vacant	
Vacant		Counties	Alan Watkins	Lee
Chris Wallace	Bamberg	Domestic User	Karolan Ohanesian	Horry
Vacant		Industry	Athena Strickland	Marlboro
Eric Odom	Orangeburg	Municipalities	Clint Elliot	Horry
Matthew McCants	Berkeley	Power Generation	Vacant	
Vacant		Private Water Supplier	Vacant	
Russell Cornette	Berkely	Public Service District	Elbert Warren	Darlington
Ronald Mitchum	Charleston	Reg. Council of Government	Lindsay Privette	Florence
Marion Rizer	Colleton	Soil and Water Conservation	Joe Ghent	Lancaster
Vacant		Special Purpose District	Nathan Ward	Kershaw





# **Drought Monitoring and Response in SC**

**How:** The State uses multiple indicators and indices to monitor drought and determine drought severity levels.

Percent of Normal Rainfall	Name:	<ul> <li>Cumulative dryness or wetness compared to long-term averages</li> </ul>
Crop Moisture Index (CMI)	***	<ul> <li>Agricultural growing season short-term (up to 4 weeks) dryness or wetness</li> </ul>
Palmer Drought Severity Index (PDSI)	1	<ul> <li>Prolonged (month, years) abnormally dry or wet conditions</li> </ul>
Water Resources		<ul><li>Streamflow levels</li><li>Lake levels</li><li>Groundwater levels</li></ul>
Keetch-Byram Drought Index (KBDI)	*	Daily forest fire potential
U.S. Drought Monitor for South Carolina	And the second	General areas of drought, labeled by intensity on a weekly basis

# Weekly Data Review

# Precipitation



### Timesteps:

- 14 days
- 30 days
- 60 days 90 days
- Others as needed

- Observed
- Departure of normal =
- Percent of normal
- Standard Precipitation Index (SPI)

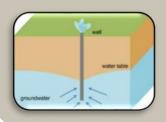
# **Evaporation**



### Data:

- Evaporative **Demand Drought** index (EDDI)
- **Stand Precipitation Evaporation Index** (SPEI) (see SPI)

# Lake and Groundwater



provided by SCDNR hydrology each week, reflecting values in percentiles

## Data:

### Depth (remote Moisture sensed)



Soil

- 10cm
- 40cm
- 100cm
- 200cm

# Reports



- CoCoRaHS Reports
- **CMOR Reports**
- **FSA County Reports**

# Surface Water



### Timesteps:

- Real time
- Daily average
- 7-day average
- 14-day average
- 28-day average

# Data:

- Flow values (cfs)
- Percentile rankings

# **Vegetation Health**



**KBDI VegDRI** 

**SC Drought** 

Response **Act and** Regulations

- Drier than normal
- Soil moisture declines
- Water demand increases

Moderate

- Water levels decrease
- Crops and plants wither
- Irrigation increases

Severe

Water levels continue to drop

agricultural

Number of wildfires increases

Poor grazing and

conditions

Extreme

- Widespread impacts to agriculture, forestry, water utilities, and water-dependent businesses
- SCDNR, SCO and DRC monitor conditions, share information, and make recommendations to manage drought. State and federal agencies, water utilities, and reservoir managers monitor conditions.

Water utilities review drought plans and ordinances.

- Water utilities implement drought plans and ordinances.
- DRC may recommend voluntary or mandatory water conservation.

As drought conditions and impacts become more severe, response actions increase accordingly.

- State agencies increase monitoring and communications.
- Citizens may see local notices for burn bans, boat ramp closings, and water use restrictions.
- The Governor may:
  - o request voluntary or mandatory water conservation.
- o assist with managing impacts, including requesting disaster declarations by the US Dept. of Agriculture and activating the National Guard to assist with wildfire suppression.

**State** Emergency Emergency Operations **Operations Plan** 

- Water systems and citizens are without, or losing access to water.
- Public safety, health, and welfare are threatened.
- The State Emergency Response Team (SERT) is activated to lead state-level response to the drought emergency.

### APPENDIX 10

### (SOUTH CAROLINA DROUGHT RESPONSE PLAN)

### TO THE SOUTH CAROLINA EMERGENCY OPERATIONS PLAN

### I. INTRODUCTION

- A. A drought is a slowly developing disaster that may occur over several months or years. Impacts from drought may occur quickly for some sectors while for others it may take years to have an impact.
- A drought event can have a major impact on the State economy, and will affect everything from agriculture to industry to individuals.
- C. Droughts are naturally recurring events in South Carolina. The length and severity has varied greatly over the last 25 years. The worst recorded drought, from 1999 to 2002, was one of the longest and most severe in more than 100 years. The 2007-2008 drought was shorter in duration than the 1999-2002 drought, but it had a stronger intensity, especially for the Upstate region. Parts of the State experienced severe drought again in 2011-2012 and 2016-2017.

### II. PURPOSE

- Establishes policies and procedures for the State and Counties when responding to a drought situation.
- B. Identifies follow-on State-level actions to assist with and provide relief from severe or extreme drought conditions that have reached a level of disaster beyond the scope of the South Carolina Drought Response Committee.
- C. Provides statewide planning and response strategies that allow State and County Emergency Management officials to effectively and efficiently plan and coordinate the application of local, State, and Federal resources in response to a severe or extreme drought event to prevent loss of life, minimize damage, lessen the economic impact, and protect the environment.

### III. ASSUMPTIONS

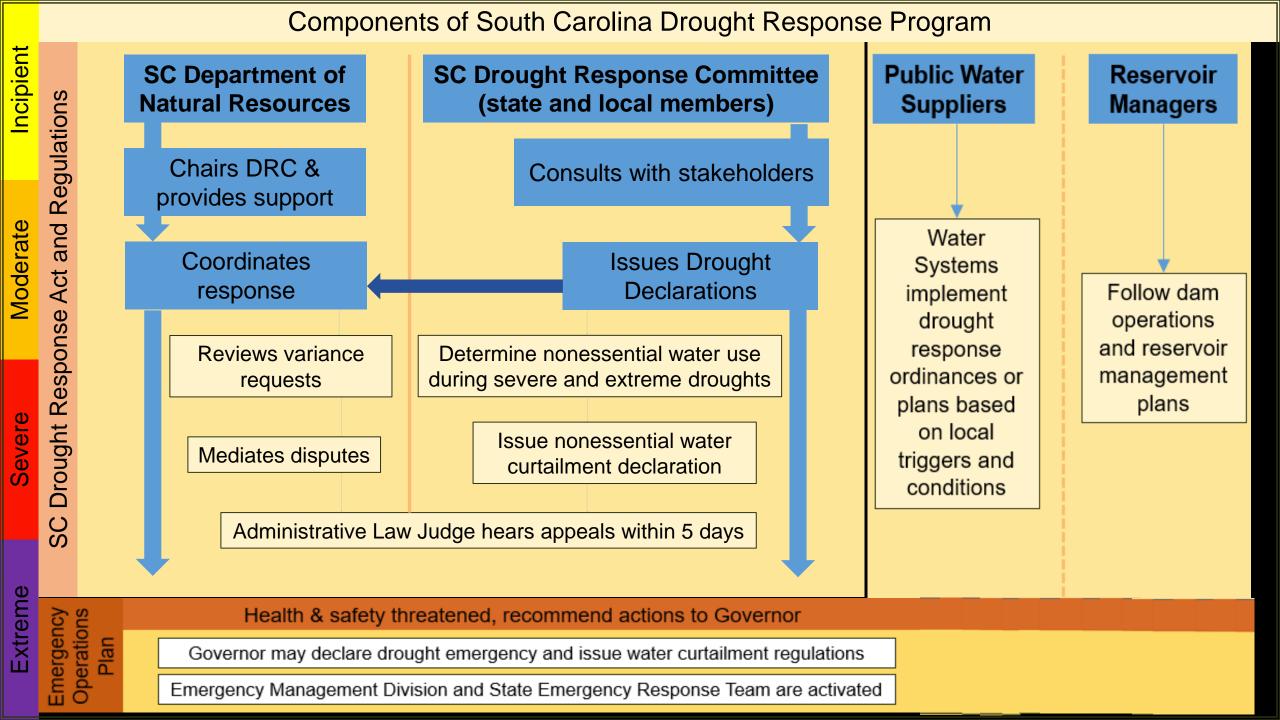
- A. Not all areas of the State will be affected the same way at the same time during a drought. Therefore, different types of drought response operations may be occurring simultaneously in the State.
- B. State actions in response to "Severe" or "Extreme" drought conditions may be identical as individual communities may be in both conditions in varying degrees.
- C. The State Drought Response Plan may be in effect at the same time other measures are being implemented by the SC Drought Response Committee and local water systems.

SC Drought Response Plan -

Appendix 10-1 June 2017

Identifies follow-on State-level actions to assist with and provide relief from severe or extreme drought conditions that have reached a level of disaster beyond the scope of South Carolina Drought Response Committee.

https://www.scemd.org/media/1237/appendix-10-sc-drought-response-plan.pdf



## Model Drought Management Plan and Response Ordinance

(Provided by the South Carolina Department of Natural Resources as required by the South Carolina Drought Response Act of 2000.)

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C	Description of Water System Layout, Water Sources, Capacities and Yields4
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# Local Level Drought Plans



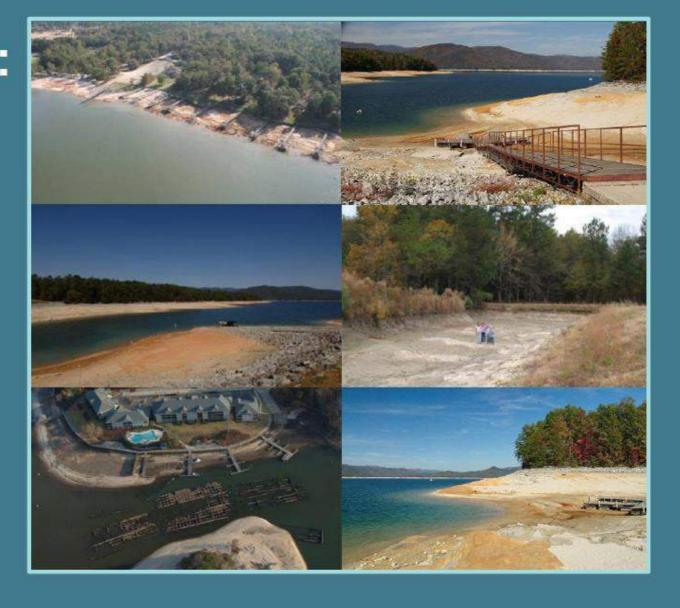
While the Drought Response Act requires local water systems to have a drought plan, there is no legal requirement to update the plan.

Many plans in the state have not been updated since 2003...



# Drought Planning Guide: A Resource for Water Suppliers in the Palmetto State



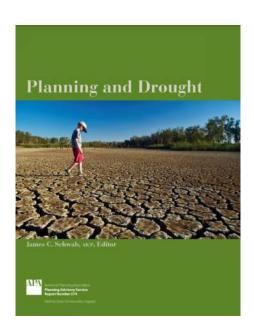


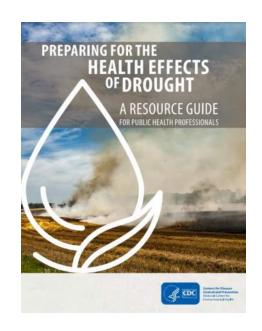
Dr. Elliot Wickham

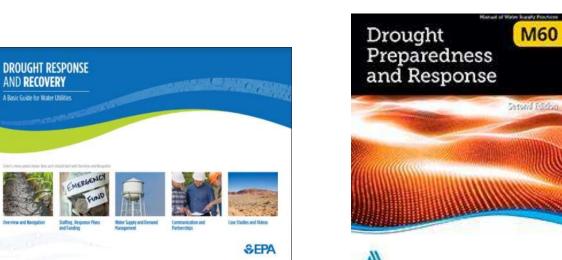
SC State Climatology Office

SC Department of Natural Resources

# So many drought planning guides: why do we need a new one?











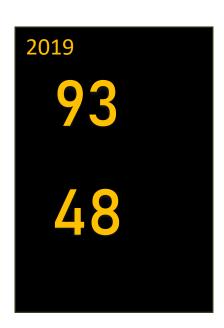
To provide specific guidance for how water systems can create a robust drought management plan that fits the requirements of SC Law.

# SC Drought and Water Shortage Tabletop Exercise September 2017 and 2019 – SC Emergency Operations Center











**Next Tabletop Exercise : March 5, 2025** 





# Local Drought Planning Guidebook: The Driving Factors

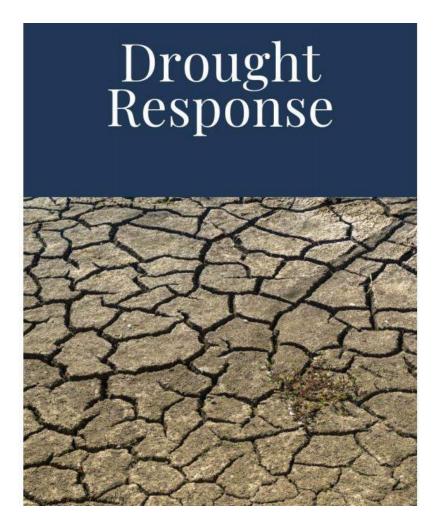
1. Lack of effective planning information from water systems across the state.

2. Many local drought response plans and ordinances across the state are out of date.





# Mount Pleasant Waterworks Drought Management and Response Plan Revised May 2020



D. Identification of Water System Specific Drought or Water Shortage Indicators: Operators of every water system must develop historical trends that are valuable indicators of a system's ability to meet demand when demand begins to outpace supply. Mount Pleasant Waterworks has developed triggers for use during drought or demand water shortages that describe when specific phases of the Drought Response Plan are implemented. Staff will monitor triggers and recommend action. The system triggers are as follows:

### **Incipient Drought Phase:**

 Drought Response Committee declaration (considering droughts can be localized.)

### **Moderate Drought Phase:**

- Drought Response Committee declaration (considering droughts can be localized.)
- 2. Average system storage levels fall below 60% for 48 hours.
- 3. Well pumping levels less than 100' above pump in one or more wells.

### Severe Drought Phase:

- Drought Response Committee declaration (considering droughts can be localized.)
- 2. Average system storage levels fall below 40% for 48 hours, and/or
- Well pumping levels less than 75' above pump in one or more wells.

### **Extreme Drought Phase:**

- Drought Response Committee declaration (considering droughts can be localized.)
- 2. Average system storage levels fall below 20% for 48 hours, and/or
- 3. Well pumping levels less than 50' above pump in one or more wells.

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Mount Pleasant Waterworks Drought Management and Response Plan Revised May 2020



# **Severe Drought Phase**

### Triggers:

- 1. Drought Response Committee (DRC) declaration, OR
- 2. Average system storage levels fall below 40% for 48 hours, OR
- 3. Well pumping levels less than 75' above pump in one or more wells.
- Rationing when water pressure has been reduced to 40 psi and water storage levels drop below 20% for 48 hours.

### Goals: To be

To be implemented at Trigger #2 or #3 above

- 1. 40% Reduction of all water use
- 2. Voluntary reductions from customers in the use of water for all purposes
- Mandatory restrictions on non-essential usage and restrictions on times when certain water usage is allowed

Note: Actions may be time-based to prescribe certain activities. For example, the request for 40% reduction in water usage may only be necessary after 30 or 45 days within this drought stage depending on other factors.

### Administrative Actions:

	Task	Assignee (ICS Position*)
	Issue a Proclamation to be released to the local media, MPW customers, and to	General Manager
	the South Carolina Department of Natural Resources Drought Information	
$\vdash$	Center that Severe drought conditions are present.	
	Provide written notification to the South Carolina Department of Natural	General Manager
	Resources Drought Information Center.	
	Communicate with the Southern Drought Management Area (DMA) DRC	General Manager
	representative on MPW's drought conditions, impacts, and actions taken so	
$\vdash$	DRC has this information when setting drought levels for the Southern DMA.	
	Consider offering incentives to customers for finding and repairing leaks	General Manager
	and/or for complying with voluntary restrictions.	
	Communicate financial impacts of drought to Commissioners and customers.	General Manager
	Provide written notification monthly to the South Carolina Department of	General Manager
1	Natural Resources Drought Information Center regarding the outcomes of the	
	voluntary and mandatory restrictions.	
	Encourage all residential water customers to voluntarily reduce overall	General Manager
1	monthly water usage to 60% of the customer's monthly average. If voluntary	
1	reduction of usage is not successful, the Mount Pleasant Waterworks may, at	
	its option, implement the excessive use rate schedule for water, included at the	
	bottom of this table. (Note: this rate modification is based on a reduction	
	from actual average usage/REU vs. allocated capacity/REU.)	
	Analyze AMI and other data to determine actual water usage reduction vs.	Customer Services
	goal. Determine customers not meeting 40% goal and generate customized	Manager
	notification to encourage.	

Task	Assignee (ICS Position*)
Monitor and track daily/weekly call volume in Call Center. Consider invoking Emergency Call Takers to work in Contact Center to handle increased call volume.	Customer Services Manager
Suspend cut-offs.	Customer Services Manager
Activate new tier charges in CIS when decision to implement is made by General Manager. When modified rate structures are implemented, a comparison of actual usage vs. target of modified tier structure should be included in customer bills.	Customer Services Manager
Follow communication guidelines outlined in Mount Pleasant Waterworks Crisis Communication Plan to inform Mount Pleasant Waterworks' customers of the water system condition and voluntary and mandatory conservation measures that the customers are requested to follow during Severe drought conditions. See Appendix G for guidelines. Encourage self-policing by residents to alert the utility of system leaks.	PIO
Add bill inserts with conservation measures and updates on actual water usage reduction vs goal.	PIO
Collaborate and communicate with other water utilities and entities within the Southern Drought Management Area to ensure consistent messaging.	PIO
Work with CWS for consistent messaging to customers and public.	PIO
Develop and update ongoing list of Frequently Asked Questions (and answers) from Contact Center calls and Marketing/Communications.	PIO
Conduct regular (at least weekly) communications meetings between dispatch, customer service, and communications to review FAQ and develop consistent messaging.	PIO
Communicate to customers in advance when to expect higher water bills.	PIO
Publicize widely the penalties to be imposed for violations of mandatory restrictions and the procedures to be followed if a variance in the restrictions is requested.	PIO
Expand the use of education and public relations efforts and emphasize the penalties associated with violating the mandatory restrictions.	PIO
Conduct financial analysis of capacity buy-in vs. wholesale rates from CWS to determine the most cost-effective way to purchase additional water.	Finance Section Chief
Track and report billed revenues vs. collected revenues.	Finance Section Chief
Email and update all staff on current drought stage and conservation measures.	Planning Section Chief
Keep staff updated with current conditions on Canteen display board.	Planning Section Chief
Report drought-related conditions and impacts weekly to the National Drought Mitigation Center: <a href="http://bit.ly/droughtreport19">http://bit.ly/droughtreport19</a>	Planning Section Chief
Adjust regular meeting schedule (see schedule below).	Planning Section Chief
Attend DRC conference calls for updates.	Planning Section Chief

### Severe Drought Phase Excessive Use Rate Schedule

Tier I	0 - 3,000 gallons/REU	regular rate
Tier II	3,001 -6,000 gallons/REU	2 times regular rate
Tier III	6,001 - 9,000 gallons/REU	3 times regular rate
Tier IV	Greater than 9,000 gallons/REU	4 times regular rate

Meeting Schedule (Severe Drought):

Day of Week	Time	Location	Attendees
Mondays	10:00 AM	MPW Conference Room	MPW ICS Team MPW Commissioners Town Staff (e.g., Public Services) CWS representatives
Thursdays, as determined by DRC	TBD	Conference Call	Drought Response Committee, MPW IC, Planning Section Chief & Operations Branch Director
Fridays	3:00 PM	Conference Call	MPW ICS Team MPW Commissioners Town Staff (e.g., Public Services) CWS representatives

**Operations Actions:** 

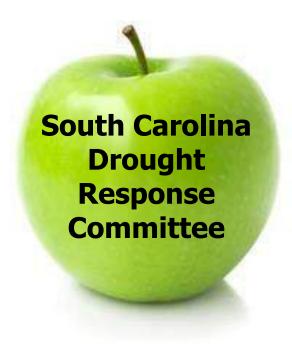
i ee i	Task	Assignee (ICS Position*)
0	Utilize AMI and field inspections to identify water leaks and intensify maintenance efforts to correct water leaks in the distribution system.	Field Service Branch Director
0	Cease installation of new irrigation taps on the water system.	Field Service Branch Director
0	Contact all permitted hydrant users to cease using water until further notice.  Notify all hydrant metered customers that meters will be pulled for the duration. Restoration of the meters will commence once conditions are favorable for normal use.	Field Service Branch Director
2	Communicate to all fire stations the reduction in pressures and procedure to follow to increase pressures during firefighting.	Field Service Branch Director
0	Adjust auto blowoffs to maintain minimum water quality goals.	Field Services Branch Director
2	Consider making provisions for emergency cooling/improved ventilation of critical machinery due to the stress increased demand and/or elevated environmental temperatures may place on the machinery.	Field Services Branch Director
0	Coordinate with Town, utilities and their associated contractors to enact/enforce restrictions on directional drilling to minimize damage risk to water lines during severe and/or extreme drought.	Field Services Branch Director

	Task	Assignee (ICS Position*)
0	Maintain regular (at least weekly) contact with CWS to receive updates on their assets and operational conditions. Provide updates to MPW staff during regular team meetings.	Operations Branch Director
0	Monitor usage, storage levels, and operation status of critical assets and report to regular management meetings.	Operations Branch Director
0	Consider increase in blending of raw water to increase production as needed.	Operations Branch Director
0	Reduce distribution pressures to ~40 psi. Per the AWWA M60 manual, lower water pressures typically result in an average of 6% reduction in water usage.	Operations Branch Director
	Backfill storage tanks at night from CWS.	Operations Branch Director
0	Consider recycled water from wastewater treatment plants for commercial companies to collect and distribute to customers for irrigation.	Operations Branch Director
0	Consider increasing the frequency of monitoring and testing of water quality.	Operations Branch Director
0	Measure & report water levels in each of the deep wells weekly.	Water Supply Group Supervisor
0	Monitor fluoride levels for potential public notification.	Water Supply Group Supervisor

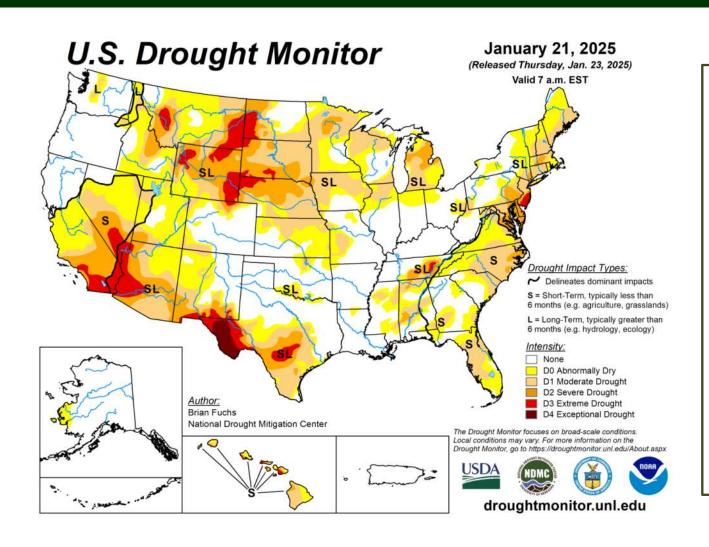
<sup>\*</sup> See Table 13.5 of the MPW Emergency Management Plan for the ICS Positions referenced above.

# Understanding the USDM and the South Carolina Drought Response Committee





# The United States Drought Monitor (USDM)



# **Uses**

- National map of drought severity and extent
- USDA: Trigger Disaster Declarations and Low-interest loan eligibility
- Farm Service Agency: Eligibility for Livestock Forage Program
- IRS: Tax Deferral on forced livestock sales due to drought
- SC: 1 of 7 indicators the SC DRC uses for assessing drought severity in the state

https://droughtmonitor.unl.edu/



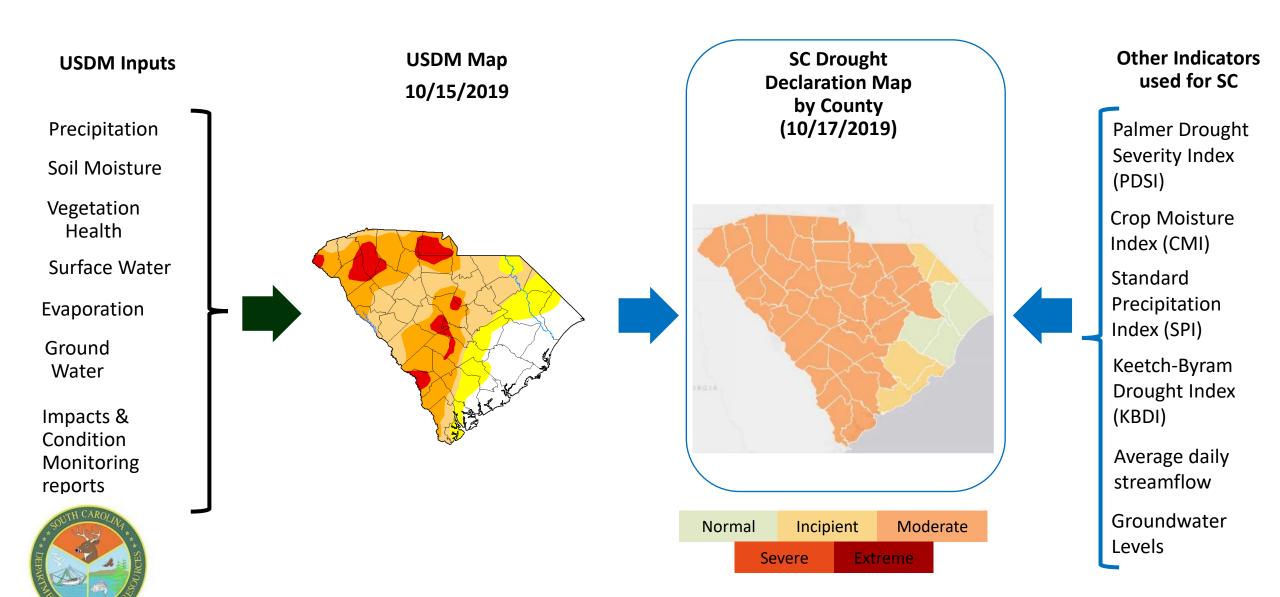
# Comparing the USDM and SC DRC Apples



	USDM	SC DRC
Agency Leads	Authors are from Federal Agencies (NDMC, NOAA, and USDA)	Five State Agencies (DNR, DHEC, SCDA, EMD, SCFC)
Participants	Federal and State Agencies, as well as universities and other entities that monitor conditions	Local stakeholders (Water suppliers, agriculture, conservation districts, power generation, local gov.)
Frequency	ency Weekly product	Committee convenes as needed when conditions warrant discussion.
Severity Levels	Abnormally dry, Moderate, Severe, Extreme, & Exceptional Drought	Incipient, Moderate, Severe, and Extreme Drought
Allows for	Federal disaster declarations and loans for agriculture	Used to determine non-essential water use curtailment recommendations for public water suppliers in South Carolina.

Indicators...

# **South Carolina Designations for Drought Response**

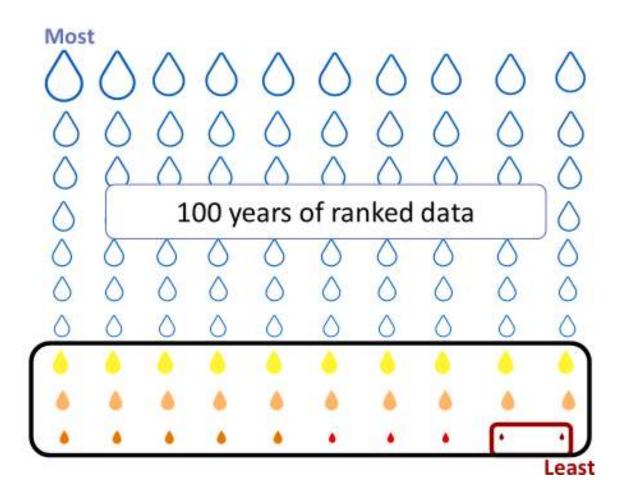


# **Understanding the USDM Drought Severity Categories in Context**

# Intensity is based on historical likelihood

### Percentile

	100	21
	None	31-100
D0	Abnormally dry	21-30
D1	Moderate drought	11 - 20
D2	Severe drought	6 - 10
D3	Extreme drought	3 - 5
D4	Exceptional drought	1 - 2





# **Impact / Reporting Data CMOR Tool**

# **Drought Impacts Toolkit**

Home

Tools

**Emerging Impacts** 

Impact Assessments

# Submit and view Condition Monitoring Observer Reports (CMOR)

Condition Number (Change States) (Change State

2022 Map

Archive

**Download Factsheet** 

Download Factsheet En Español

Watch Video

Social Media Resources

CMOR use in North Dakota

Report drought-related conditions and impacts within the U.S. This is a nation-wide service provided by the National Drought Mitigation Center, based at the University of Nebraska, in partnership with the National Integrated Drought Information System. Information submitted by this form appears on a map and becomes part of a permanent public record. Please note that this form is not part of the process to apply for assistance. To participate, you must legally be an adult, at least 18 years old in most states, 19 in Nebraska or Alabama, or 21 in Mississippi. By submitting information, you agree that it may be used in drought monitoring research. Questions? Please email DIRinfo@unl.edu.



Submit Report by App

Home > Tools > CMOR

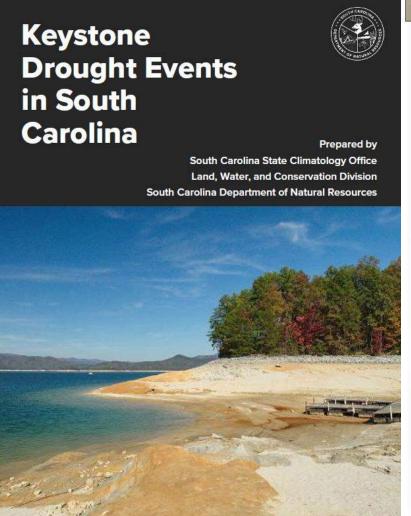
For further assistance in using the app, see the factsheet.







# Drought Monitoring and Response



### DROUGHT OF 1925 - 1927

drought year on record (at the time) and is currently the fifth driest year on record, with a rainfall deficiency of 11.16 inches. The average annual rainfall for 1925 was 36.73 inches, 3.22 inches lower than the previous record from 1911. Every state sector was impacted agriculture struggled, hydroelectric power was limited, and these limits affected the textile mills and other industries. With over half of the state's workers in the agriculture sector, nearly 16 percent of farms in South Carolina were abandoned, and a quartermillion people left the state for better opportunities elsewhere. Rainfall remained below normal through 1927, although 1925 was the year of the most severe drought. SC Department of Agriculture called 1925 the most severe drought experienced in forty vears. Rainfall across the region was below average for the next couple of years. The cotton crop failure hit South Carolina hard since over half of the state's workers worked in agriculture, and they almost exclusively worked in cotton. Streamflow values were reported to be at a record low, considerably reducing power generation and forcing slowdowns and mill closures.

1925 was the most intense



Dorothea, photographer. Oldest son of sharacropper family working in the cotton. Cheanee, South Carolina, Library of Congress, Prints & Photographis Division, FSA/OWI Collection, LC-DIG-5ta-8e-20095.

# Drought Causing Fires Still Rage Many Fish to Die in Sumter County

(Money to the Record

SUMTER, S. C. Sept. 7.—Beach cause of the law water in Black river swamp in Sumter county fish are dying by the thousands. The main stream in Black River swamp near the Piowden's mill road is still flowing, but all the reet of the streams that usually flow are dry.

hundreds of acres of fine woodland have been destroyed. All the woods are parched and burn like tinder

Source: Charleston News and Courier

Month of 1925	Statewide Rainfall	Departure from Normal	Monthly Ranking
January	8.39"	4.70*	Wettest
February	1.72"	-2,18"	17th Driest
March	1.55"	-2.61*	5th Driest
April	2.18"	-1.18"	32 <sup>nd</sup> Driest
May	2.14"	-1,44"	20th Driest
June	3,46"	-1.24"	36th Driest
July	3.50"	-1.98"	13th Driest
August	1.57"	-3.68"	Driest
September	1.90"	-2.28"	16th Driest
October	2.70"	-0.38"	1077
November	3.86"	1.15"	28th Wettest
December	3.76"	0.15"	1,823
		73/2007	

https://www.dnr.sc.gov/climate/sco/Publications/SCKeystoneDroughtEvents.pdf





# **Contact Information**

Hope Mizzell, South Carolina State Climatologist, MizzellH@dnr.sc.gov, 803-734-9568

Melissa Griffin, Asst. State Climatologist, GriffinM@dnr.sc.gov, 803-734-9091

Vacant, Water Resources Climatologist

Frank Strait, Severe Weather Liaison, <a href="mailto:StraitF@dnr.sc.gov">StraitF@dnr.sc.gov</a>, 803-734-0339

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