Drought Management and Response Discussion – Part 1

John Boyer

Agenda Item 6

Per the Planning Framework, the Specific Drought Response-related Obligations of the RBC, with Support from SCDNR, are:

1. Collecting and evaluating local hydrologic information for drought assessment.
2. Providing local drought information and recommendations to the DRC regarding drought declarations.
3. Communicating drought conditions and drought declarations to the rest of the RBC, stakeholders, and the public.
4. Advocating for a coordinated, basin-wide response by entities with drought management responsibilities.
5. Coordinating with other drought management groups in the basin as needed.

Planning Framework Outline for **Chapter 8. Drought Response**

1. Summarize **existing drought plans** and **drought advisory groups**
2. Summarize any **drought response initiatives** developed by the RBC
3. List **recommendations** on drought management or drought management strategies
4. Include a **communication plan** to inform stakeholders and the public on current drought conditions and activities regarding drought response

Drought Impacts to SC Upstate Agriculture

Greenville News

SOUTH CAROLINA

An Upstate drought ended in January. For farmers, the ramifications lasted for months.

Sarah Swetlik
Greenville News

Published 5:02 a.m. ET April 2, 2024 | Updated 1:41 p.m. ET April 3, 2024

Debbie Webster plants four pastures' worth of grass each fall to feed the horses, cows, sheep and goats that live on her farm in Oconee County. By February, her winter grasses would usually be about six to eight inches tall, the perfect size to help nourish each of her animals.

But this February, her winter grasses had barely reached two inches.

A fall drought in the Upstate forced Webster to plant her winter grasses in December last year. It's the latest she's ever planted, she said. She knew trying to grow grass out of the parched soil would be a waste of energy, money and seeds.

Livestock farmers typically sow plants animals can graze on throughout the year, referred to as cover crops, late in the fall and during the spring. But when farmers face a drought, planting times can get pushed and throw off the cycle.

A drought's impact goes far beyond short grasses. Sometimes, there isn't enough water for seeds to sprout, forcing farmers to plant again later in the season. Other times, farmers will have to supplement hay to feed their livestock. Both hurdles can cost thousands of dollars.

The 2023 drought followed a pattern of drier summers in the Upstate over the last 120 years. As the global temperature continues to increase, droughts could happen more often and become even more detrimental and more costly.

For Webster, the 2023 drought meant spending $7,000 more on hay than she did in 2022.

Take Aways from the Article:

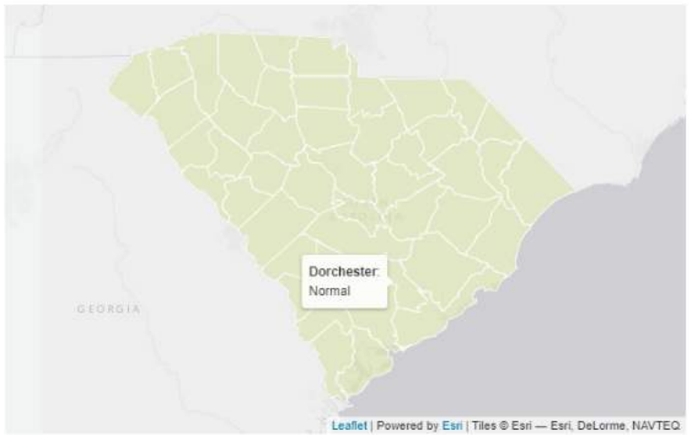
- Farmers often see the effects of drought well before the state officially declares one.
- Warmer temperatures in the Upstate could mean more agricultural droughts and/or greater impacts.
- Some farmers are practicing "climate-smart" agriculture. They are basing decisions around weather patterns rather than traditional planting seasons.

Drought Monitoring in South Carolina

Elliot D. Wickham
Water Resource Climatologist
SC State Climatology Office

Drought Monitoring in South Carolina

South Carolina Drought Response Committee



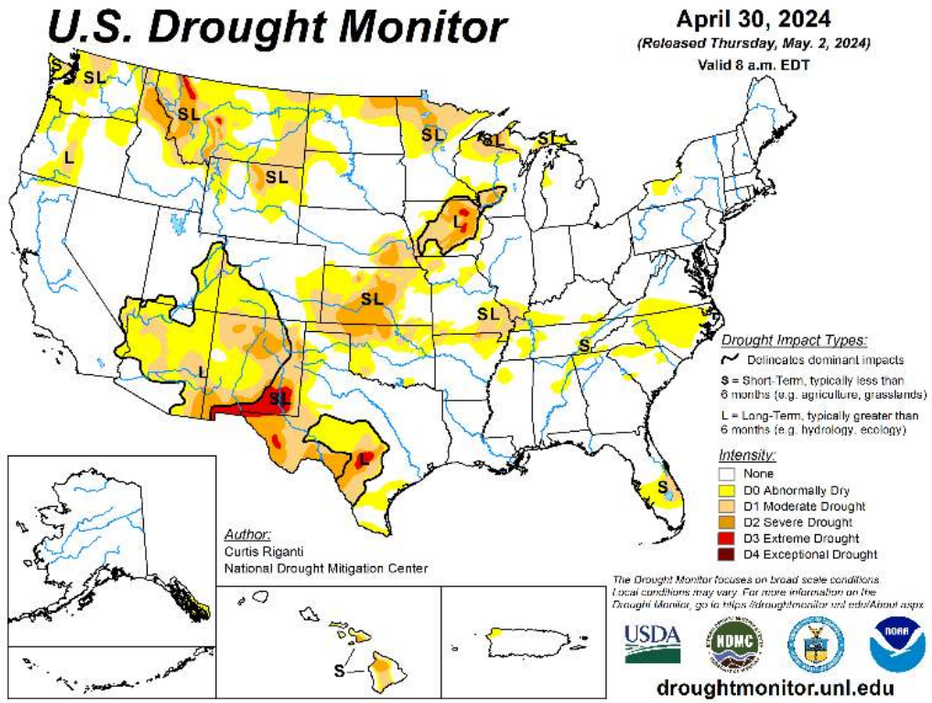
Current Status

Normal	46
Incipient	0
Moderate	0
Severe	0
Extreme	0

Number of Counties in Each Category

Latest Drought Committee Meeting: 01-11-2024

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

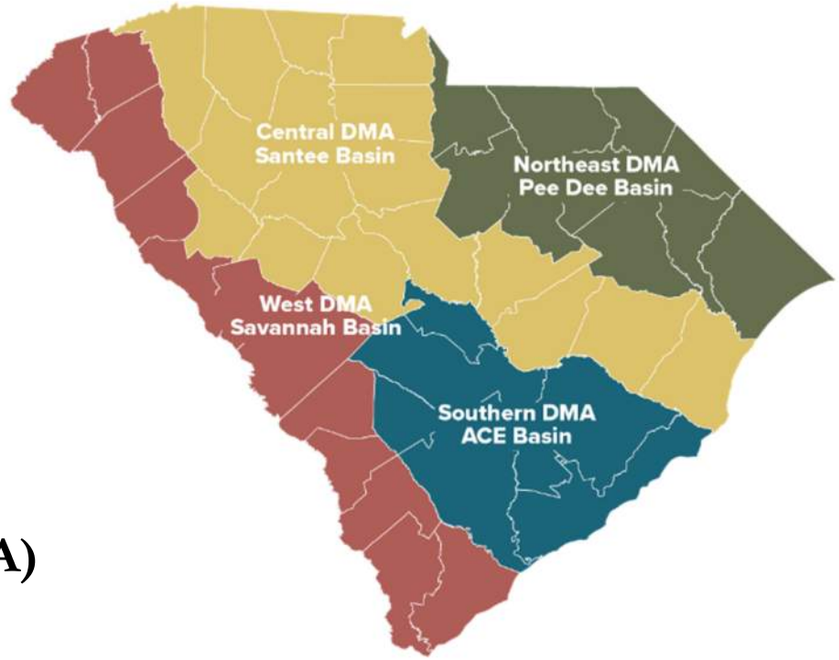


The SC Climate Office leads the drought monitoring efforts for the state

South Carolina Drought Response Committee (DRC)

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 Health and Environmental Control
- Department of Natural Resources

Local members (12 per DMA)

- Water Utilities
- Regional Council of Governments
- Power Generation Facilities
- Soil and Water Cons. Districts
- Agriculture
- Domestic User
- Industry

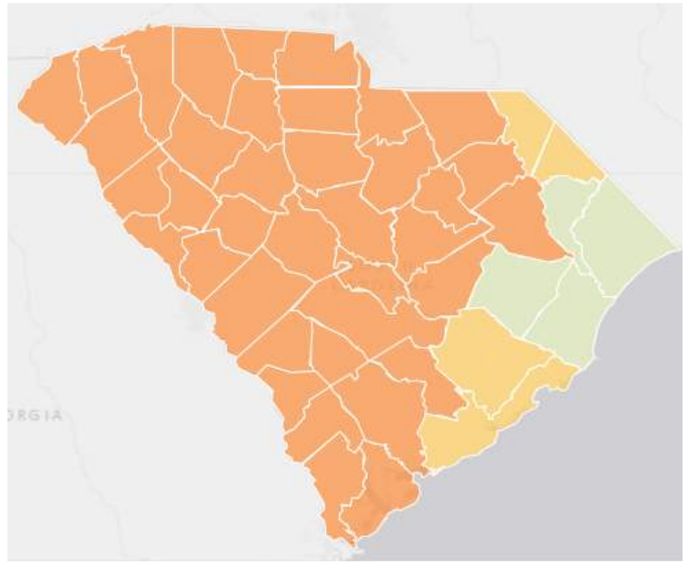
The DRC has 53 members

South Carolina Drought Response Committee (DRC)

The DRC:

1. Meets as needed
2. Makes county-level designations for drought severity
   - Normal
   - Incipient
   - Moderate
   - Severe
   - Extreme
3. At severe and extreme levels will make recommendations for non-essential water curtailment for **only** public water suppliers

SC Drought Declaration Map by County (10/17/2019)



Public Water Suppliers:

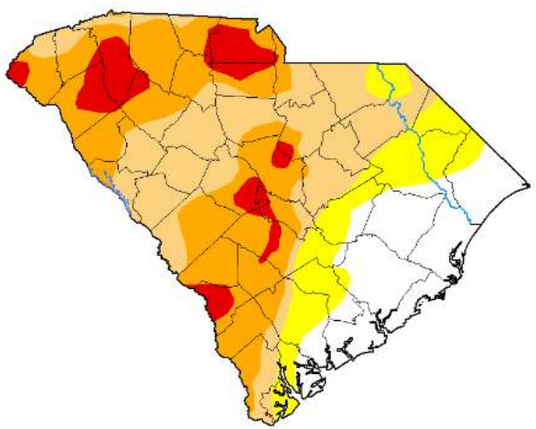
1. Are required to have local drought management plans and response ordinances for water conservation and may enact their plans based on DRC county-level drought designations.

DRC Indicators

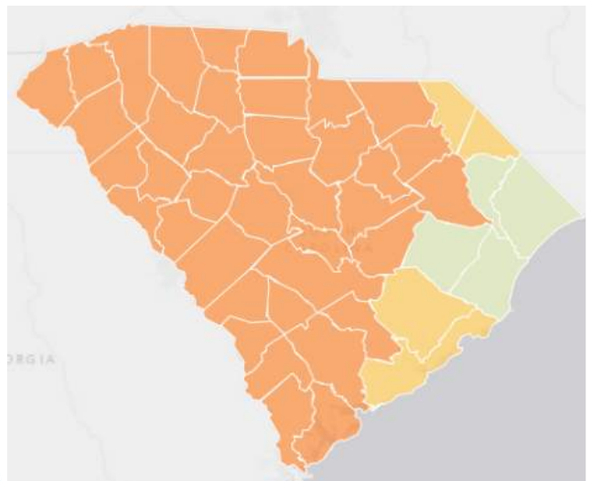
US Drought Monitor Map

10/15/2019

Intensity:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought



SC Drought Declaration Map by County (10/17/2019)



Normal | Incipient | Moderate | Severe | Extreme

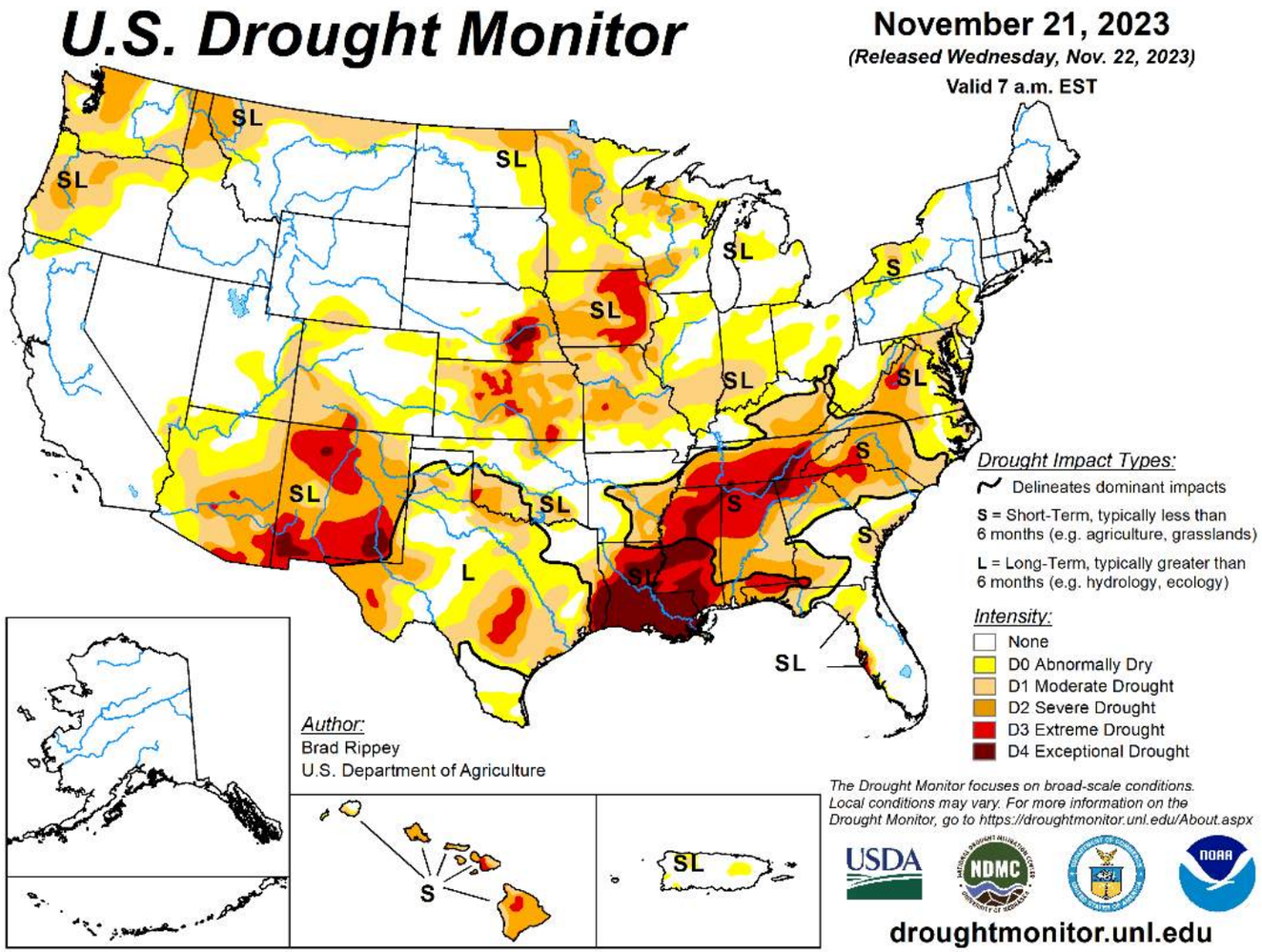
Indicators used for SC DRC

- Palmer Drought Severity Index (PDSI)
- Crop Moisture Index (CMI)
- Standard Precipitation Index (SPI)
- Keetch-Byram Drought Index (KBDI)
- Average daily streamflow
- Groundwater Levels

DRC Indicators and Severity Levels

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
STANDARD PRECIPITATION INDEX (SPI)	0.00 to -0.99	-1.00 to -1.49	-3.00 to -3.99	≤ -2.00
KEETCH-BYRUM DROUGHT INDEX (KBDI)	300 to 399	400 to 499	500 to 699	≥ 700
U.S. DROUGHT MONITOR (USDM)	D0	D1	D2	≥ D3
AVERAGE DAILY STREAMFLOW	111%-120% of the minimum flow for 2 consecutive weeks (CW)	101%-110% of the minimum flow for 2 CW	Between the minimum flow and 90% of the minimum flow for 2 CW	≤ 90% of the minimum flow for 2 CW
GROUNDWATER, STATIC LEVEL IN AQUIFER	between 11-20ft above trigger level for 2 consecutive months (CM)	between 1-10ft above trigger level for 2 CM	between trigger level and 10ft below for 2 CM	≤ 10ft below the trigger level for 2 CM

The United States Drought Monitor (USDM)

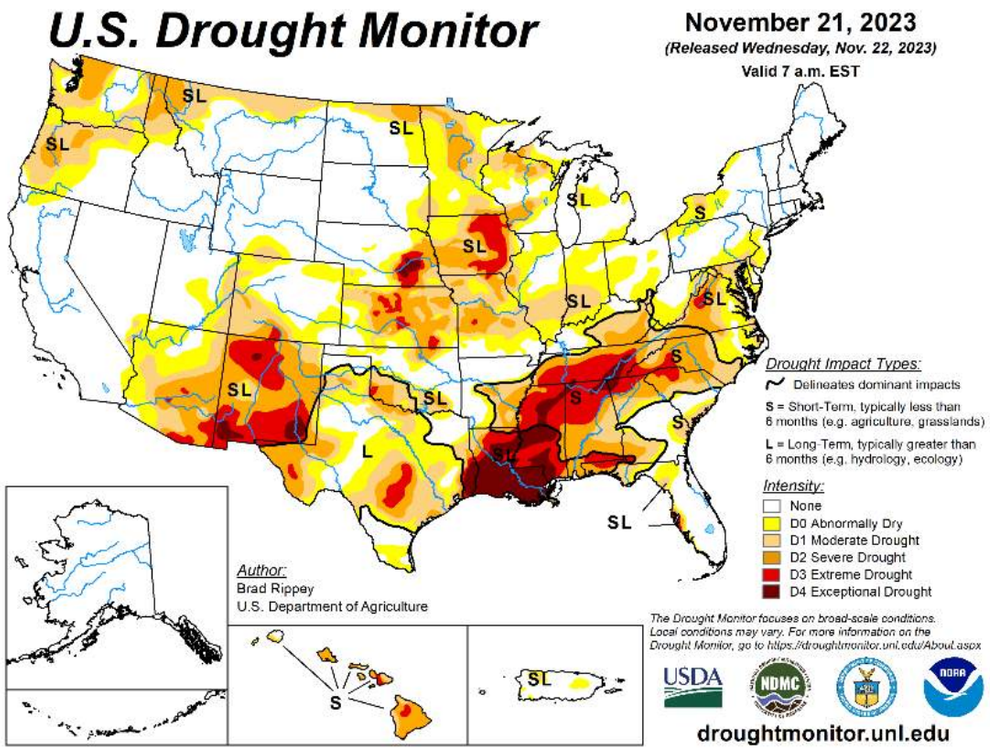


National product to map drought severity and extent

Aims to capture and depict all types of drought

Some programs use this product for agricultural aid

The USDM Process



The map is updated each week by one author

All authors are part of federal entities

USDM categories are based on convergence of evidence from multiple data points & indicators

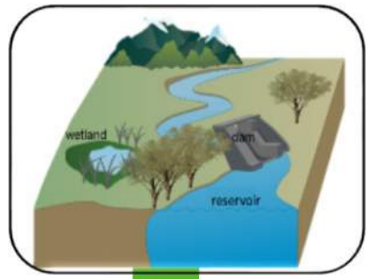
Most states provide input to help the author accurately depict local conditions

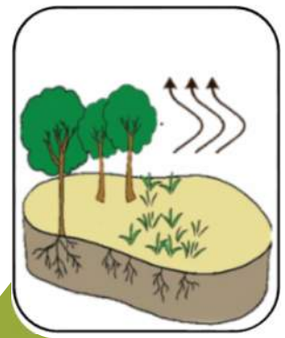
The author gets final say on what the map depicts

The USDM Process: Data

Surface Water

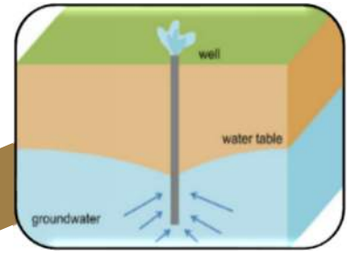
Vegetation Health





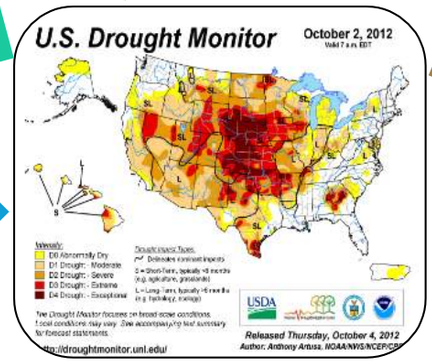
Evaporation

Soil Moisture



Ground Water

Precipitation



Impacts & Condition Monitoring reports

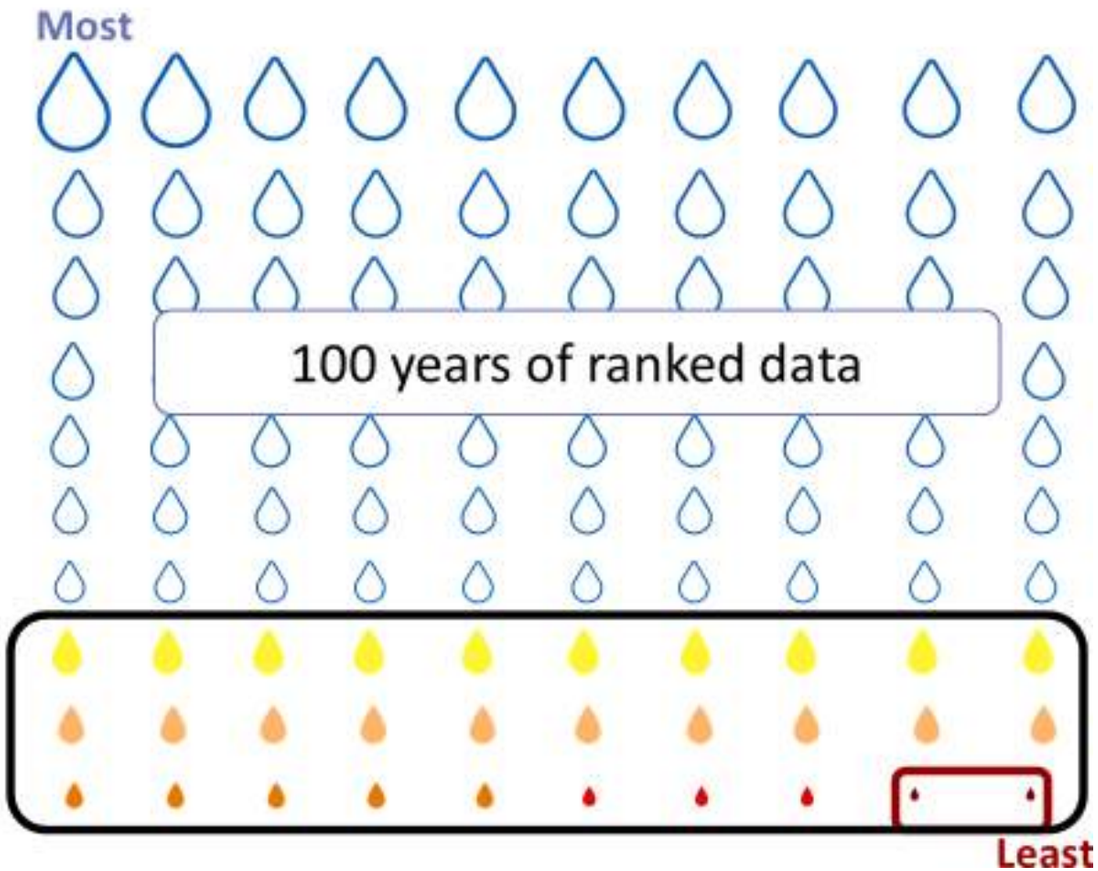
The USDM Process: Categories

Intensity is based on historical likelihood

		Percentile
	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

Not Drought

Drought



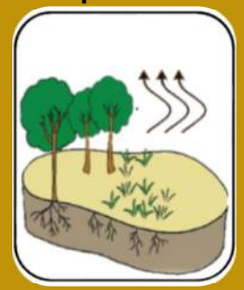
South Carolina and USDM: Weekly Data Review

Precipitation

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

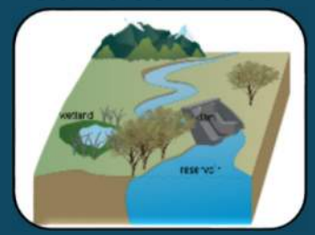
Data:
- Observed
- Departure of normal
- Percent of normal
- Standard Precipitation Index (SPI)

Evaporation



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

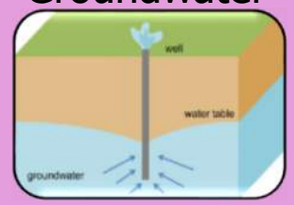
Surface Water



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

Data:
- Flow values (cfs)
- Percentile rankings

Groundwater



provided by SCDNR hydrology each week, reflecting values in percentiles

Soil Moisture

Depth (remote sensed)
- 10cm
- 40cm
- 100cm
- 200cm

Data:
- Volumetric
- Relative
- Percentile

Reports

- CoCoRaHS Reports
- CMOR Reports
- FSA County Reports

Vegetation Health

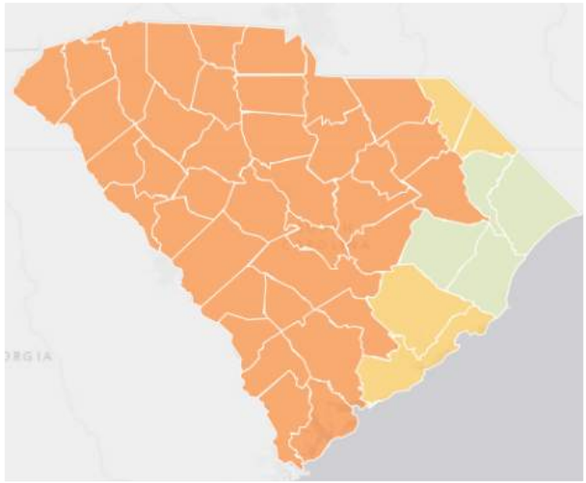
VegDRI, weekly product based on remotely sensed data

USDM vs SC DRC

	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	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.

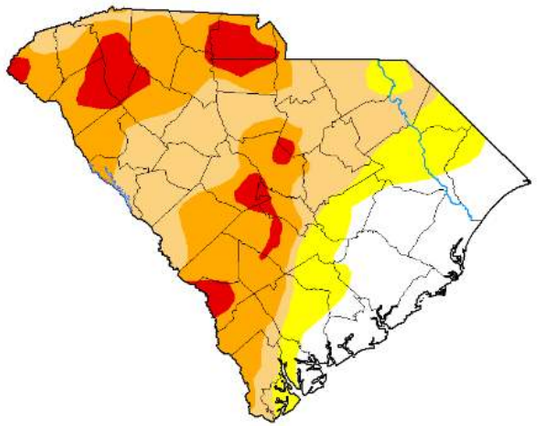
Why the Maps Look Different?

SC Drought Declaration Map by County (10/17/2019)



US Drought Monitor Map

10/15/2019



Time:

- DRC map updated as needed
- USDM updated weekly

Indicators:

- Used indicators are similar, yet different
- Spatial and temporal variations
- DRC uses indicator thresholds, USDM uses percentile rankings
- DRC designations follow county lines, USDM designations follow data "polygons"

Process Outcomes

DRC:

1. County-level drought designations that can result in local public water systems enacting their drought management plans.
2. At severe and extreme levels will make recommendations for non-essential water curtailment for **only** public water suppliers

The outcomes of DRC process relates to public water suppliers.

USDM:

1. The (USDA) may use the USDM for agricultural aid depending on severity and temporal extent for the following programs:
   - Crop Insurance
   - Conservation Reserve Program Haying and Grazing
   - Emergency Conservation Program
   - Emergency Forest Restoration Program
   - Farm Loans
   - Environmental Quality Incentives Program
   - Emergency Watershed Program
   - Livestock Forage Program

The outcomes of USDM process relate to Agriculture.

Questions?

Elliot D. Wickham

Water Resource Climatologist

Cell: **803-465-1098**

Email: **wickhame@dnr.sc.gov**