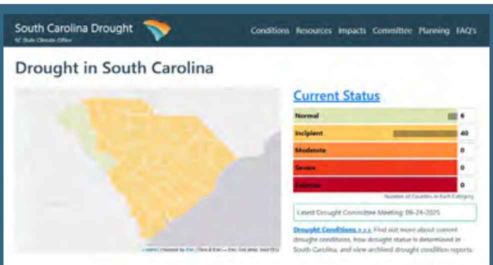
CHAPTER 3

Buffalo Creek at Lake Thurmond (courtesy Harry Shelley)

Drought and Drought Response

Drought can have widespread economic, social, and environmental impacts, and requires a comprehensive approach related to water planning.

Find comprehensive information about drought monitoring, resources, impacts and more at the South Carolina State Climatology Office website, www.scdrought.com.



This section defines drought; explores the different types of droughts that may affect South Carolina; reviews the history and impacts of drought in the state; summarizes existing state, basin, and local drought response plans; presents the drought planning and response recommendations made by the RBCs during the river basin planning process; and highlights the uncertainty around the future frequency, severity, and duration of drought.

SUMMARY

Drought is generally defined as a prolonged water shortage owing to insufficient precipitation. Droughts are further characterized based on how they develop and their impacts. Droughts can be classified as meteorological, hydrological, agricultural, socioeconomic, or ecological, and can range from short term (flash drought) to long term.

South Carolina's humid subtropical climate is prone to droughts year-round. Historical droughts, especially those in 1950 to 1957, 1998 to 2002, and 2007 to 2009, caused severe impacts across the agriculture, forestry, recreation, and public water supply sectors. These events highlight the need for effective drought planning, robust monitoring and response systems, and increased resilience.

The South Carolina Drought Response Act established in 2000 provides the state with a mechanism to respond to drought conditions and empowers SCDNR to formulate, coordinate, and execute a statewide drought mitigation plan. The Act also created the South Carolina Drought Response Committee (DRC) to be the major drought decision-making entity in the state. At the local level, public water systems must develop drought response plans aligned with the state's framework. These include voluntary and mandatory water use reductions during drought conditions. At the basin level, entities like Duke Energy, Santee Cooper, and the U.S. Army Corps of Engineers (USACE) implement basin-specific protocols to manage water during droughts.

During the river basin planning process, the RBCs developed recommendations intended to improve how local and state organizations plan, mitigate, and respond to drought. The RBCs' recommendations included several proposed improvements:

- Conduct 5-year updates to drought management plans and support smaller public water systems with technical and financial assistance for plan updates.
- Consider using drought surcharges to disincentivize high water use during drought.
- Coordinate drought response messaging and consistency in response actions between water utilities.
- Encourage more frequent and widespread drought condition reporting through the Condition Monitoring Observer Reports (CMOR) system.
- Enhance drought and climate monitoring via developing a statewide automated environmental monitoring network.
- Discourage decreasing block rate structures that incentivize high water use.

With increasing hydrologic variability, future droughts may be more frequent, severe, or longer. Proactive planning, improved data collection, and interagency coordination to address uncertainties are required. Protecting water resources and ecosystems will be increasingly necessary to build resiliency and mitigate impacts from drought as reliance on the state's water resources grows.

Buffalo Creek at Lake Thurmond (courtesy Harry Shelley)

3.1 DEFINING DROUGHT

Generally, drought may be defined as a water shortage brought about by a lack of precipitation over an extended period. In contrast to other environmental hazards, droughts develop slowly over weeks, months, or years. Given the many different types of drought and the multitude of environmental, social, and economic impacts they have, more specific definitions of drought have been developed, as shown in **Figure 3-1**. For example, a hydrologic drought could be defined conceptually as a reduction in streamflow, reservoir levels, and aquifer levels, resulting in reduced water supply availability. On the other hand, operational definitions of drought typically describe the degrees of departure from climatic variables to analyze drought frequency, severity, and duration. For example, the Standard Precipitation Index (SPI), the Palmer Drought Severity Index (PDSI), the Keetch-Byram Drought Index (KBDI), and indicators such as streamflow and soil moisture are often used to operationally identify the onset and severity of drought. Operationally defining drought helps water users, policy makers, and resource planners in recognizing and planning for drought (National Drought Mitigation Center [NDMC] 2025).

Traditionally defined by how they develop and their impacts, drought types can be classified as meteorological, hydrological, agricultural, socioeconomic, or ecological, and as either short term or long term.

- A **meteorological drought** may be defined by deficiencies in monthly or seasonal precipitation and is characterized by higher-than-average temperatures, high winds, low relative humidity, and less cloud cover. In South Carolina, one of the first impacts during the onset of a meteorological drought is the onset of brush fires.

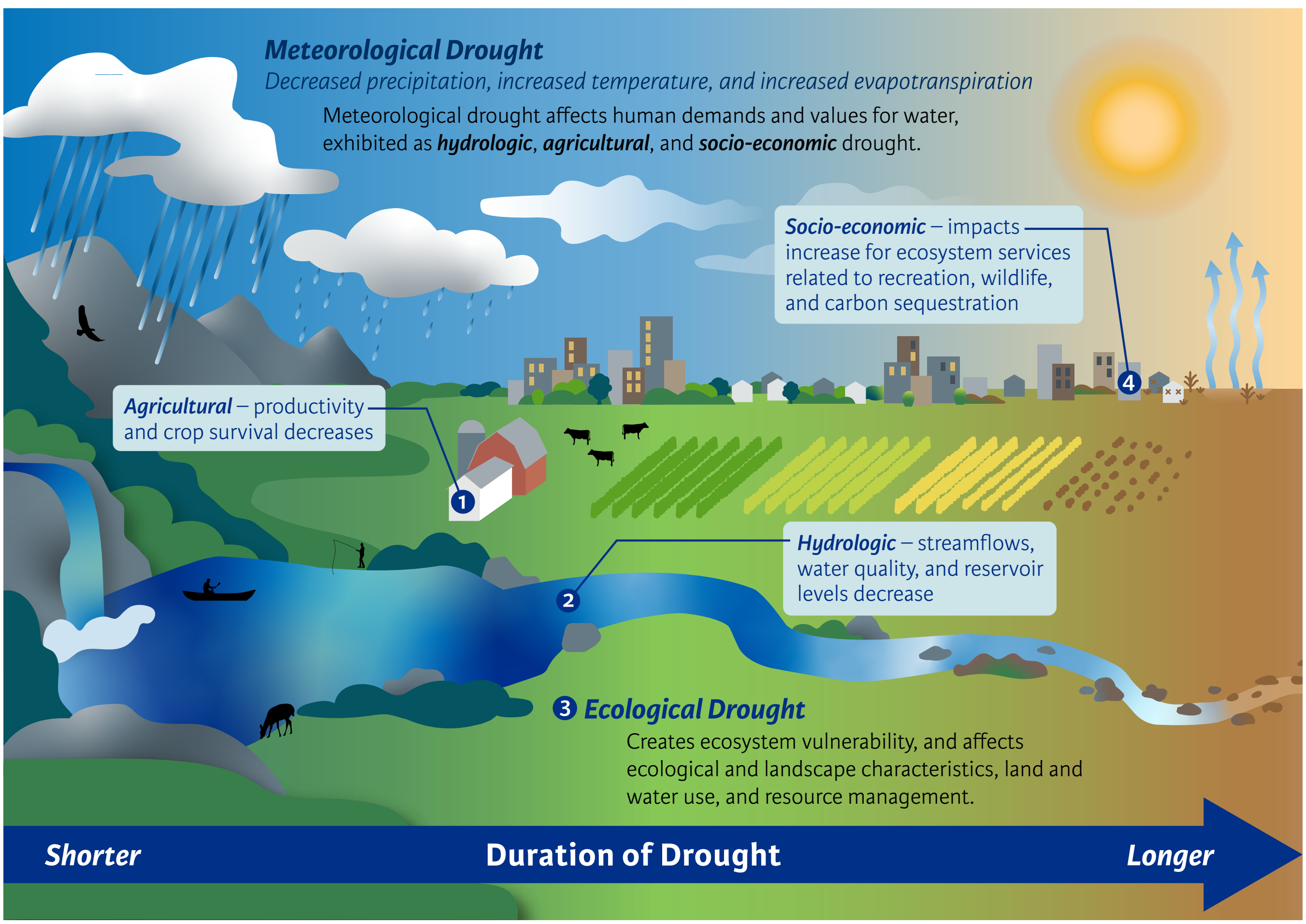


Figure 3-1. Types of drought.

Adapted from US Forest Service

- An **agricultural drought** may be determined by a combination of precipitation shortages; soil water deficits; reduced stream, lake, and groundwater levels; and other factors that impact crops and livestock. Soil water deficiencies in an agricultural drought may lead to plant water stress and reduced biomass and yield. **Flash drought** is a rapid onset, short-duration type of drought that fits into the broader categories of short-term drought and agricultural drought. Flash drought intensifies rapidly because of changes in precipitation, temperature, wind, and radiation. These changes in the weather increase evapotranspiration and lower soil moisture. Flash droughts can cause extensive damage to agriculture, economies, and ecosystems.

- A **hydrological drought** is measured by declines in streamflow, lake levels, or groundwater levels on a watershed- or river-basin scale. While a hydrological drought originates with the meteorological deficit in precipitation, it is measured based on the impacts to the hydrologic system. Generally, hydrologic impacts and deficiencies lag meteorological and agricultural indicators. For example, it may take several months for precipitation deficiencies to cause declines in reservoir levels.

- A **socioeconomic drought** considers the impacts of meteorological, agricultural, or hydrologic droughts on the supply and demand of economic goods. Socioeconomic drought occurs when there is a weather-related shortfall in water supply that is exceeded by the demand for water to meet an economic need. All regions of the state may experience a socioeconomic drought, although the economic drivers and impacts in each region are likely to differ.

- An **ecological drought** is a deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedback in natural and/or human systems. Ecological drought impacts may include reduced biodiversity, forest conversion, fish kills in streams, river degradation, and/or species migration. Short-term droughts may cause woody plants such as trees and shrubs to wilt, while long-term drought may cause native plants to die back and allow invasive plant species to intrude. Changes in plant cover during long-term drought reduce habitat for wildlife and affect water resources. Dry vegetation and higher-than-average temperatures can also leave regions more susceptible to wildfire. All regions of the state may experience ecological drought, although the impacts may differ substantially based on the type of ecosystems present.

Periods of precipitation deficit that last for a few weeks or months are considered short-term droughts. Indicators used to monitor short-term drought include topsoil moisture and streamflow, and indices used to monitor for short-term drought impacts include the SPI, Palmer Z Index, and Crop Moisture Index. Periods of precipitation deficit and drought patterns that last more than 6 months are typically considered long-term droughts (NDMC 2025). Indicators used to monitor long-term drought impacts include reservoir storage and groundwater levels. Drought can also develop rapidly, in what is referred to as flash drought. In addition to the lack of precipitation associated with conventional drought, flash droughts are often driven by abnormally high temperatures, winds, and/or incoming solar radiation, which leads to high evapotranspiration rates.

Center pivot sprinkler in the Edisto River basin

3.2 CLIMATE

South Carolina boasts a rather diverse climate, which can be attributed to several factors. Because of its position within the mid-latitudes, the prevailing westerly winds help steer weather systems across the state. Its position on the continent's eastern coast makes the state susceptible to cold air masses moving in from the northwest. The Appalachian Mountains tend to block most cold air outbreaks, contributing to mild winters. The presence of the Atlantic Ocean, with the Gulf Stream flowing northward off the coast, is also important since land and water heat and cool at different rates. South Carolina's weather is dominated by the position of the Bermuda High during the warm season, which provides a persistent flow of warm, moist air into the region.

Although South Carolina typically receives adequate precipitation, droughts can occur at any time of the year and last for several months to several years. While precipitation is the primary driver of water availability in the state, multiple factors, including temperature, evapotranspiration, and water demands, must be considered when evaluating how drought periods impact stream and river flows, reservoir levels, and groundwater availability.

South Carolina regularly experiences severe weather in the form of thunderstorms, tornadoes, tropical cyclones, and winter storms. Elevated temperatures during the summer months often result in greater water loss from the top layers of soil owing to high evaporation and transpiration. If precipitation does not occur at regular intervals, or with enough intensity to replenish water loss, a drought will occur.

Figure 3-2 demonstrates how South Carolina has moved in and out of drought conditions over the last 130 years. The graph shows the monthly PDSI, which is a standardized drought index based on a simplified soil water balance and estimates of relative soil moisture conditions. The magnitude of the PDSI indicates the severity of the departure from normal conditions. A PDSI value greater than 4 represents very wet conditions, while a PDSI less than -4 represents an extreme drought.

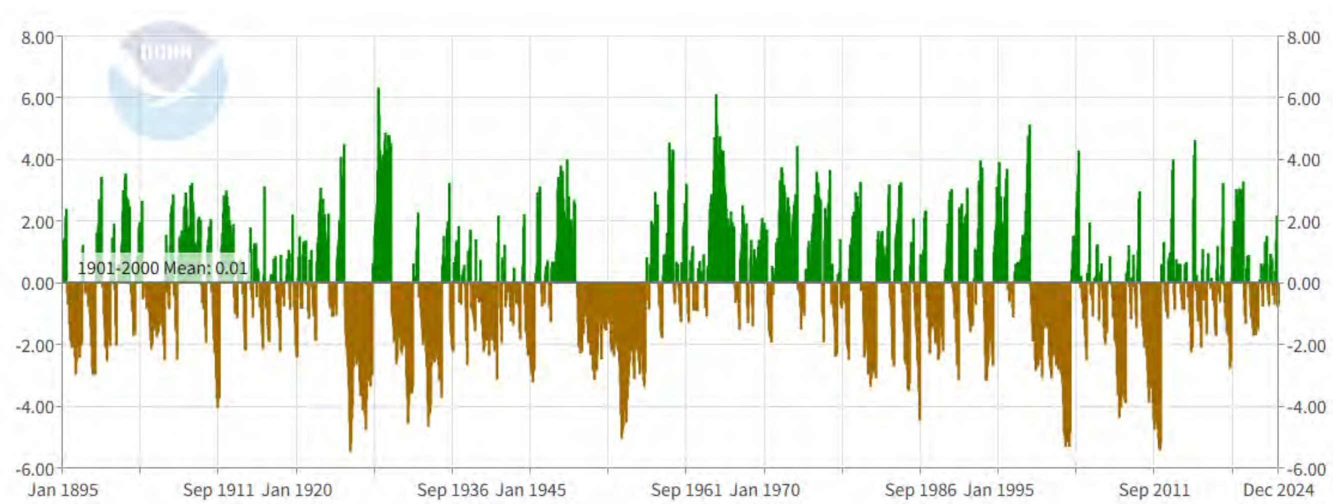


Figure 3-2. Annual statewide PDSI, 1895 through 2024 (National Oceanic and Atmospheric Administration 2025).

3.3 IMPACTS AND HISTORY OF DROUGHT

A drought impact is defined as any observable effect or change on human activity or a natural process at a specific time that is directly or indirectly caused by drought. The extent of this impact is dictated by the interaction of the drought event and the impacted elements, such as people, agricultural areas, reservoirs, and water supplies, and the vulnerabilities of these elements to droughts. Economic, environmental, and social impacts from drought conditions can cause widespread hardship.

Initially, economic impacts may include direct impacts to farmers, businesses, and individuals, or indirect impacts to businesses that support farmers or depend on farming, such as agricultural supply companies. The loss of this capital may affect the availability of food and other agricultural products. Municipal and industrial economic impacts may include additional expenses for water companies or industries to secure additional water supplies. Power companies may have to reduce hydroelectric generation and have greater reliance on more expensive energy sources to meet customer needs. Recreation-and navigation-related industries may also lose business or incur additional expenses as a result of decreased water levels.

Many environmental impacts can result from drought conditions. Plant and animal habitat can be destroyed or damaged. Diseases can increase in wild animals because of a lack of food and water supply. Although migration may be an option in some cases, extreme drought can lead to more dire circumstances. Drought can also cause decreased water levels in reservoirs and streams, and loss of acquatic and wetland habitats, which may result in increased water temperatures, poor water quality, and fish kills. Susceptibility to wildfire also increases during drought conditions. Forest fires have caused large economic losses for the timber industry and dry conditions have made forests more susceptible to pest infestations like the southern pine beetle.

The social impacts of drought affect not only lifestyle, but health and safety. Reduced incomes, relocating families or businesses to areas with adequate and reliable water supply, and a decreased availability of water-based recreational activities are examples of such social impacts. More extreme impacts can include stress from economic loss caused by drought, health-related impacts from poor water quality, decreased water availability, and/or increased dust. There may also be public safety concerns because of an increased range and frequency of wildfires.

Lake Russell

While historical events are not necessarily indicative of future conditions, evaluating the history of drought and its associated impacts can identify potential impacts of future droughts and help identify effective mitigation, monitoring, and response measures. The South Carolina State Climatology Office (SCO), which is part of SCDNR, maintains a timeline that highlights some of the major droughts and their impacts and has developed the report *Keystone Drought Events in South Carolina*, which summarizes the significant droughts dating back to 1910. Three of the more notable droughts are described as follows:

- **1950 to 1957:** One of the most prolonged and widespread droughts occurred from 1950 to 1957 and covered at least 60 percent of the contiguous United States at its peak. In South Carolina, every year from 1950 to 1956 and most of 1957 experienced below-average rainfall. 1954 was the driest year in state history, with an annual precipitation of 31.72 inches—16.08 inches below normal. During this period, many streams ran dry and some major rivers, like the Black and Coosawhatchie Rivers, stopped flowing for prolonged periods.
- **1998 to 2002:** Beginning in 1998, much of South Carolina experienced 4 years of below-normal precipitation and some of the largest precipitation deficits ever recorded. On August 13, 2002, the US Drought Monitor (USDM) classified most of the Upstate to be in D4 (Exceptional Drought) status, with the rest of the state in D3 (Extreme Drought) (**Figure 3-3**). On August 26, 2002, the South Carolina DRC declared every county to be in extreme drought status. Severe impacts across multiple sectors, including agriculture, recreation, forestry, energy production, and public water supply, were recognized. Agricultural impacts included reduced crop yields, an increase in the cost of digging new wells for irrigation, ponds drying up, and a decrease in the ability of pastures to adequately sustain livestock (SCDNR SCO 2002). The forestry industry dealt with the cascading impact of the increased potential for fire, leading to outdoor burn bans, while the reduced water availability stressed trees. This stress increased susceptibility to the southern pine beetle, resulting in over a billion dollars in losses to the timber industry. Some mandatory conservation efforts were enforced, and streamflows reached record lows. Low flows exposed boats to hazards and negatively affected businesses that relied on river recreation for income. Groundwater levels and reservoir storage were significantly depleted, and coastal areas such as Charleston experienced the effects of saltwater intrusion on their water supplies.

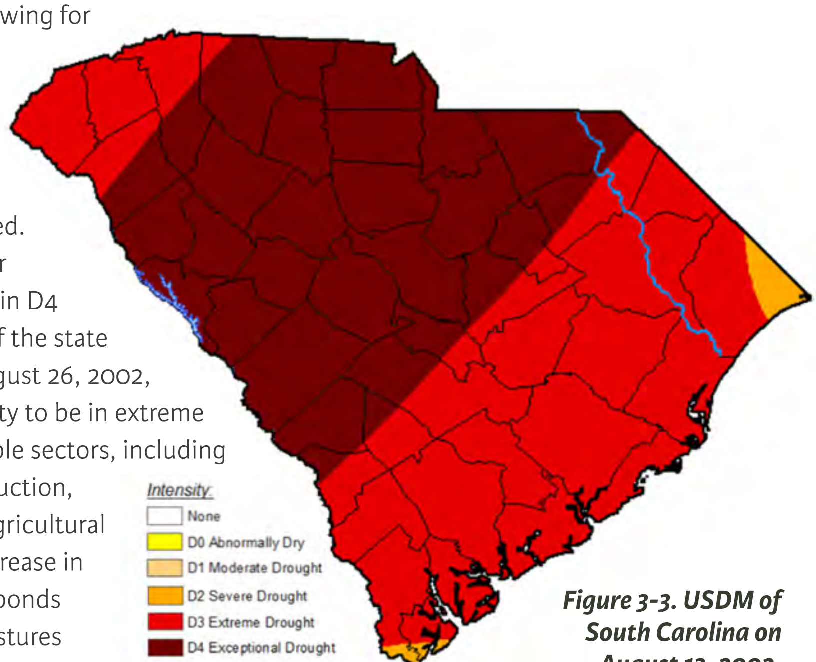


Figure 3-3. USDM of South Carolina on August 13, 2002.

Lake Wallace

- **2007 to 2009:** The drought from 2007 to 2009 was a statewide event in South Carolina, with the most severe conditions observed north of the Fall Line. 2007 was South Carolina's third driest year on record, with a statewide average annual precipitation of 34.90 inches (SCDNR SCO 2025b) compared to typical average annual rainfall of approximately 48 inches. With low upstream flows from the Broad and Saluda basins, the effects were felt across various sectors in the state, including agriculture, recreation, forestry, energy production, and public water supplies. The combination of low soil moisture and tree stress caused by reduced water availability led to increased wildfire risks. In July and August 2007, wildfire occurrences exceeded normal levels, with 518 fires burning a total of 2,730 acres. By April 2008, the number of fires had risen to 2,800, damaging 17,000 acres (SCDNR SCO 2008a). By September 2008, the state saw a 66 percent increase in the number of acres burned compared to the 5-year average (SCDNR SCO 2008b). It was not until April 2009 that the risk of wildfires began to decrease as drought conditions improved. Public water supplies were also severely impacted by the intensity and duration of the 2007 to 2009 drought. During summer and fall 2007, the number of water systems implementing water restrictions increased significantly. Water levels in Lake Marion dropped more than 6 feet between July 2007 and November 2007 (**Figure 3-4**). By January 2008, 191 water systems statewide had implemented some level of water conservation measures, and of these, 146 had imposed voluntary restrictions and 45 had imposed mandatory restrictions (SCDNR SCO 2008c). In July 2008, the Governor and SCDNR issued a statement encouraging water conservation, particularly in counties experiencing severe and extreme drought conditions. This message aimed to promote water-saving practices for all residents throughout the state (SCDNR SCO 2008d). The Governor had rarely needed to exercise his executive authority to promote water conservation in South Carolina, underscoring the severity of the drought situation. It was not until June 2009 that conditions returned to normal.

Figure 3-4. 2007 to 2009 drought impacts. *Clockwise from top left: Lake Marion, 2008; Lake Moultrie 2007; Lake Jocassee 2007; Deep Hole Swamp in Florence County, 2008.*

Bushy Park Reservoir (courtesy Charleston Water System)

3.4 DROUGHT RESPONSE

3.4.1 State Drought Response

The South Carolina Drought Response Act of 2000 (Code of Laws of South Carolina, 1976, Section 49-23-10 et seq., as amended) was enacted to provide the state with a mechanism to respond to drought conditions (SCDNR 2009). The Act stated that SCDNR will formulate, coordinate, and execute a statewide drought mitigation plan. The Act also created the DRC to be the major drought decision-making entity in the state. The DRC is a statewide committee chaired and supported by SCDNR's SCO, with representatives from local interests.

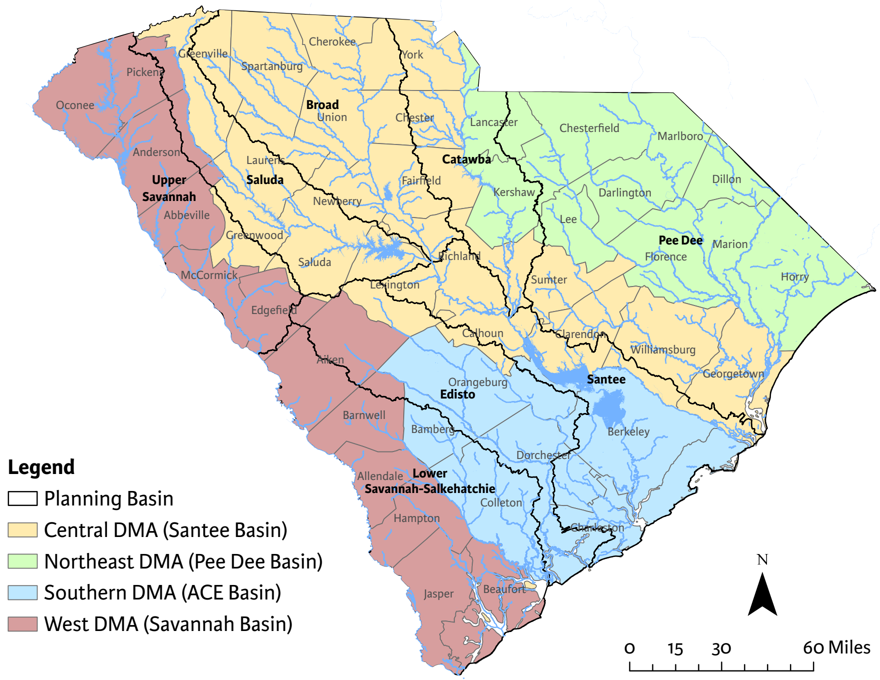


Figure 3-5. The four Drought Management Areas.

To help prevent overly broad response to drought, the Act assigned SCDNR the responsibility of developing smaller Drought Management Areas (DMAs) within the state. The state was split into four DMAs that generally follow the boundaries of the four major river basins but are delineated along geopolitical county boundaries rather than basin boundaries, as shown in **Figure 3-5**. The Governor appoints members, to include representatives from various state agencies and from 12 different stakeholder groups, within each DMA (**Figure 3-6**).

In accordance with the Act, SCDNR developed the South Carolina Drought Response Plan. South Carolina has four drought alert phases: incipient, moderate, severe, and extreme. SCDNR and the DRC primarily monitor seven drought indicators and indices to determine when drought phases are beginning or ending. These include the USDM, Crop Moisture Index, PDSI, KBDI, and streamflow and reservoir levels. The South Carolina Drought Regulations establish thresholds for these drought indicators, corresponding to the four drought alert phases. Declaration of a drought alert phase is typically not made based only on one indicator but on a convergence-of-evidence approach. The need for a drought declaration alert phase is also informed by additional information, including water supply and demand, rainfall records, agricultural and forestry conditions, and climatological data.

The South Carolina Emergency Response Plan has an appendix that describes actions when drought conditions have reached a severity level beyond the scope of local communities. The South Carolina Emergency Operations Plan is an all-hazard plan developed for use by state government departments and agencies to ensure a coordinated and effective response to natural, technological, or man-made disasters that may occur in South Carolina.

State Agency Representation	Local DMA Representation	
SC Department of Natural Resources	Agriculture	Private Water Supplier
SC Department of Environmental Services	Commission of Public Works	Public Service District
SC Emergency Management Division	Counties	Regional Council of Governments
SC Department of Agriculture	Domestic User	Soil & Water Conservation District
SC Forestry Commission	Industry	Special Purpose District
	Municipalities	
	Power Generation Facilities	

Figure 3-6. State agency and local stakeholder representation on the DRC.

3.4.2 Local Drought Response

Based on their assessment of drought conditions, SCDNR and the DRC coordinate the appropriate response with the affected DMAs or counties. At a local level, Section 49-23-90 of the Drought Response Act states that municipalities, counties, public services districts, and commissions of public works shall develop and implement drought response plans or ordinances. These local plans must be consistent with the State Drought Response Plan. The SCDNR SCO developed a model drought management plan and response ordinance for local governments and water systems to use as templates, and more recently prepared a Drought Planning Guidebook that serves as a companion document to the model drought plan and helps provide context for building a robust local drought plan for water systems. The guidebook uses case studies and best practices taken from water systems within South Carolina.

In a drought mitigation plan, each phase of drought has a set of responses that are set in motion to reduce demand, bolster supply, or both. The drought plans and ordinances include system-specific drought indicators, trigger levels, and responses. Responses include a variety of actions that would be taken to reduce water demand at the levels indicated in **Table 3-1**.

When drought conditions have reached a level of severity beyond the scope of the DRC and local communities, the State Drought Response Plan, Emergency Management Division, and State Emergency Response Team are activated. Under Section 49-23-80 of the Act, if SCDNR and the DRC determine that drought has reached a level of severity such that the safety and health of citizens are threatened, the DRC shall report such conditions to the Governor. The Governor is then authorized to declare a drought emergency and may require curtailment of water withdrawals.

Table 3-1. Demand reduction goals of drought response plans in South Carolina.

DROUGHT PHASE	RESPONSE
Incipient	None specified
Moderate	Seek voluntary reductions with the goal of: • 20% reduction in residential use • 15% reduction in other uses • 15% overall reduction
Severe	Mandatory restrictions for nonessential use and voluntary reductions of all use with the goal of: • 25% reduction in residential use • 20% reduction in other uses • 20% overall reduction
Extreme	Mandatory restrictions of water use for all purposes with the goal of: • 30% reduction in residential use • 25% reduction in other uses • 25% overall reduction

Lake Thurmond (courtesy Harry Shelley)

3.4.3 Regional Drought Response

Several of the eight planning basins have regional drought response protocols already in place that are designed to manage water use during periods of low inflow caused by drought. These protocols and plans establish trigger points, define stages of response, and coordinate water conservation efforts and water use reductions with the goal of extending water availability, supporting operational needs (typically for energy and municipal water production) and ecosystem needs for as long as possible. The Edisto RBC, as part of their planning process, developed a voluntary low flow management strategy. It, and other drought response protocols in the river basins, are described below.

Catawba-Wateree River Basin

During Duke Energy's Catawba-Wateree hydroelectric relicensing process, a Low Inflow Protocol (LIP) was developed to establish procedures for reductions in water use during periods of low inflow to the Catawba-Wateree basin. The LIP was originally established in 2006, on the basis that all parties with interests in water quantity will share the responsibility of establishing priorities and conserving the limited water supply (Duke Energy 2022). The protocol was developed collaboratively by the Catawba-Wateree Drought Management Advisory Group, which includes state agencies, federal entities, and large water users. The LIP, which was most recently updated in 2022, does not supersede the requirements of the Drought Response Act.

This five-stage LIP provides objective trigger points and procedures for how the reservoirs, hydroelectric facilities, and thermoelectric facilities will be operated by Duke Energy. The LIP also outlines water withdrawal reduction measures (voluntary, mandatory, or emergency as needed) and goals for municipal and other major water users during periods of low inflow. During times that inflow is not adequate to meet all normal demands for water and maintain reservoir levels as normally targeted, the LIP calls for Duke Energy to progressively reduce hydropower generation. If hydrologic conditions worsen, various stages of response are triggered. Each progressive stage of low inflow conditions calls for greater reductions in hydropower station water releases and reductions in water withdrawals by the public water systems and those irrigating directly from the eleven reservoir system. The goal of the staged LIP is to take the actions needed in the Catawba-Wateree River Basin to delay the point at which the usable water storage inventory of the reservoirs is fully depleted. The triggers for the various stages and the actions required of all major water users are objective, clear, and aligned, so that the basins response to drought occurs early enough to have significant water savings and without requiring political decision making. The LIP is intended to provide additional time to allow precipitation to restore streamflow, reservoir levels, and groundwater levels to normal ranges.

Lake Wylie Hydro Station (courtesy Duke Energy)

Edisto River Basin

During the RBC planning process, the Edisto RBC developed and approved by consensus, a low flow management strategy. The intent of the low flow management strategy is to incrementally reduce surface water withdrawals so that water users, including the most downstream users on the Edisto River, still have access to water under conditions that might arise during severe and extreme drought. The strategy, which calls for increasing reductions in withdrawal as river flows drop below certain thresholds, also works to maintain water in the river to support ecological needs.

The strategy takes effect when flow in the Edisto River measured at the Givhan's Ferry USGS gaging station (02175000) is less than 332 cubic feet per second (cfs), which is 20 percent of the long-term median flow of 1,660 cfs. When flow drops below this threshold, the strategy calls for voluntary reductions in withdrawals of certain surface water users by a specified amount, depending on the level of flow.

The Edisto RBC recognized that surface water users in the basin do not have equal means to comply with the voluntary withdrawal reductions. To ease the burden on users with fewer resources, the low flow management strategy applies to surface water users when their cumulative peak monthly withdrawal has exceeded 60 million gallons per month (MGM) in any of the previous 12 months. With this threshold, and based on current withdrawals, the strategy captures 92 percent of the volumetric withdrawal from the Edisto River but excludes the lower 86 percent of small withdrawers that may have more difficulty in reducing withdrawals and/or using alternative sources of water, such as groundwater.

The low flow strategy does not apply to surface water users who have existing agreements with SCDES to shift withdrawals from surface water to groundwater or vice versa, based on agreed-to triggers. In such cases, the timing of their shift from surface water to groundwater will be dictated by their agreement with SCDES, not the low flow management strategy. The low flow strategy does not set any new (lower) minimum flow requirements for new surface water withdrawals permitted in the basin. New permits will still be governed by the prescribed minimum instream flow in the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act.

Edisto River

Santee River Basin

Water management during droughts in the lower portion of the Santee River basin has been a major issue, especially during recent droughts occurring in 1998 to 2002, 2007 to 2009, and 2015 to 2016. The Low Inflow and Drought Contingency Plan (LIDCP) was required per License Article 406 as part of the new 50-year license granted by the Federal Energy Regulatory Commission (FERC) to the South Carolina Public Service Authority for the Santee Cooper Project (Santee Cooper 2024). Santee Cooper operates the Santee Dam on the Santee River where they manage the level of Lake Marion and releases downstream. The Santee Dam controls the flow entering Lake Moultrie and the southern portion of the Santee River basin.

The LIDCP has triggers tied to the water level in Lake Marion and streamflow on the Congaree and Wateree Rivers, upstream. The triggers can result in designation of a short-term low inflow (flash drought) condition and three increasingly severe drought levels. Reductions in reservoir releases generally occur when Lake Marion's water level drops below the target operating range and other conditions are met. The level of response varies depending on the magnitude and duration of hydrologic drought on the Congaree and Wateree Rivers. For rising lake levels, the need to ease restrictions is triggered when Lake Marion's level displays a sustained rise toward the operating range of the response curve. Unlike the Catawba-Wateree's LIP or the Edisto's low flow management strategy, the Santee LIDCP does not require voluntary or mandatory conservation by public supply, industrial, or other water users on or upstream of Lake Marion.

Jefferies Hydro Plant


Santee River

Upper Savannah River Basin

The USACE Savannah District operates three dams on the Savannah River in the Upper Savannah River basin where they manage lake levels and releases downstream: Hartwell, Russell, and Thurmond. The Savannah River Basin Drought Management Plan has evolved from the initial Drought Contingency Plan (DCP) established in 1989 to the latest 2012 version, which includes a number of modifications made primarily as a result of the droughts of 1998 to 2002 and 2007 to 2009 (USACE 2012).

The DCP is implemented when either Hartwell or Thurmond pool elevations drop below a defined trigger elevation. Four successively lower trigger levels result in reduced releases ranging from 4,200 to 3,100 cfs at the Thurmond Dam, depending on the time of year. On a rising pool, flow restrictions are lessened only after both Hartwell and Thurmond elevations are 2 feet above the trigger elevation. In Drought Levels 1 and 2, the 28-day running average streamflow measured at the USGS Broad River gage (in Georgia) is used to further define the weekly average release from Thurmond.

Water management in the Savannah basin during droughts has been a major issue, and USACE was requested to examine the DCP as part of the second interim of the Savannah River Basin Comprehensive Study. Environmental organizations have also requested USACE consider the environmental benefits that would result from restoring natural variability to downstream river flows. The Comprehensive Study ended in 2020 because of insufficient funding and other reasons. The draft Comprehensive Study Report tentatively recommended no seasonal variation in drought trigger levels, raising the trigger levels by 3 to 6 feet, and further restricting the flow of water from Thurmond Dam earlier during drought. This recommendation was identified in the study as Alternative 2 (USACE 2020); however, the recommendation was not implemented since the Comprehensive Study ended prior to completion.

In addition, the Duke Energy LIP was established as part of the relicensing agreement for the Keowee-Toxaway Hydro Project and it effects operations of the three Duke Energy reservoirs (Bad Creek, Lake Jocassee, and Lake Keowee) in the Upper Savannah River basin (Duke Energy Carolinas, LLC 2013). The LIP establishes a joint management plan that Duke Energy, public water suppliers with large water intakes withdrawing from project reservoirs, and public water suppliers with large water intakes on the Savannah River USACE reservoirs (Hartwell, Russell, and Thurmond) agree to follow under drought conditions. The LIP has five stages (0 through 4) that specify how the reservoirs will be operated during drought conditions. The five stages are triggered by remaining usable storage, USACE DCP levels, composite average streamflow, and the USDM. Under Stage 1, the goal is to reduce water usage by 3 to 5 percent from the amount that otherwise would be expected. Similarly, stages 2, 3, and 4 call for 5 to 10 percent, 10 to 20 percent, and 20–30 percent reductions, respectively.

Savannah River (courtesy Beaufort-Jasper Water & Sewer Authority)

Broad, Pee Dee, and Saluda River Basins

Additional low inflow protocols are associated with FERC-licensed projects in the Saluda and Broad River basins, and in North Carolina's Yadkin-Pee Dee River basin, which drains to the Pee Dee River basin in South Carolina. These are generally in the form of minimum reservoir flow releases during low inflow periods.

3.4.4 River Basin Council Involvement in Drought Response

The *State Water Planning Framework* encourages the RBCs to play a role in supporting drought response, collecting drought information, and coordinating drought response activities. Specific RBC responsibilities, with the support of SCDNR and SCDES, include:

- Collecting and evaluating local hydrologic information for drought assessment.
- Providing local drought information and recommendations to the DRC regarding drought declarations.
- Communicating drought conditions and declarations to the rest of the RBC, to stakeholders, and to the public.
- Advocating for a coordinated, basin-wide response by entities with drought management responsibilities (e.g., water utilities, reservoir operators, large water users).
- Coordinating with other drought management groups in the basin as needed.

During development of their River Basin Plans, the RBCs reviewed and discussed these responsibilities. Each RBC developed a communication strategy, identifying one or more members to serve as a designated liaison to receive and communicate information to the DRC. In recent years, the SCO has worked with the Governor's Office to appoint RBC members to the DRC, representing the four DMAs. As of August 2025, there were 11 RBC members on the DRC and 1 member from the Catawba-Wateree Water Management Group Board of Directors. Of the seven RBCs, only the Saluda RBC does not currently have representation on the DRC. Having consistent RBC representation on the DRC will improve communication of drought impacts at the basin level, enhance coordination between groups, and better support drought declaration and response decisions.

Pee Dee River

3.5 RECOMMENDATIONS FROM THE RIVER BASIN COUNCILS

During the river basin planning process, each RBC had the opportunity to learn about the basin and state climate and become more familiar with drought monitoring, occurrence, designation, response, recovery, and the roles played by the SCO, DRC, and others. Each RBC then discussed and developed recommendations intended to improve how local and state organizations plan, mitigate, and respond to drought. The RBCs also sent one or more representatives to a statewide Drought Tabletop Exercise led by the SCO in March 2025.

There was a high level of consistency in consensus-based recommendations developed by the RBCs related to drought. The recommendations that were most consistent across the RBCs are summarized below.

Water utilities should review and update their drought management plan and response ordinance every 5 years or more frequently if conditions change. Many of the plans were submitted to the SCO in 2003, shortly after the Drought Response Act went into effect, and have not been updated. As such, they may contain information that is outdated. The Act did not explicitly require drought plans to be updated at a specific interval; however, the SCO is actively encouraging public water suppliers to update their plans, and many have done so within the past year.

Water utilities should consider drought surcharges on water use during severe and/or extreme drought phases. Drought surcharges, when used, are typically only implemented if voluntary reductions are not successful in achieving the desired reduction in water use. In the Saluda River basin, some water utilities have already built into their response ordinance the ability to implement drought surcharges during the severe and/or extreme drought phases.

Water utilities within a basin should coordinate, to the extent practical, their drought response messaging. Consistent and coordinated drought response messaging can be important, especially when there are drought conditions impacting the entire basin and possibly neighboring basins. Consistent and coordinated messaging can prevent confusion and provide efficiency. The RBCs recognized that coordinated and consistent messaging may not be possible when drought conditions are appreciably different across the basin, when utilities are in different stages of drought response, or when response strategies between two or more utilities are different.

Water users and those with water interests should submit drought impact observations through CMORs. The CMOR system, maintained by NDMC, provides supporting evidence in the form of on-the-ground information to help the authors of the USDM better understand local conditions. The SCO also reviews and uses the CMOR system in a variety of ways. CMORs can be submitted by clicking the "Submit a Report" button at NDMC's Drought Impacts Toolkit website.

Broad River at Columbia

Additional drought recommendations that were made by one or more RBCs, but not all, are listed below. Like the previous set of drought recommendations, these were consensus-based recommendations which represented RBC support ranging from strong to "can live with it."

To improve monitoring conditions that may lead to drought, and to monitor changing conditions during drought, an automated environmental monitoring network of weather and climate monitoring stations in South Carolina should be funded and established. An automated network of weather and climate monitoring stations provides near real-time data at the local level to improve situational awareness and preparedness and support decision-makers and stakeholders, such as emergency management agencies, water resources managers, agricultural interests, transportation officials, energy providers, and the DRC. Currently, South Carolina is only one of 10 states in the United States without an automated network of weather and climate monitoring stations.

Water utilities, when updating their drought management plan and response ordinance, should look for opportunities to develop response actions that are consistent with those of neighboring utilities. While triggers are likely to be unique to each water utility based on their source(s) of water, coordination of response actions identified in their ordinance, to the extent practical, supports consistent messaging through the basin and helps avoid confusion between customers.

State funding should be made available to water utilities to support the review and update of drought management plans. Water utilities with limited financial and technical capability may benefit from technical assistance to identify appropriate drought triggers and response strategies.

The use of decreasing block rate structures by water providers should be discouraged. Under a decreasing block rate structure, water customers pay a lower per unit rate as their water use increases. This type of rate structure discourages water conservation, and may lead to higher water use during drought, especially by residential customers. In North Carolina, the use of decreasing block rate structures is prohibited for local governments and large community water systems applying for state funds for extending water lines or expanding water treatment capacity.

Industries should continue and enhance information-sharing on best practices for drought management.

Reedy River at Greenville

3.6 UNCERTAINTY AND THE FUTURE OF DROUGHT

Since the turn of the century, hydrologic variability in the Southeastern United States has increased in the form of more frequent and severe rainstorms that have caused devastating flooding and more frequent periods of drought. **Figure 3-7** provides an illustration from the Saluda Basin, where low flow periods in sequential years are highlighted in yellow. During the past 25 years, the periods of time in which interannual drought conditions have been observed have become more frequent, and in many cases more severe, than in the 50 years prior.

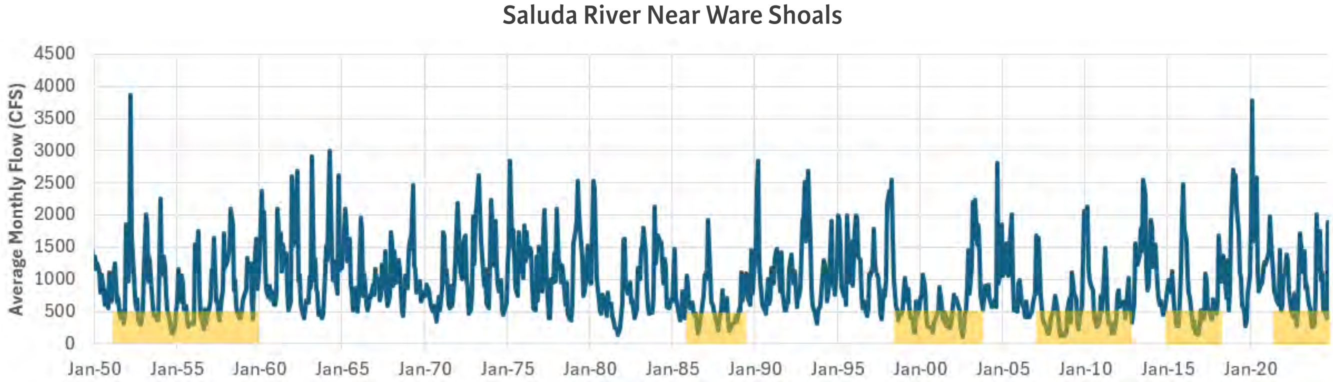


***Figure 3-7. Hydrograph of Saluda River near Ware Shoals.** Yellow-shaded periods illustrate consecutive years of low flow.*

Because of the significant uncertainty associated with future hydrologic patterns, future drought conditions and consequences cannot be projected with certainty. To help cope with uncertainty in future droughts, several RBCs elected to simulate hypothetical future droughts that were more severe than historical droughts. These simulations proved that future droughts could exacerbate stress on water supply systems to concerning levels if they were to occur with such severity. Given that the frequency and severity of drought could be increasing and informed by simulations that evaluated impacts to reservoir levels from more severe droughts, the RBCs recommended improvements in South Carolinas drought planning and management policies and procedures. These are intended to help cope with the uncertainty in drought conditions that could be very different than historical droughts.

Information from future droughts, including rainfall patterns, river flows, reservoir and groundwater levels, and temperature trends will continually expand the database used by SCDNR, SCDES, and other agencies to better prepare the state for future drought conditions. Droughts do not only pose risks for water supply, but pose risks for wastewater disposal (as assimilative capacities of rivers and streams may become lower) and for aquatic ecosystems that depend on river depths, flow velocities, and water temperatures. As future droughts occur, coordination between state agencies and departments, including those with responsibility for water quality, discharge permitting, and fish and wildlife habitat, will be essential. Future updates to this State Water Plan and the River Basin Plans should carefully assess trends in rainfall, streamflow, and storage levels for surface water and groundwater to determine whether additional protective measures should be considered.