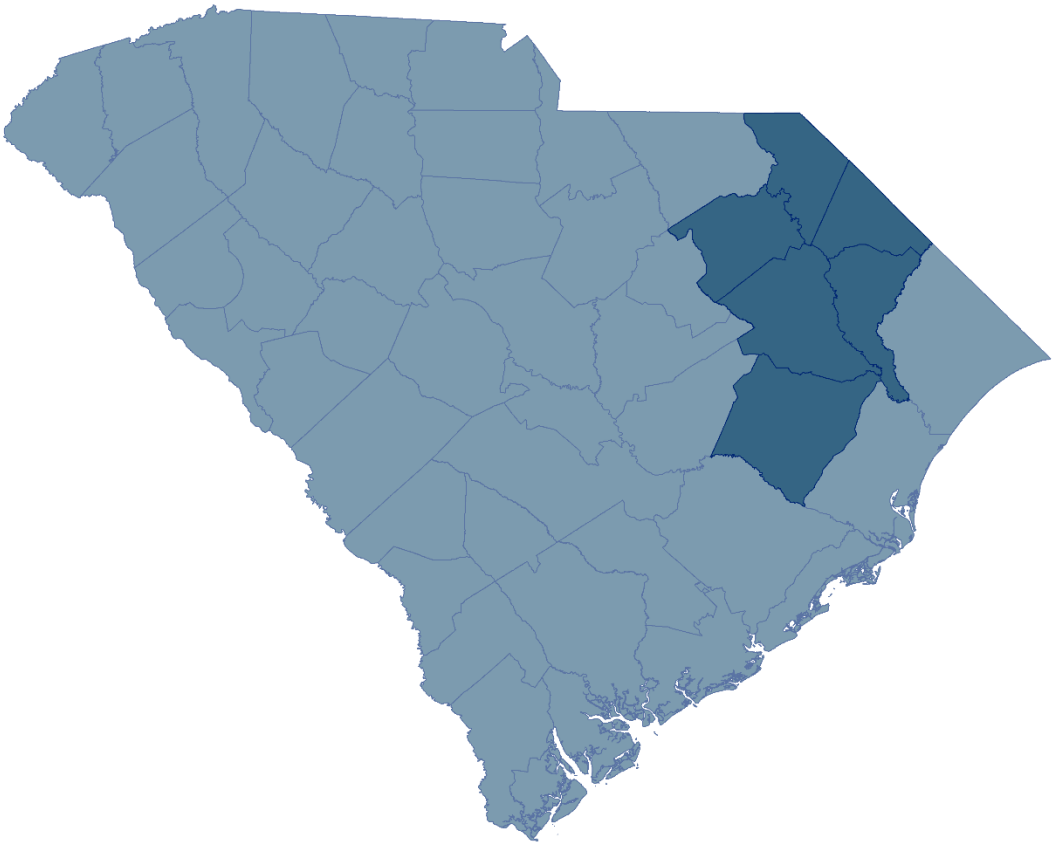
Pee Dee Capacity Use Area Groundwater Evaluation

Permitting Year 2025



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Technical Report Number: **005-2024**
September 2024

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Introduction

The Pee Dee Capacity Use Area (Pee Dee Area), which includes the whole of Darlington, Dillon, Florence, Marion, Marlboro, and Williamsburg Counties, was the fourth of six currently designated areas of South Carolina's (SC) Coastal Plain to be incorporated into the Capacity Use Program. In the parts of the state designated as a Capacity Use Area, a groundwater withdrawer is defined as, "*a person withdrawing groundwater in excess of three million gallons during any one month from a single well or from multiple wells under common ownership within a one-mile radius from any one existing or proposed well*" (Groundwater Use and Reporting Act, 2000).

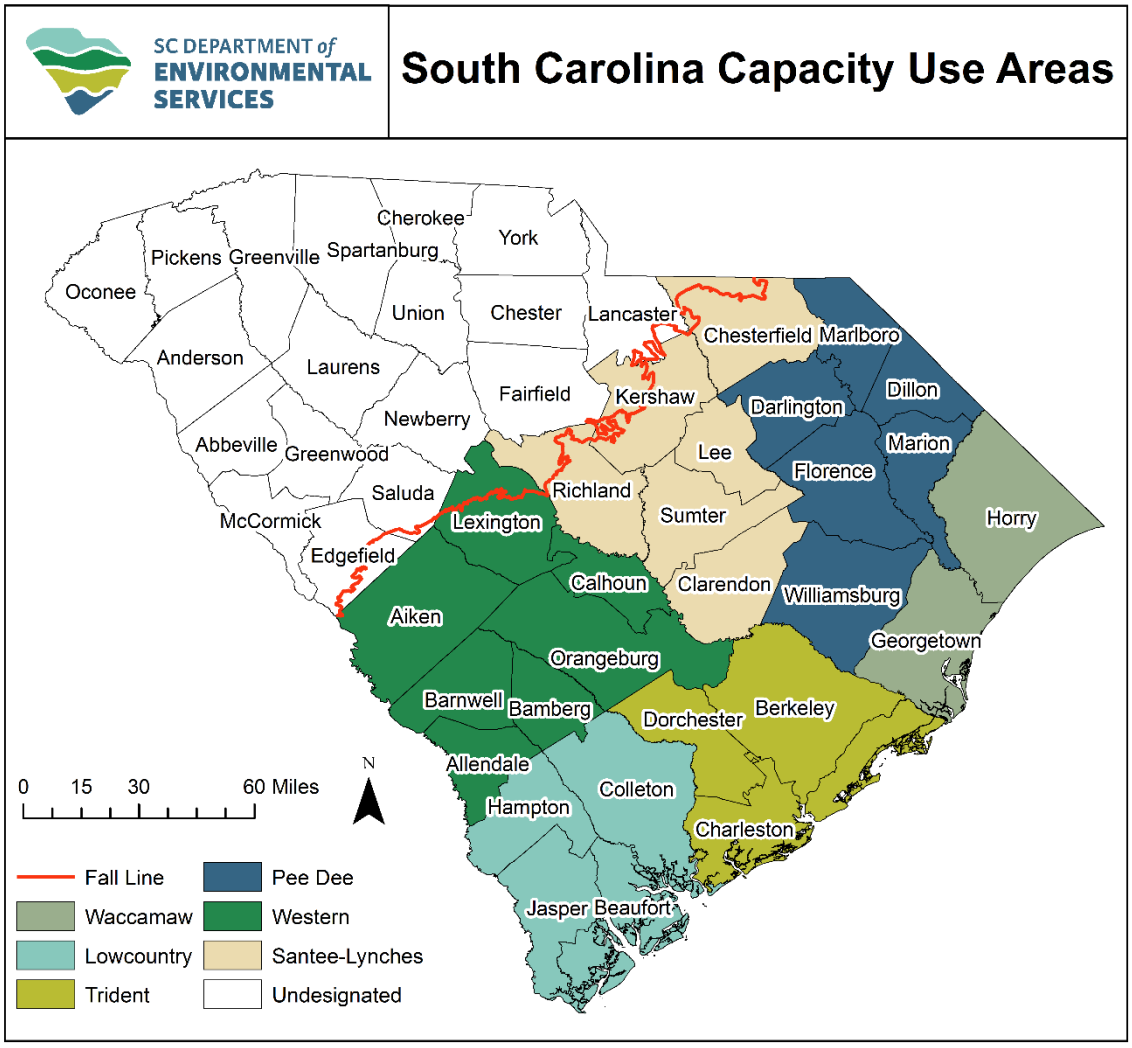

Figure 1. Map of SCDES Capacity Use Areas.

Regulatory History

In 1967, the SC Water Resources Planning and Coordination Act (Water Resources Act) established the SC Water Resources Commission (the Commission), which initially designated the Waccamaw Area (comprising of Horry County, Georgetown County, and Brittons Neck of Marion County) as the inaugural Capacity Use Area in 1979. Subsequently, in 1993, the Commission's responsibilities were restructured under the Water Resources Act, which transferred water permitting tasks to the SC Department of Health and Environmental Control (SCDHEC) and water planning duties to the SC Department of Natural Resources (SCDNR), leading to the dissolution of the Commission.

In 2000, the SC Code of Laws (Title 49, Section 5) was revised to include what is now the current Groundwater Use and Reporting Act (Groundwater Use and Reporting Act, 2000). Significant changes included the authorization for groundwater assessments, initiated by either SCDHEC, local governments, or non-governmental organizations, to determine the necessity of establishing a Capacity Use Area. Additionally, the new law mandated the development of a Groundwater Management Plan for each designated area.

The Capacity Use Areas and associated counties were designated in the following order:

- **Waccamaw Area (1979):** Georgetown and Horry Counties, and Brittons Neck of Marion County
- **Lowcountry Area (1981):** Beaufort, Colleton, and Jasper Counties
- **Trident Area (2002):** Berkeley, Charleston, and Dorchester Counties
- **Pee Dee Area (2004):** Darlington, Dillon, Florence, Marion (including Brittons Neck, leaving only Georgetown and Horry Counties in the Waccamaw Area), Marlboro, and Williamsburg Counties
- **Lowcountry Area (2008):** Addition of Hampton County
- **Western Area (2018):** Aiken, Allendale, Bamberg, Barnwell, Calhoun, Lexington, and Orangeburg Counties
- **Santee-Lynches Area (2021):** Chesterfield, Clarendon, Kershaw, Lee, Richland, and Sumter Counties

The initial Pee Dee Groundwater Management Plan (PDGMP) (Berezowska & Monroe, 2017) was approved by the SCDHEC Board of Directors in August 2017. The stated goals of the PDGMP are to:

1. Ensure sustainable development of the groundwater resource by management of groundwater withdrawals;
2. The protection of groundwater quality from salt-water intrusion; and,
3. Monitoring of groundwater quality and quantity to evaluate conditions.

The PDGMP addressed achieving these goals by evaluating the following aspects of groundwater use in the Pee Dee Area:

- Groundwater resources currently utilized;
- Current water demand by type and amount used;
- Current aquifer storage and recovery, and water reuse;

- Population and growth projections;
- Water demand projections;
- Projected opportunities for aquifer storage and recovery, as well as water reuse;
- Projected groundwater and surface water options; and
- Water conservation measures.

Following the guidelines set forth in the PDGMP, this document provides an evaluation of current groundwater use and recommendations for its management.

In 2023, Senate Bill 399 (S.399) was enacted, effective July 1, 2024, leading to the abolition of SCDHEC and its Board. This restructuring resulted in the establishment of two distinct cabinet agencies: the SC Department of Public Health (SCDPH) and the SC Department of Environmental Services (SCDES). Furthermore, the Hydrology and Aquatic Nuisance programs of SCDNR were incorporated as sections within SCDES, conserving and consolidating the relevant powers and duties of the preceding agencies.

Hydrogeologic Framework

Physiographic Provinces

Figure 2. Map of the Atlantic Coastal Plain from North Carolina to Georgia and parts of northern Florida, Virginia, and Maryland. The inset map indicates the extent of the entire Atlantic and Gulf Coastal Plain. U.S. Geological Survey (usgs.gov/media/images/atlantic-coastal-plain-maryland-florida); accessed March 6, 2024.

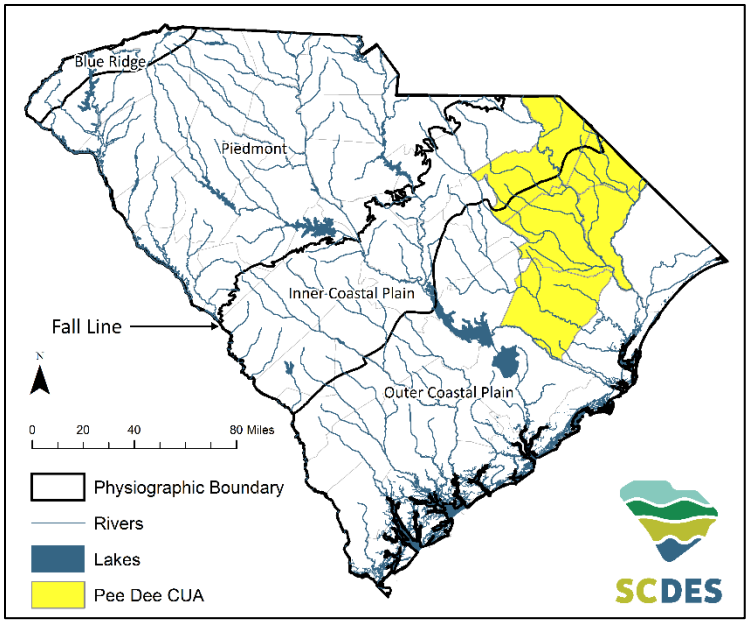

Figure 3. Map of South Carolina's physiographic provinces with the Pee Dee Area highlighted yellow.

The Coastal Plain of SC (CPSC) is part of the larger Atlantic Coastal Plain (ACP), which stretches from New Jersey in the north to Florida in the south. From the Fall Line to the coastline, the ACP comprises three distinct regions: the Sand Hills, the Inner Coastal Plain, and the Outer Coastal Plain (Fig. 2). The CPSC is comprised of the Inner Coastal Plain, which includes the Sand Hills region, and the Outer Coastal Plain (Fig. 3)

The Inner Coastal Plain is delineated by the Fall Line to the northwest and the inland boundary of the Brandywine terrace to the southeast (Logan & Euler, 1989). This region is characterized by undulating hills and deeply incised river valleys. In contrast, the Outer Coastal Plain mirrors that of the broader ACP and is characterized by a succession of coastal terraces intersected by numerous waterways (Campbell, et al., 2010).

The Pee Dee Area is situated within both the Inner and Outer Coastal Plain physiographic provinces of SC (Fig. 3), and the topography ranges from approximately 10 to 440 feet above mean sea level (MSL). Notably, Pee Dee Area counties experience occasional riverine flooding, with record flood stage cresting events recorded in October 2015, October 2016, and September 2018 as the result of heavy rainfall associated with tropical cyclones in the area (SC State Climatology Office, 2023). Given the abundance of water resources in the Pee Dee Area, both groundwater and surface water are available and utilized by stakeholders in this region.

Aquifers

The hydrogeologic framework of the CPSC is characterized by wedge-shaped stratigraphy comprised of alternating layers of water-bearing, permeable sand or carbonate deposits (aquifers) and layers of fine-grained clays, silts, or low-permeability carbonate deposits (confining units) (Fig. 4). The hydrogeologic units underlying the CPSC were deposited during the late Cretaceous to Tertiary Periods. From oldest to youngest, the Cretaceous units are the Gramling, Charleston, McQueen Branch, and Crouch Branch aquifers. The Tertiary units, in the same chronological order, are the Gordon, Floridan (further divided into the Middle Floridan and Upper Floridan), and Surficial aquifers (Fig. 4; Gellici & Lautier, 2010).

The Cretaceous aquifers are found beneath all six Pee Dee Area counties, except for the Gramling and Charleston aquifers, which extend only into Florence, Marion, and Williamsburg counties. Notably, the Floridan aquifer is absent in the Pee Dee Area, and the Gordon aquifer is present only in the southern half of Williamsburg County (Czwartacki, Wachob, & Gellici, 2019).

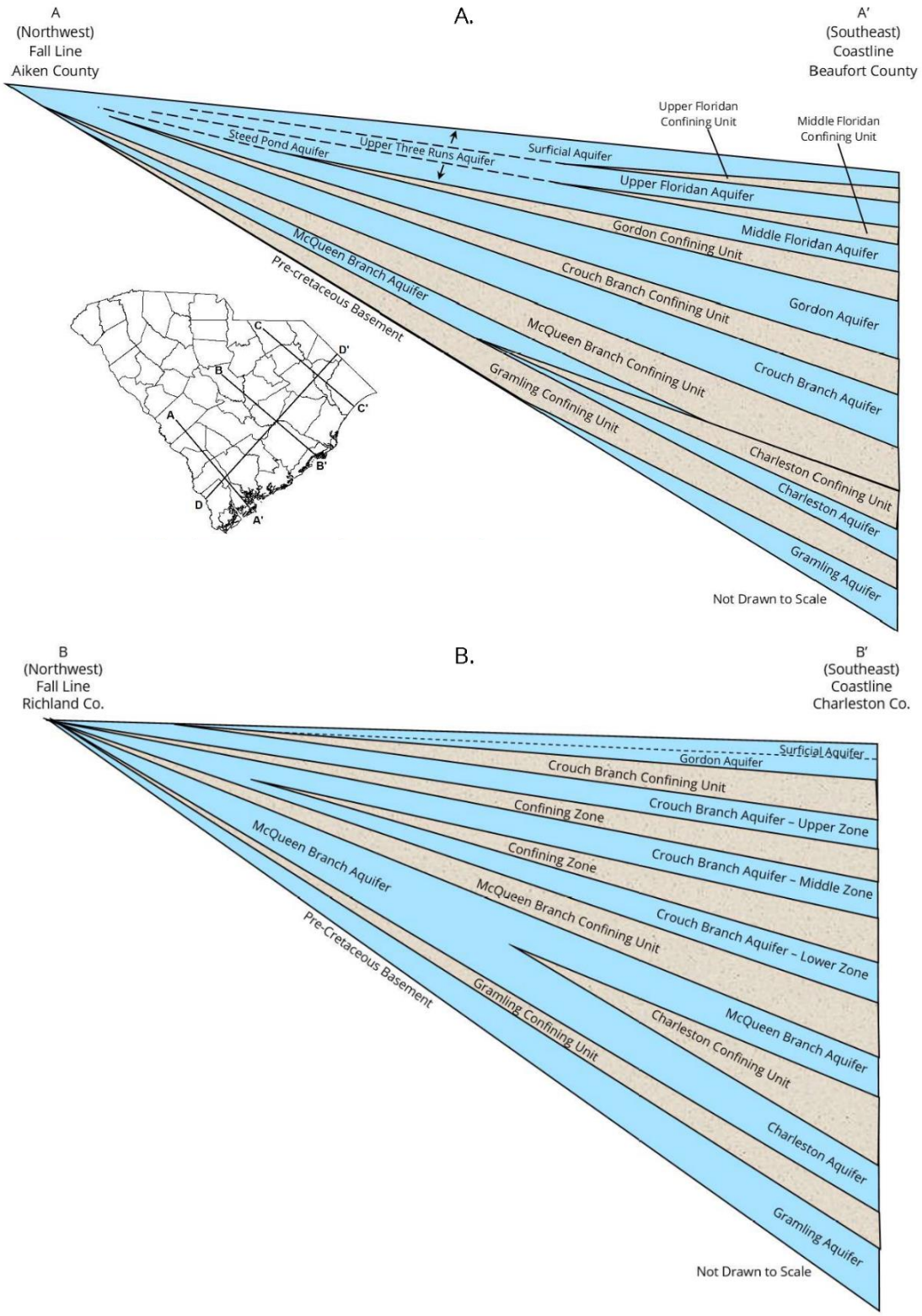

Figure 4. Generalized cross-sections of CPSC stratigraphy. The inset map shows the locations of the four (4) cross-sections. A. The A to A' line; B. The B to B' line; C. The C to C' line; and D. The D to D' line (Campbell, et al., 2010).

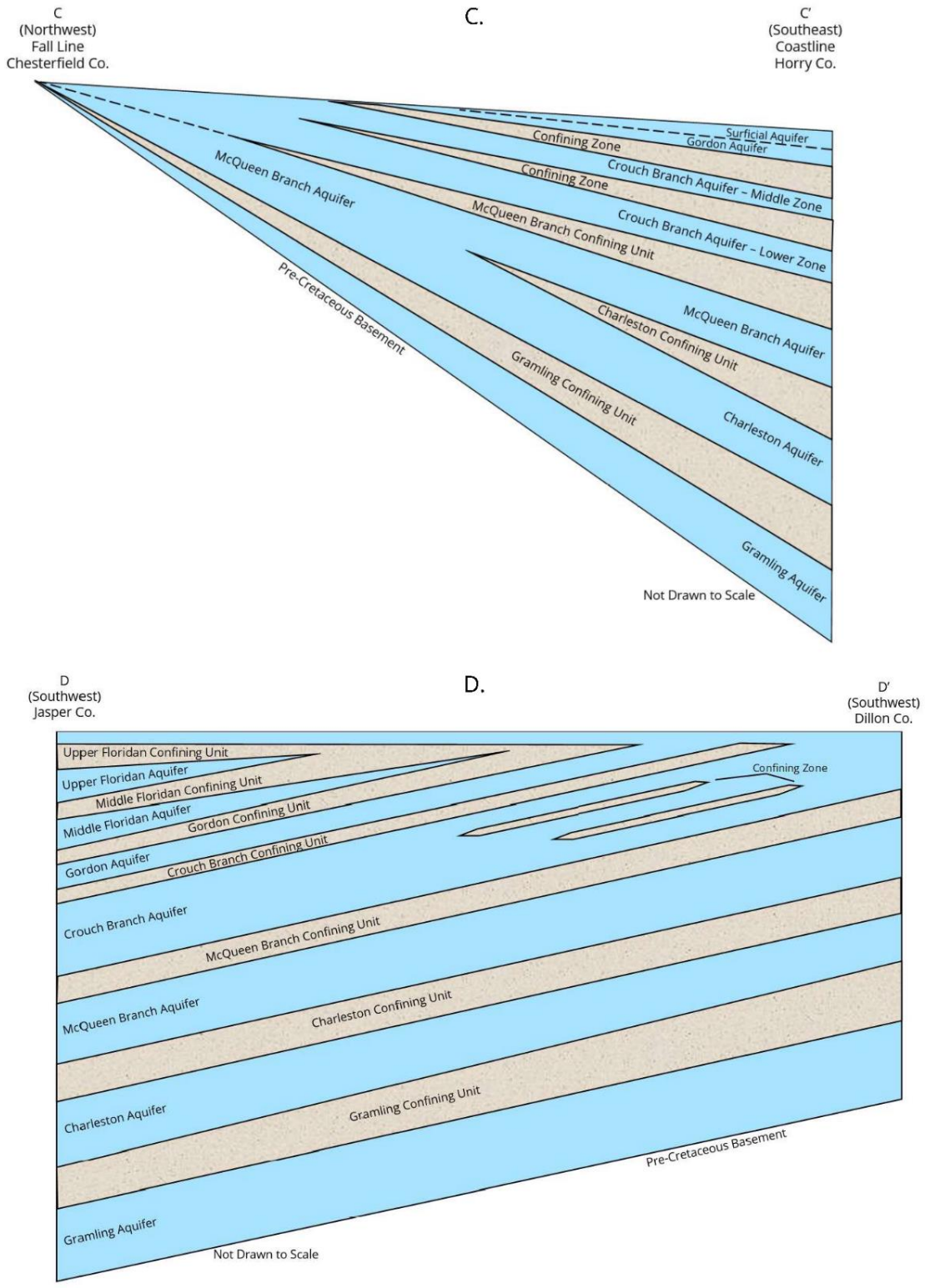

Figure 4, continued.

Recharge Areas

The recharge areas for South Carolina's aquifers are primarily located within the Inner Coastal Plain (Fig. 5). The surficial aquifer receives direct recharge through infiltration of local precipitation and interactions with surface water bodies; therefore, this aquifer does not have a regional recharge area.

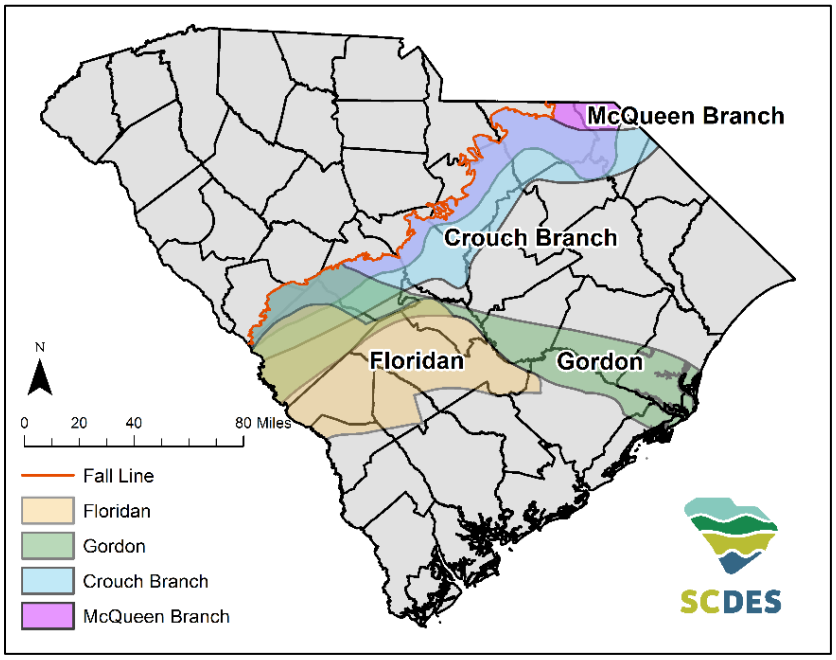

Figure 5. Map indicating the location and extent of the CPSC aquifer recharge areas.

In the Pee Dee Area, the confining units gradually thin and taper out to the northwest, causing the uppermost aquifers to coalesce (Fig. 4, C.). Consequently, the aquifers nearest to the Fall Line are shallower, more interconnected, and exhibit a higher degree of interaction with surface water compared to those in the southeastern region of the Pee Dee Area where the aquifers are more distinct and separated by confining units (Campbell, et al., 2010).

The rate at which groundwater is recharged in the deeper aquifers in the Pee Dee Area is primarily governed by the rate of groundwater movement from the recharge zones near the Fall Line and the transmissivity of the aquifer. Groundwater flow rates for silts to well-sorted sands typically range from 0.003 to 300 feet per day (Fetter, 2001). As a result, it may take anywhere from a few years to tens of thousands of years to reach the deeper aquifers in the Pee Dee Area.

Surface Water

The Pee Dee Area is predominantly situated within the Pee Dee River basin, with a small portion of Williamsburg County extending into the Santee River basin. Significant rivers that flow through the Pee Dee Area are the Little Pee Dee River, Great Pee Dee River, Black Creek, Lynches River, Black River, and Santee River (Fig. 6). These rivers and their smaller tributaries are used as primary water sources or as alternatives to groundwater sources in the Pee Dee Area counties; however, aside from small impoundments, there are no major lakes or reservoirs that exist entirely within the Pee Dee Capacity Use Area. The largest surface water impoundment by volume and area is Lake Robinson, which is situated across both Darlington and Chesterfield counties.

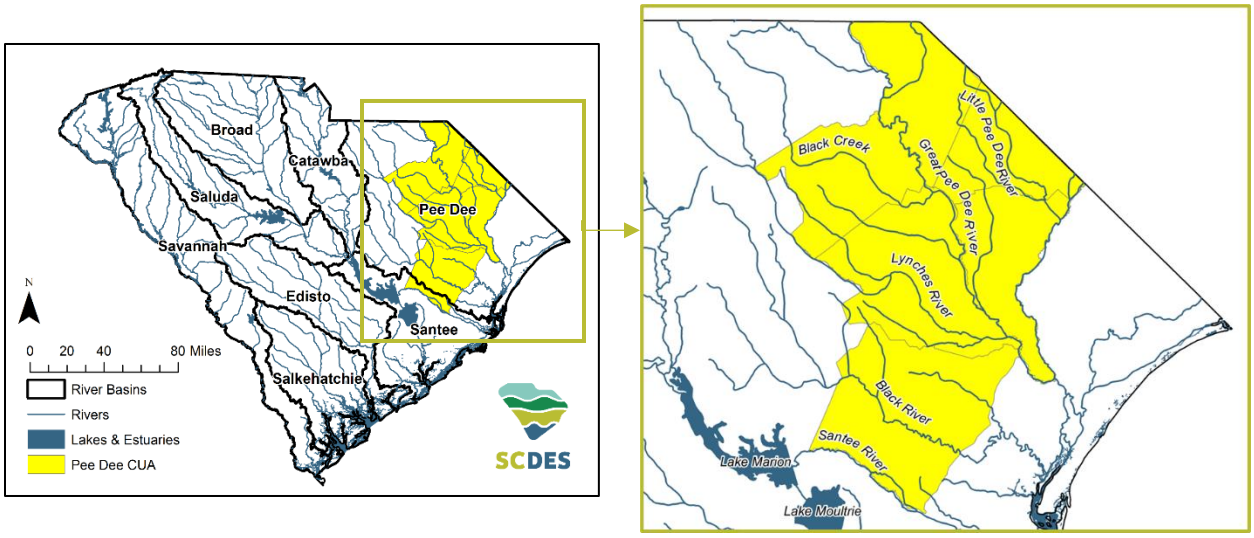

Figure 6. Surface water map of South Carolina with the Pee Dee Area highlighted yellow. The inset map shows major rivers that flow through the Pee Dee Area.

Current Groundwater Demand

In 2023, 134 facilities reported groundwater use from 395 permitted wells in the Pee Dee Area counties. Of the permitted wells, 173 were permitted for water supply (44%), followed by 163 for agricultural irrigation (41%), 35 for industry (9%), 13 for nuclear power (3%), and 11 for golf course irrigation (3%). Together, Darlington and Florence counties accounted for approximately one-half of the permitted wells in the Pee Dee Area (28% and 23%, respectively), followed by Marlboro County (14%), Dillon County (14%), Marion County (12%), and Williamsburg County (9%) (Table 1, Fig. 7).

Table 1. Pee Dee Area Capacity Use wells by county and use category – 2023.

Use Category	Darlington	Dillon	Florence	Marion	Marlboro	Williamsburg	Total
Agricultural Irrigation (IR)	58	28	19	18	31	9	163 (41%)
Golf Course Irrigation (GC)	7	0	4	0	0	0	11 (3%)
Industrial (IN)	14	0	11	0	3	7	35 (9%)
Power Nuclear (PN)	13	0	0	0	0	0	13 (3%)
Water Supply (WS)	19	28	57	28	23	18	173 (44%)
Total	111 (28%)	56 (14%)	91 (23%)	46 (12%)	57 (14%)	34 (9%)	395 (100%)

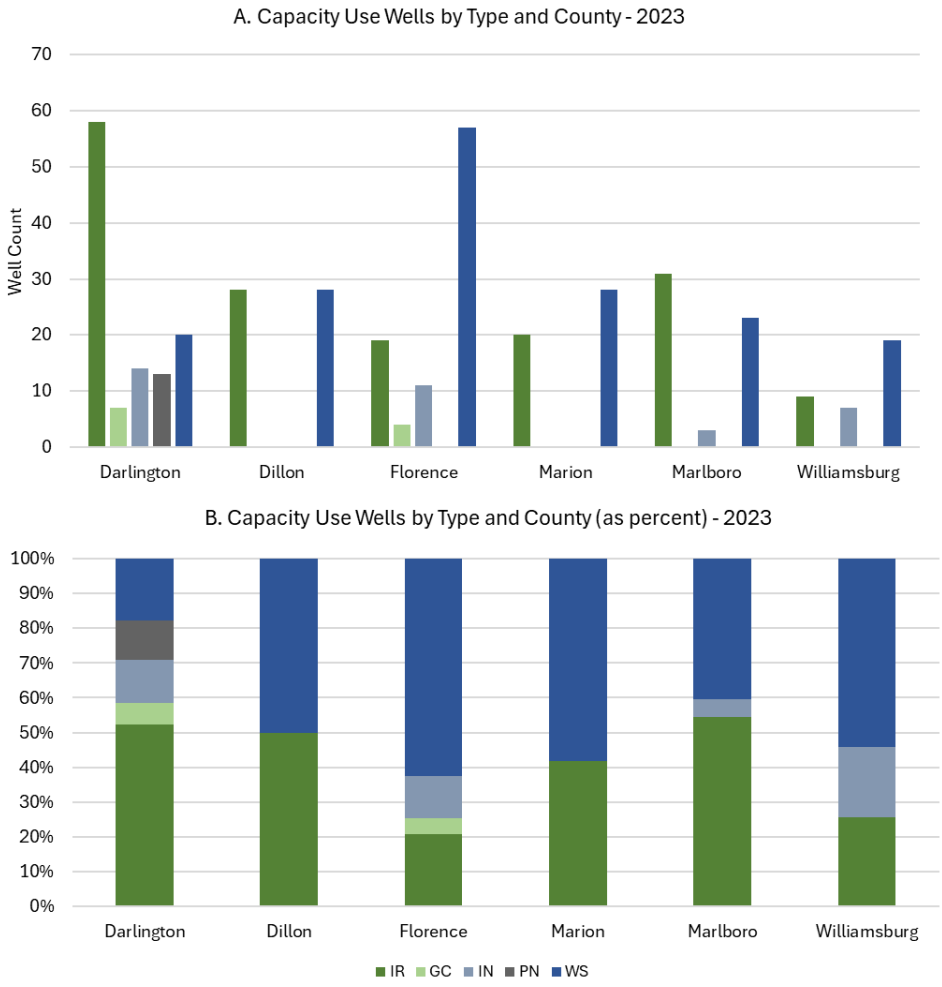

Figure 7. Pee Dee Area permitted wells by type and county – 2023. A. Well count distribution, and B. Well count distribution presented as a percent of the total well count for each county.

In 2023, a total of 17,770.82 million gallons (MG), or 17.771 billion gallons, of groundwater use was reported for the Pee Dee Area. Water supply was the leading category of reported groundwater use in 2023 (65%), followed by agricultural irrigation (18%), industry (15%), nuclear power (2%), and golf course irrigation (<1%). Of the Pee Dee Area counties, Florence had the largest demand on groundwater in 2023 (30%), followed by Darlington (28%), Dillon (12%), Williamsburg (11%), Marion (10%), and Marlboro (9%) (Table 2, Fig. 8).

Table 2. Reported water use in millions of gallons by county and category – 2023.

Use Category	Darlington	Dillon	Florence	Marion	Marlboro	Williamsburg	Total
Agricultural Irrigation (IR)	856.72	502.74	488.22	529.21	507.92	288.50	3,173.31 (18%)
Golf Course Irrigation (GC)	30.90	0	6.10	0	0	0	37 (<1%)
Industrial (IN)	1,412.67	0	669.86	0	0	633.1	2,715.63 (15%)
Nuclear Power (PN)	377.02	0	0	0	0	0	377.02 (2%)
Water Supply (WS)	2,377.87	1,610.13	4,164.60	1,227.61	1,059.84	1,027.81	11,467.85 (65%)
Total	5,055.18 (28%)	2,112.87 (12%)	5,328.78 (30%)	1,756.82 (10%)	1,567.76 (9%)	1,949.41 (11%)	17,770.82 (100%)

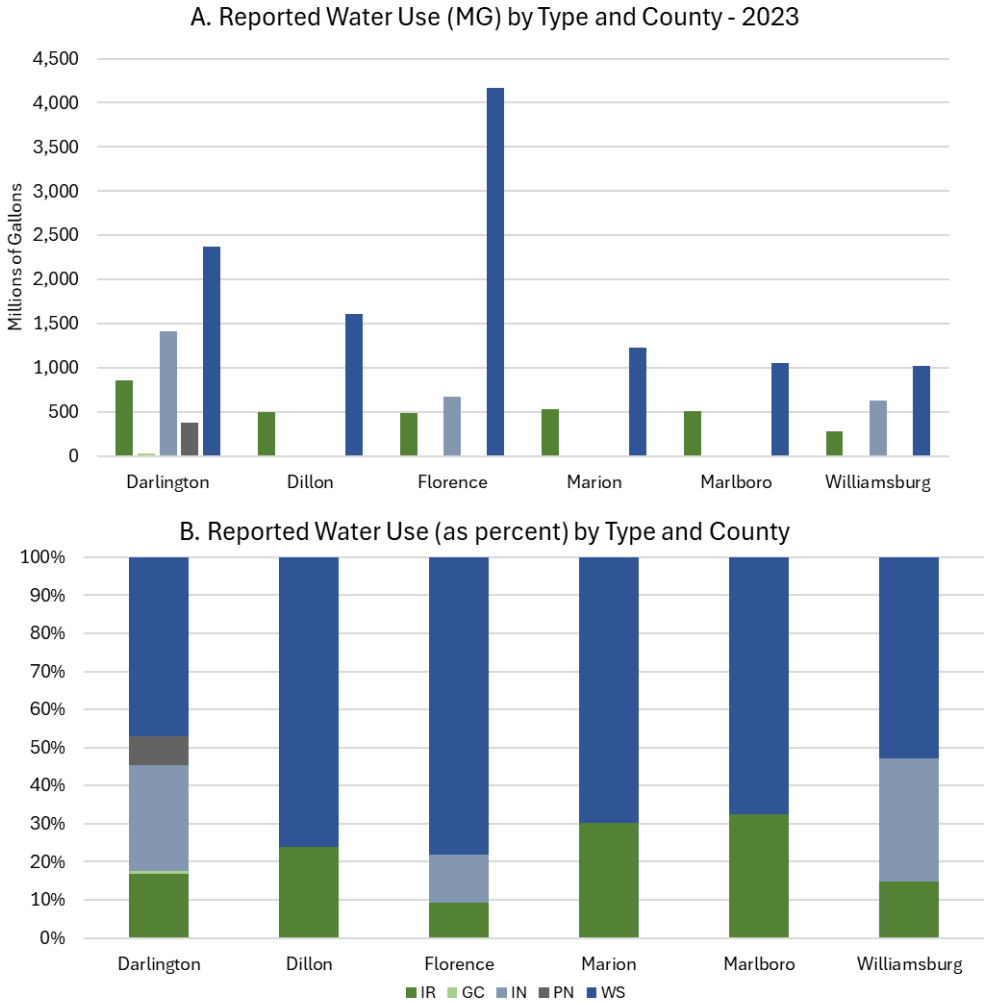

Figure 8. Pee Dee Area reported water use by type and county – 2023. A. Reported water use distribution, and B. Reported water use distribution presented as a percentage of the total reported water use for each county.

Aquifer Demand Details

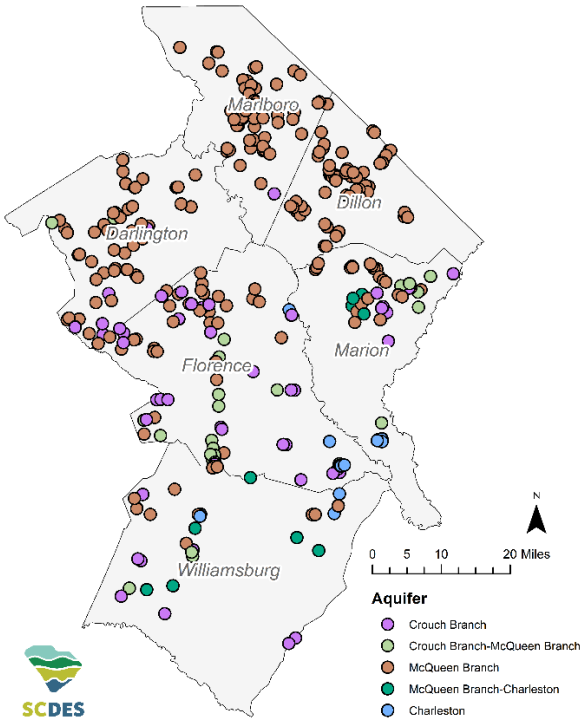

Figure 9. Map of the Pee Dee Area displaying the locations of permitted wells which reported water use for 2023. Different symbol colors represent the aquifer(s) into which each well is screened.

In terms of number of wells, the McQueen Branch aquifer is the most heavily accessed aquifer in the Pee Dee Area (274 wells, 69%), followed by the Crouch Branch aquifer (66 wells, 17%), and the Charleston aquifer (14 wells, 4%) (Fig. 9).

The Pee Dee Area also contains wells that are cross-screened, or screened across more than one aquifer, which allows water to be withdrawn from each aquifer where a screen is present. Wells that are cross-screened were grandfathered into the Capacity Use Program; however, in accordance with SC Regulation 61-71 Well Standards, SCDES no longer issues permits for the construction of cross-screened wells due to the potential for cross-contamination and/or water depletion of the aquifer(s) (2016). As it is not possible to determine the quantity of water being withdrawn from the individual aquifers, cross-screened wells are presented as a hyphenation of the aquifers into which they are screened. In 2023, the Pee Dee Area had 28 wells (7%) screened across the Crouch Branch-McQueen Branch aquifers and 13 wells (3%) screened across the McQueen Branch-Charleston aquifers (Table 3).

Table 3. Pee Dee Area Capacity Use well counts and reported water use by aquifer – 2023.

Aquifer	Number of Wells (%)	2023 Water Use MG (%)
Crouch Branch	66 (17%)	2,154.59 (12%)
Crouch Branch-McQueen Branch	28 (7%)	913.91 (5%)
McQueen Branch	274 (69%)	13,235.26 (75%)
McQueen Branch-Charleston	13 (3%)	858.28 (5%)
Charleston	14 (4%)	608.79 (3%)
TOTAL	**395 (100%)**	**17,770.82 (100%)**

Pee Dee Area County Details

Note that each permitted facility is owned and operated by a groundwater withdrawer, and some groundwater withdrawers operate multiple facilities, which may share the same name. The permitted annual groundwater withdrawal limit for each facility will be re-evaluated during the upcoming 2025 Groundwater Withdrawal Permit renewal cycle for the Pee Dee Area.

Darlington County

Darlington County had 41 permitted facilities with a total of 111 active wells in 2023. The total reported groundwater withdrawals for 2023 were 59% of the county's total permitted annual withdrawal limit. The McQueen Branch aquifer provided 97% (4,892.24 MG) of Darlington County's total reported groundwater use for 2023, followed by the Crouch Branch aquifer at 2% (116.79 MG), and the Crouch Branch-McQueen Branch aquifers at <1% (46.15 MG) (Table 4).

Table 4. Darlington County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit No.	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
Fox Creek Golf Club	16GC001G	15.60	10.00	Crouch Branch
Traces Golf Club	16GC052G	48.50	20.90	Crouch Branch
Fiber Industries, LLC- Palmetto Plant	16IN001G	500.00	55.74	McQueen Branch
SONOCO PRODUCTS CO	16IN005G	1,758.00	1,323.79	McQueen Branch
NUCOR CORP	16IN006G	315.00	33.14	McQueen Branch
Rogers Brothers Farm	16IR016G	105.00	31.76	Crouch Branch-McQueen Branch
			57.08	McQueen Branch
Les Galloway Farms	16IR017G	40.00	36.09	McQueen Branch
Les Galloway Farms	16IR018G	30.00	29.24	McQueen Branch
CHAPMAN FARMS	16IR030G	94.00	22.61	McQueen Branch
LAWSON TURF FARM	16IR041G	79.00	2.72	Crouch Branch
			26.47	McQueen Branch
REM Farms LLC- Allen Road	16IR042G	36.00	21.00	McQueen Branch
Segars Farms- Bay Road	16IR081G	247.00	26.03	McQueen Branch
Woodard Farms	16IR082G	190.00	37.30	McQueen Branch
Windham Farms	16IR084G	70.70	18.00	McQueen Branch
Mason White Farms	16IR085G	30.00	10.00	Crouch Branch
Randolph Farm	16IR086G	50.40	11.10	McQueen Branch
TOLSON FARMS	16IR087G	60.00	61.00	Crouch Branch
Light Farms, LLC	16IR088G	33.70	12.11	Crouch Branch
David Aycock Farm	16IR089G	62.40	15.80	McQueen Branch
Tyler Segars Farm	16IR090G	21.36	14.39	Crouch Branch-McQueen Branch
Ryan Galloway Farm	16IR091G	63.00	17.00	McQueen Branch
Les Galloway Farms	16IR092G	60.00	58.95	McQueen Branch
Norwood Pivot System #1	16IR095G	50.00	23.00	McQueen Branch
William N. Chapman Farms, LLC	16IR097G	50.00	20.91	McQueen Branch
JDC III Farms	16IR098G	20.00	4.77	McQueen Branch
Rabb Farm	16IR099G	116.00	30.90	McQueen Branch
Wilkes Farm	16IR100G	28.00	2.13	McQueen Branch
Johnny Tedder Farm	16IR101G	12.00	3.00	McQueen Branch
Rogers Brothers Farm	16IR103G	90.00	29.10	McQueen Branch
Rogers Brothers Farm	16IR104G	143.00	59.70	McQueen Branch
Rogers Brothers Farm	16IR105G	174.00	54.30	McQueen Branch
Rogers Brothers Farm	16IR106G	44.00	10.38	McQueen Branch
Chaplin Farms	16IR107G	190.50	47.70	McQueen Branch
Chaplin Farms	16IR108G	190.50	6.90	McQueen Branch

Table 42, continued.

HB ROBINSON NUCLEAR PLANT	16PN001G	663.60	0.06	Crouch Branch
			376.97	McQueen Branch
Darlington County Water and Sewer Authority	16WS001G	1,800.00	1,704.80	McQueen Branch
Darlington, City of	16WS002G	339.00	268.71	McQueen Branch
City of Hartsville	16WS003G	659.00	404.36	McQueen Branch
Mimms Gandy Farms, LLC	WDR000095	28.08	19.40	McQueen Branch
Trey Rogers Farms, LLC	WDR000104	40.00	16.20	McQueen Branch
Norwood Pivot System #2	WDR000105	51.30	19.70	McQueen Branch
	TOTALS	**8,598.64**	**5,055.21**	

Dillon County

Dillon County had 16 permitted facilities with a total of 56 active wells in 2023. The total reported groundwater withdrawals for 2023 were 59% of the county's total permitted annual withdrawal limit. The McQueen Branch aquifer accounted for 100% (2,112.87 MG) of the total reported groundwater use in Dillon County for 2023 (Table 5).

Table 53. Dillon County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit No.	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
Sellers Gaddy Gasque PLOZ Farm I, LLC- Sellers Farm	17IR001G	348.00	60.94	McQueen Branch
FPI Properties LLC- Catfish Bay Farm	17IR017G	252.00	99.00	McQueen Branch
Q & Q Farms, Inc.	17IR018G	9.20	3.00	McQueen Branch
Little Pee Dee Farms- Bunker Hill Road Field	17IR019G	49.70	12.50	McQueen Branch
Little Pee Dee Farms- FreeStates Road Field	17IR020G	51.60	11.80	McQueen Branch
Little Pee Dee Farms- McPhaul & New Ground Fields	17IR021G	140.00	30.70	McQueen Branch
P & S Farms- Sherwood Farm	17IR022G	50.00	2.70	McQueen Branch
Baxley & Baxley Farms	17IR023G	45.00	13.80	McQueen Branch
Glasdrum Farms/ John's House Tract	17IR024G	17.00	7.70	McQueen Branch
Jack Leggette Farms- Stateline Farm	17IR025G	90.80	13.45	McQueen Branch
Sinclair Farm	17IR026G	130.30	125.00	McQueen Branch
Dillon County Farms, LLC	17IR027G	275.00	122.15	McQueen Branch
Dillon, City of	17WS001G	461.00	300.02	McQueen Branch
Town of Latta	17WS003G	175.00	103.19	McQueen Branch
Trico Water Company, Inc.	17WS004G	1,415.00	1,147.88	McQueen Branch
Border Courts Inc./South of the Border Motel	17WS005G	70.00	59.05	McQueen Branch
	TOTALS	**3,579.60**	**2,112.87**	

Florence County

Florence County had 23 permitted facilities with a total of 91 active wells in 2023. The total reported groundwater withdrawals for 2023 were 56% of the county's total permitted annual water use limit. The McQueen Branch aquifer provided 63% (3,346.17 MG) of Florence County's total reported groundwater use for 2023, followed by the Crouch Branch aquifer at 24% (1,285.75 MG), the Crouch Branch-McQueen Branch aquifers at 10% (535.78 MG), and the Charleston aquifer at 3% (161.09 MG) (Table 6).

Table 64. Florence County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
Traces Golf Club	21GC005G	49.50	6.10	Crouch Branch
Pret Advanced Materials, LLC	21IN002G	650.00	123.96	Crouch Branch
			0	Crouch Branch-McQueen Branch
			137.51	Charleston
McCall Farms, Inc.	21IN008G	600.00	203.54	Crouch Branch
			158.24	McQueen Branch
Clarios, LLC- Florence Recycling Center	21IN010G	76.00	10.10	Charleston
Nan Ya Plastics Corporation, America	21IN012G	600.00	0	Crouch Branch
			36.51	Crouch Branch-McQueen Branch
Cane Branch Turf Farm LLC	21IR012G	40.00	10.78	Crouch Branch
Tolson Farms- Grice	21IR014G	75.00	26.00	McQueen Branch
Goodland Farms	21IR015G	197.20	5.00	Crouch Branch-McQueen Branch
HMS Investments	21IR052G	126.00	2.00	Crouch Branch-McQueen Branch
Flo Fund Domestic LLC- Grist Mill Property	21IR053G	459.50	70.51	McQueen Branch
Kelley Farms Partnership	21IR054G	49.00	71.30	Crouch Branch
Floyd Farms	21IR055G	140.40	5.43	Crouch Branch-McQueen Branch
			8.90	McQueen Branch
Ward Family Farms, LLC	21IR056G	196.00	253.00	Crouch Branch
Galloway Farms	21IR057G	90.00	5.30	McQueen Branch
Tolson Farms- Chaney Grove Farm	21IR058G	27.00	30.00	McQueen Branch
Johnsonville, City of	21WS001G	209.00	151.00	Crouch Branch
			13.48	Charleston
CITY OF FLORENCE PEE DEE SWTP	21WS002G	4,913.00	342.01	Crouch Branch
			2,909.46	McQueen Branch
Lake City, City of	21WS005G	661.00	446.70	Crouch Branch-McQueen Branch
			95.90	McQueen Branch
Pamplico, Town of	21WS007G	87.00	64.46	Crouch Branch
			0	Crouch Branch-McQueen Branch
Scranton, Town of	21WS008G	50.00	37.09	Crouch Branch
Olanta, Town of	21WS009G	50.00	0	Crouch Branch
			19.57	Crouch Branch-McQueen Branch
			3.04	McQueen Branch
Coward, Town of	21WS010G	76.00	20.57	Crouch Branch-McQueen Branch
			38.81	McQueen Branch
WestRock CP, LLC	21WS011G	65.00	22.51	Crouch Branch
	TOTALS	**9,486.60**	**5,328.78**	

Marion County

Marion County had 11 permitted facilities with a total of 46 active wells in 2023. The total reported groundwater withdrawals for 2023 were 62% of the county's total permitted annual water use limit. The McQueen Branch aquifer provided 43% (754.76 MG) of Marion County's total reported groundwater use for 2023, followed by the McQueen Branch-Charleston aquifers at 21% (362.12 MG), the Crouch Branch aquifer at 20% (348.29 MG), the Crouch Branch-McQueen Branch aquifers at 15% (263.93 MG), and the Charleston aquifer at 2% (27.72 MG) (Table 7).

Table 75. Marion County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit No.	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
Drew Farms	33IR026G	201.00	174.50	Crouch Branch
Steve Baxley & Sons LLC	33IR054G	272.10	29.90	McQueen Branch
Steve Baxley & Sons LLC	33IR055G	57.80	12.07	McQueen Branch
FPI Colorado LLC- Maidendown Bay Farm	33IR056G	125.00	77.85	McQueen Branch
FPI Colorado LLC- 10 Mile Bay Farm	33IR057G	318.50	142.17	McQueen Branch
FPI Properties LLC- Thousand Oaks Farm	33IR058G	168.50	27.72	Charleston
Bentwood Farms	33IR059G	70.00	65.00	McQueen Branch
GSWSA- City of Marion	33WS001G	548.00	127.11	McQueen Branch
			329.84	McQueen Branch-Charleston
Marco Rural Water Company, Inc.	33WS002G	675.00	104.03	Crouch Branch
			177.06	Crouch Branch-McQueen Branch
			147.87	McQueen Branch
			32.28	McQueen Branch-Charleston
GSWSA- City of Mullins	33WS003G	373.00	69.76	Crouch Branch
			70.89	Crouch Branch-McQueen Branch
			152.79	McQueen Branch
GSWSA- Town of Nichols Water System	33WS004G	20.00	0	Crouch Branch
			15.99	Crouch Branch-McQueen Branch
	TOTALS	**2,828.90**	**1,756.83**	

Marlboro County

Marlboro County had 26 permitted facilities, with a total of 57 active wells in 2023. The total reported groundwater withdrawals for 2023 were 57% of the county's total permitted annual withdrawal limit. The McQueen Branch aquifer supplied 95% (1,495.86 MG) of the total reported groundwater use in Marlboro County for 2023, and the Crouch Branch aquifer provided 5% (71.90 MGY) (Table 8).

Table 86. Marlboro County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit No.	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
K.A.M.C.P. Oak River Plant	34IN003G	175.00	0	McQueen Branch
Arborgen Blenheim Nursery	34IR001G	115.00	71.90	Crouch Branch
HINSON FARM	34IR002G	30.00	29.00	McQueen Branch
RICHARD ROGERS FARMS	34IR003G	140.16	97.30	McQueen Branch
BFP Agricultural 4, LLC	34IR006G	130.00	2.18	McQueen Branch
FPI Carolinas LLC- Bennettsville Farm	34IR015G	80.00	40.59	McQueen Branch
Charles M. Rogers Farm	34IR016G	12.00	0	McQueen Branch
Burroughs Farms	34IR019G	57.30	0	McQueen Branch
CMB Farms LLC	34IR020G	24.00	21.30	McQueen Branch
Patrick Rogers- Green Barn Farm	34IR021G	38.40	18.40	McQueen Branch
Frank Rogers Farm- Hwy 38 Tract	34IR022G	125.00	30.00	McQueen Branch
Oneal Planting Co./Highway 38 Farm	34IR023G	15.48	6.50	McQueen Branch
Glasdrum Farms/Bottom Farm	34IR024G	24.00	8.45	McQueen Branch
Rodgers- CMB Farms, LLC	34IR025G	59.00	36.00	McQueen Branch
Patrick Rogers Farms/Crosland Towable	34IR026G	56.00	39.50	McQueen Branch
Marlboro County Farms	34IR027G	25.80	13.30	McQueen Branch
Frank Rogers Farms	34IR028G	28.80	24.00	McQueen Branch
Patrick Rogers- Hebron Chruch Road Farm	34IR029G	27.15	13.10	McQueen Branch
Patrick Rogers- Hamer Farm	34IR030G	27.15	15.30	McQueen Branch
Patrick Rogers- Hunter Farm	34IR031G	25.25	20.50	McQueen Branch
Patrick Rogers- Beverly Creek Farm	34IR033G	64.12	20.60	McQueen Branch
BENNETTSVILLE WTP	34WS001G	717.00	478.62	McQueen Branch
Marlboro Water Company, Inc.	34WS002G	480.00	334.75	McQueen Branch
McColl, Town of	34WS003G	120.00	101.32	McQueen Branch
Wallace Water Company, Inc.	34WS004G	100.00	103.18	McQueen Branch
Clio, Town of	34WS050G	50.00	41.98	McQueen Branch
	TOTALS	**2,746.61**	**1,567.77**	

Williamsburg County

Williamsburg County had 18 permitted facilities, with a total of 34 active wells in 2023. The total reported groundwater withdrawals for 2023 were 59% of the county's total permitted annual withdrawal limit. The McQueen Branch aquifer was the largest source of groundwater for the county, supplying 32% (633.35 MG) of the total reported groundwater use for 2023, followed by the McQueen Branch-Charleston aquifers at 25% (496.17 MG), the Charleston aquifer at 22% (419.98 MG), the Crouch Branch aquifer at 17% (331.87 MG), and the Crouch Branch-McQueen Branch aquifers at 3% (68.05 MG) (Table 9).

Table 97. Williamsburg County permitted facilities, annual permit limits, and reported water use for 2023.

Facility	Permit No.	Permitted Limit per Year (MGY)	Reported Water Use in 2023 (MG)	Aquifer(s)
Nan Ya Plastics Corporation, America	21IN012G	600.00	297.20	McQueen Branch
DSM Nutritional Products, LLC	45IN001G	639.00	63.22	McQueen Branch
			267.98	Charleston
Milliken Kingstree Plant	45IN003G	43.20	4.71	Crouch Branch-McQueen Branch
MCINTOSH FARMS	45IR002G	300.00	148.00	McQueen Branch
McKenzie Farms	45IR003G	24.00	12.50	McQueen Branch
Ferison Farm	45IR025G	15.00	9.00	Crouch Branch
Buy Sod (CCD Sod LLC)	45IR027G	112.80	65.00	Crouch Branch
Tryon Farm, LLC (Buy Sod)	45IR028G	43.00	28.00	Crouch Branch
H & F Farms	45IR029G	42.00	26.00	McQueen Branch-Charleston
Town of Hemingway	45WS001G	191.00	152.00	Charleston
Town of Kingstree	45WS002G	291.75	91.53	Crouch Branch
			33.20	Crouch Branch-McQueen Branch
			103.50	McQueen Branch
			58.56	McQueen Branch-Charleston
Greeleyville, Town of	45WS003G	54.20	30.14	Crouch Branch-McQueen Branch
Town of Lane Water System	45WS004G	54.00	23.03	Crouch Branch
Town of Stuckey	45WS005G	13.20	8.94	McQueen Branch
Williamsburg County W&SA South System	45WS006G	432.00	373.53	McQueen Branch-Charleston
Williamsburg County W&SA Combined System	45WS007G	107.00	38.08	McQueen Branch-Charleston
Williamsburg County W&SA Mouzon Water Sytem	45WS008G	30.38	0	McQueen Branch
Town of Andrews	45WS009G	300.00	115.31	Crouch Branch
	TOTALS	**3,292.53**	**1,949.43**	

Historic Reported Water Use and Population: 2001-2023

From 2001 to 2013, groundwater use in the Pee Dee Area averaged approximately 15,000 MG annually, fluctuating with short-term peaks and troughs caused by variations in climatic conditions (U.S. Drought Monitor, 2024). Groundwater demand in the Pee Dee Area initially increased in 2014, driven largely by agricultural irrigation, but has since stabilized. Despite this trend, a notable decline in reported groundwater use occurred in 2020, likely due to Hurricanes Bertha and Isaias, which brought substantial rainfall to the region during the summer growing season, thus reducing agricultural irrigation demand by 1,661.60 MG (NOAA, 2023). Total groundwater use in the Pee Dee Area peaked at 19,957.55 MG in 2022, largely due to abnormally dry conditions and, consequently, increased municipal water demand in Darlington, Dillon, and Florence Counties (Fig. 10 and Fig. 11; NOAA, 2024); however, total reported groundwater use in the Pee Dee Area returned to near-normal levels in 2023.

It is also worth noting that a total of 302.78 MG of groundwater use was reported by aquacultural (AQ) users in the Pee Dee Area from 2001 to 2009, and approximately 0.47 MG of groundwater use was reported for other (OT) users during 2005 (0.465 MG) and 2015 (0.001 MG).

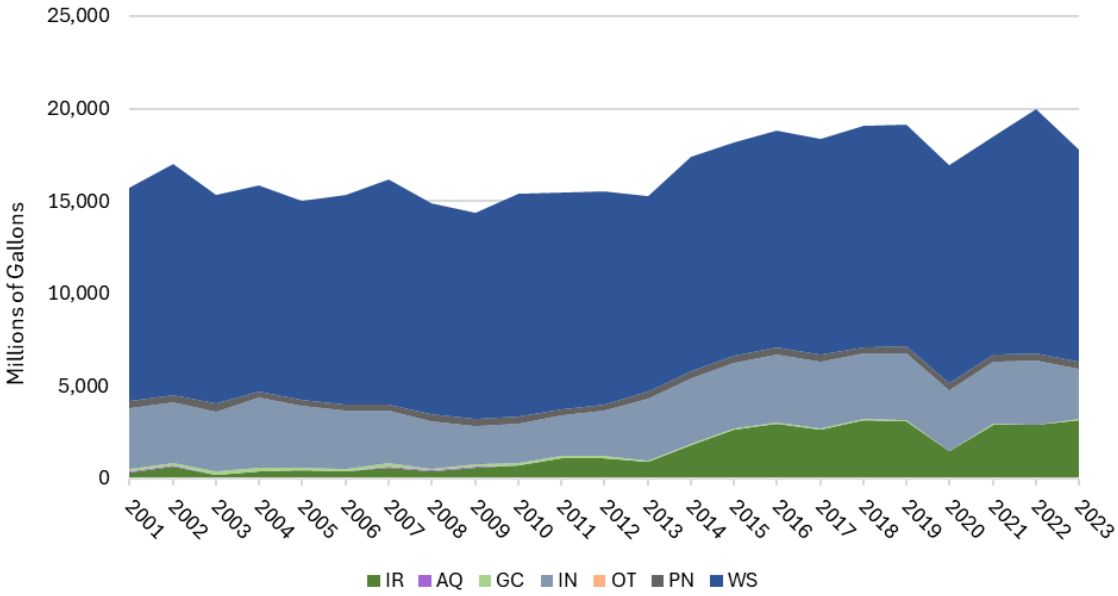

Figure 10. Reported groundwater use by type from 2001 to 2023 in the Pee Dee Area. Reported groundwater use for the AQ and OT categories are not visible due to the relatively low withdrawal rates in these categories compared to the other type use categories in the Pee Dee Area.

From 2001 to 2023, Darlington and Florence Counties consistently reported higher volumes of groundwater use compared to other Pee Dee Area counties, primarily due to their larger populations and, consequently, greater demand for municipal water supply. Overall, reported groundwater use in each of the Pee Dee Area counties has remained relatively stable over the past 23 years, apart from a notable increase in 2022 in Darlington County, which coincides with an increase in municipal water demand during an abnormally dry period in the region (Fig. 11; U.S. Drought Monitor, 2024).

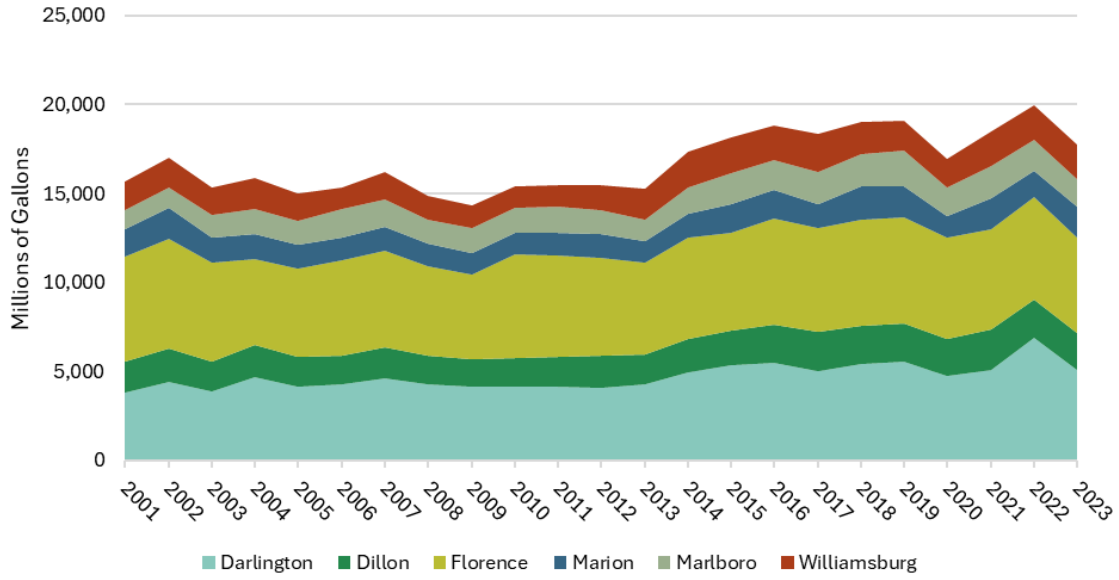

Figure 11. Pee Dee Area reported water use by county from 2001 to 2023.

In recent years, the Pee Dee Area has seen an overall decline in population. Despite this trend, Florence, Darlington, and Dillon Counties each saw population growth from the early 2000s through the mid- to late-2010s but have since experienced population declines. Meanwhile, Marion, Marlboro, and Williamsburg Counties have all experienced declines in population since 2000 (Fig. 12; U.S. Census Bureau, 2023).

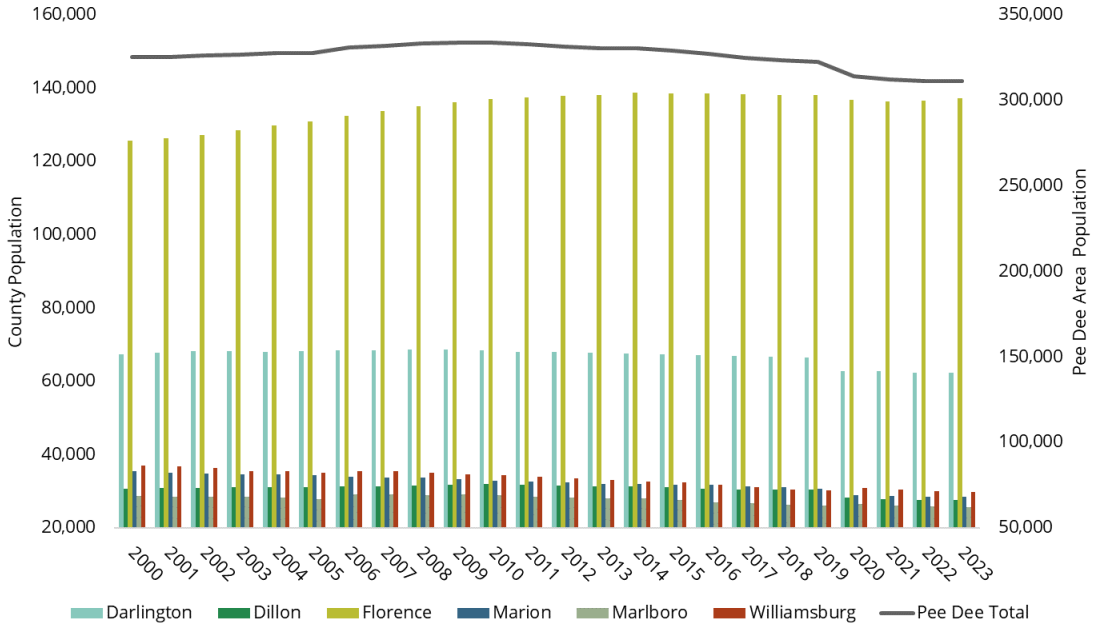

Figure 12. Population estimates and census data for the Pee Dee Area (grey line) and each individual county (vertical bars). (https://data.census.gov/profile/South_Carolina?g=040XX00US45; Accessed June 28, 2024).

Groundwater Impacts

To assess the ongoing conditions of the aquifers in South Carolina, water levels are measured manually or by using automatic data recorders (pressure transducers) in wells screened in each of the CPSC aquifers. The SCDES Hydrology Section, formly the SCDNR Hydrology Section, is responsible for the management and upkeep of the SC Groundwater Monitoring Network[1]. These water level measurements serve two primary purposes: to track the long-term impact of groundwater withdrawals and to provide a snapshot of groundwater conditions at specific points in time. For a comprehensive view of the SC Groundwater Monitoring Network's coverage, please refer to the map in Appendix B.

Groundwater Trends

There are currently 16 SC Groundwater Monitoring Network wells located in Pee Dee Area counties, 12 of which are discussed in this report (Table 10). The length of time for which there are groundwater level measurements ranges from 5.7 years to 39.7 years.

Table 10. List of SCDES Hydrology monitoring wells in Pee Dee Area counties with aquifer and length of well record.

Well ID	County	Aquifer	Record Length (years)
DAR-0228	Darlington	McQueen Branch	23.7
DIL-0121	Dillon	McQueen Branch	22.7
DIL-0172	Dillon	Crouch Branch	7.7
DIL-0173	Dillon	McQueen Branch	6.7
DIL-0175	Dillon	McQueen Branch	6.7
FLO-0128	Florence	McQueen Branch	39.7
FLO-0274	Florence	McQueen Branch	21.7
FLO-0276	Florence	Crouch Branch	21.7
MRN-0077	Marion	Crouch Branch	39.7
MRN-0078	Marion	Gramling	17.6
WIL-0012	Williamsburg	Crouch Branch	5.7
WIL-0355	Williamsburg	McQueen Branch	8.7

[1] Water level data collected before July 1, 2024, was obtained by the SCDNR Hydrology Section. Water level data collected on or after July 1, 2024, was obtained by the SCDES Hydrology Section.

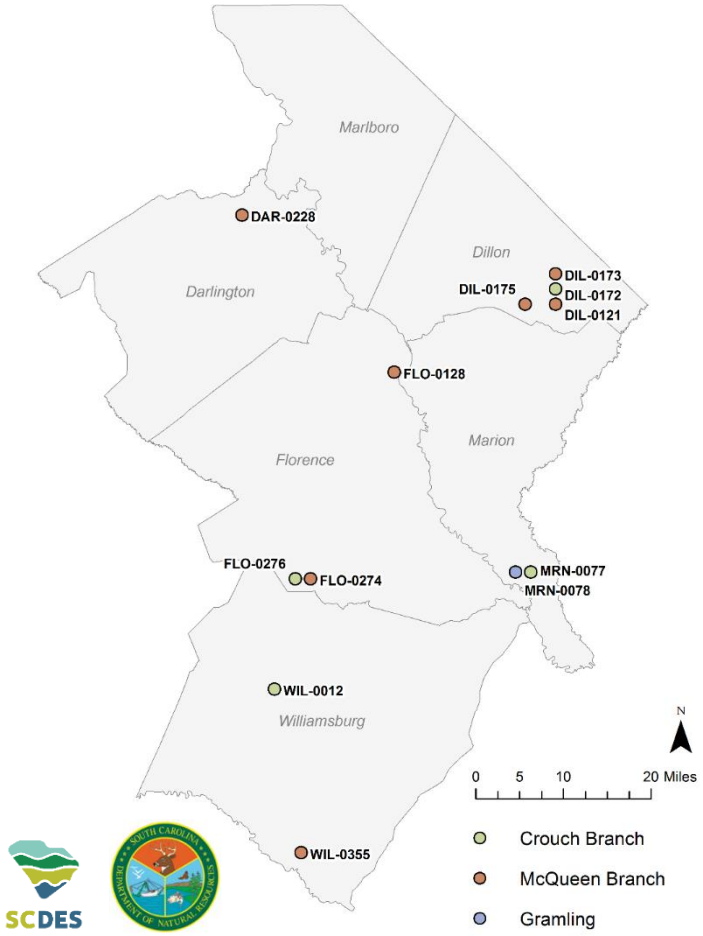

Figure 13. Map of relevant SCDES Hydrology monitoring wells in the Pee Dee Area. Different symbol colors represent the aquifer into which each well is screened. The water levels for each are displayed in Fig. 14. (https://hydrology.SCDNR.sc.gov/well-database.html; Accessed January 19, 2024).

Gordon Aquifer

Although the Gordon aquifer is present in the southernmost portion of Williamsburg County, there are currently no SC Groundwater Monitoring Network wells screened within the Gordon aquifer in the Pee Dee Area.

Crouch Branch Aquifer

In 2023, the Crouch Branch aquifer accounted for approximately 12% of all reported water withdrawals in the Pee Dee Area. Several SC Groundwater Monitoring Network wells in the region are screened within the Crouch Branch aquifer, including DIL-0172, FLO-0276, MRN-0077, and WIL-0012 (Fig. 14, A-D, respectively).

Monitoring well DIL-0172 in Dillon County has shown a water level decline of approximately 7.3 feet since monitoring began in 2014. Notably, this monitoring well exhibited spikes in water levels followed by rapid declines in late 2016 and 2018 which coincide with heavy rainfall events associated with tropical storm systems that impacted the Pee Dee Area (S.C. State Climatology Office, 2023).

In Florence County, the Crouch Branch aquifer has been steadily declining at a rate of 1.2 feet per year. Since 2000, the water level at monitoring well FLO-0276 has decreased by a total of 26.2 feet.

Marion County has also experienced water level declines in the Crouch Branch aquifer. Monitoring well MRN-0077 has recorded a total decrease of 47.3 feet since monitoring began in 1982, equating to an average decline of 1.2 feet per year.

Similar to DIL-0172, monitoring well WIL-0012 in Williamsburg County has experienced a water level decline of approximately 7.3 feet since monitoring began in 2016. The shallow nature of the aquifer at this location makes it particularly susceptible to climatic influences, thus contributing to the observed water level changes.

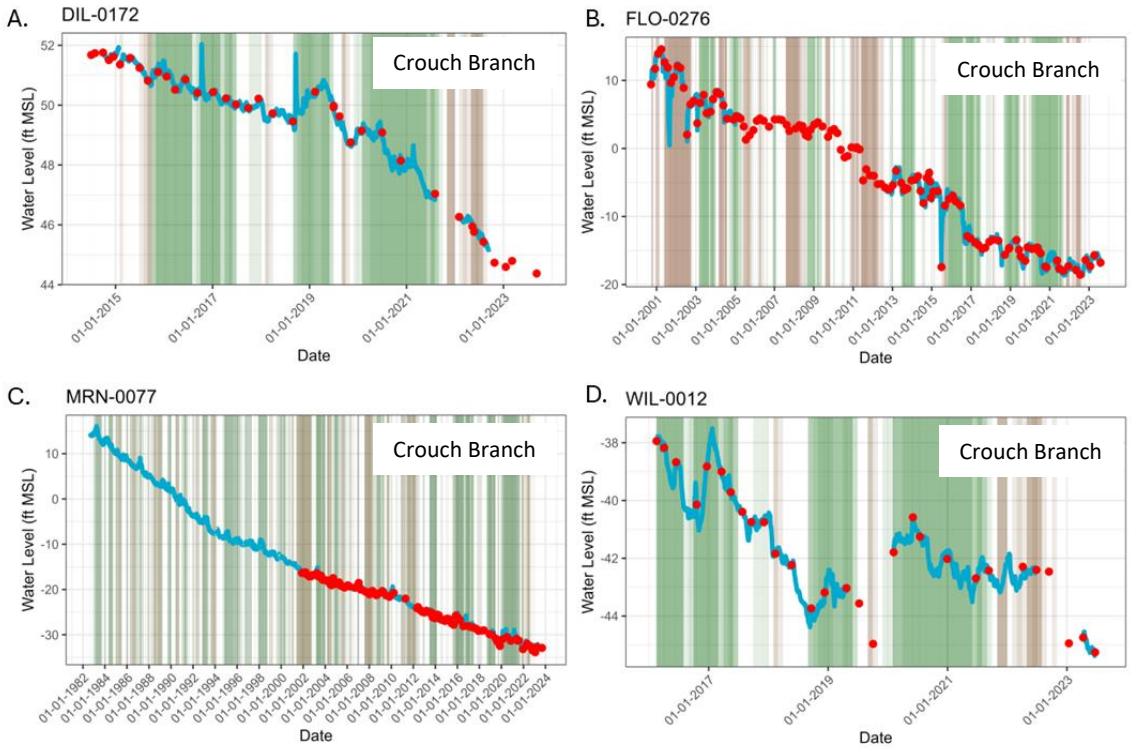

Figure 14. Crouch Branch aquifer water level plots from SCDES Hydrology monitoring wells in the Pee Dee Area. Water levels are shown in feet relative to MSL. The blue lines represent automatic data recordings and red dots represent manual water level measurements. The green background indicates climatically wet periods, and the brown background indicates climatically dry periods (http://hydrology.SCDNR.sc.gov/groundwater-data/ and https://www.drought.gov/states/south-carolina; Accessed April 2, 2024).

McQueen Branch Aquifer

The McQueen Branch aquifer is the most utilized and developed aquifer in the Pee Dee Area, accounting for approximately 75% of all reported withdrawals in 2023. The majority of SC Groundwater Monitoring Network wells in the Pee Dee Area are screened within the McQueen Branch aquifer, including DAR-0228, DIL-0121, DIL-0173, DIL-0175, FLO-0128, FLO-0274, and WIL-0355 (Fig. 15, E-K, respectively).

Water levels at monitoring well DAR-0228 in Darlington County have remained relatively stable since observations began in 2011. Groundwater levels at this location are heavily influenced by climatic conditions, likely due to the interconnectivity of the aquifers and proximity to a major surface water body (Great Pee Dee River) which may result in increased access to recharge.

In Dillon County, monitoring well DIL-0121 shows that water levels have been declining at a rate of 0.6 feet per year, resulting in a total decline of 14 feet since 1999. Similarly, water levels at DIL-0173 have been declining at a rate of 0.8 feet per year, or 4.8 feet since 2014. Also since 2014, water levels at DIL-0175 have decreased by 7.4 feet, averaging a decline of 1.2 feet per year.

While FLO-0274, located in Florence County, shows that water levels have been steadily declining in the McQueen Branch aquifer at a rate of 1.4 feet per year, or a total of 28 feet since 2000, FLO-0128 has exhibited a multidecadal recovery at a rate of 2.4 feet per year from 1999 through 2019. This recovery coincides with a reduction in groundwater demand by high-capacity groundwater withdrawers in the area. Since 2019, observed water levels at FLO-0128 have remained relatively stable.

In Williamsburg County, water levels at monitoring well WIL-0355 have decreased by 11.5 feet since 2012, averaging a decline of 1.3 feet per year.

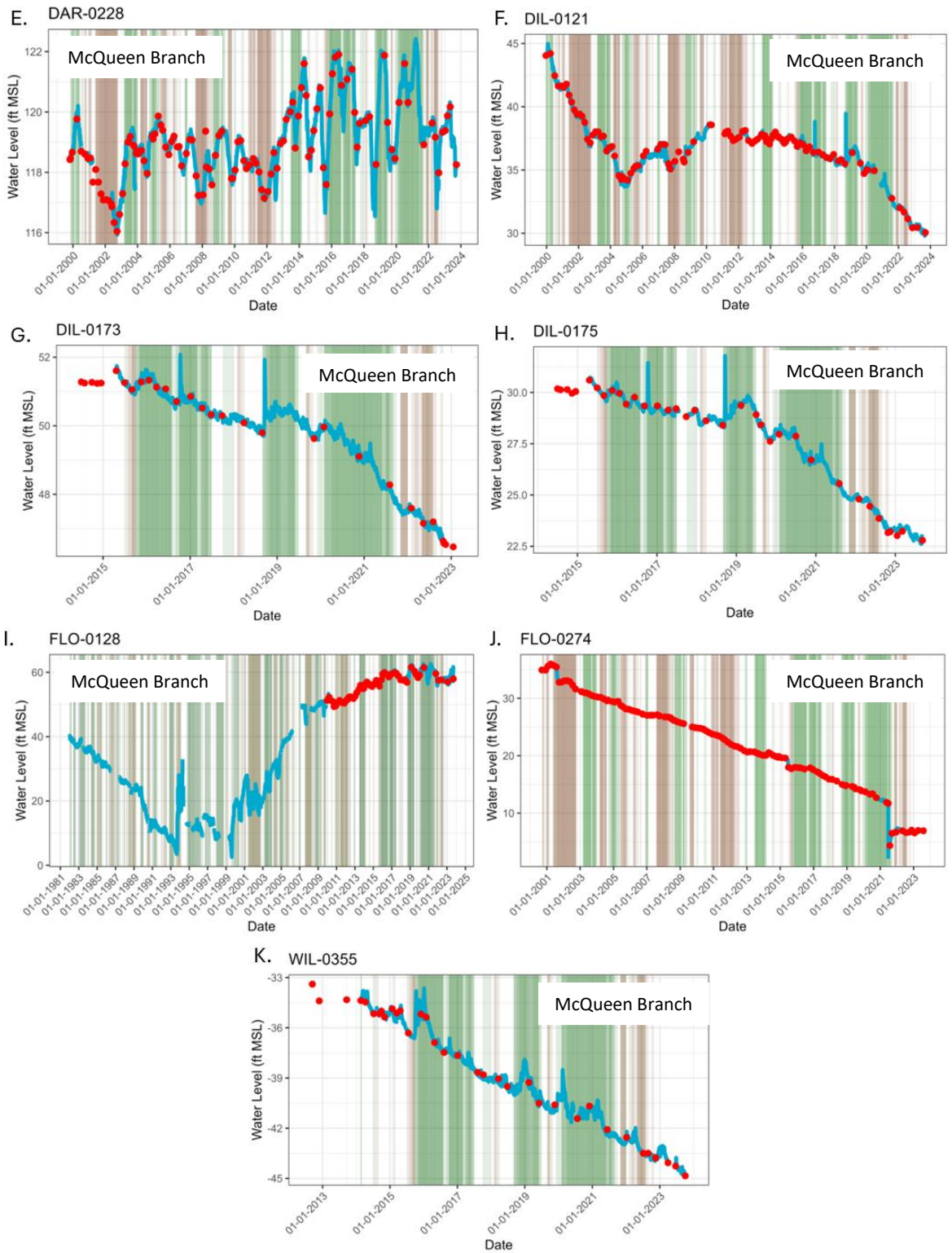

Figure 15. McQueen Branch aquifer water level plots from SCDES Hydrology monitoring wells in the Pee Dee Area. Water levels are shown in feet relative to MSL. The blue lines represent automatic data recordings and red dots represent manual water level measurements. The green background indicates climatically wet periods, and the brown background indicates climatically dry periods (http://hydrology.SCDNR.sc.gov/groundwater-data/ and https://www.drought.gov/states/south-carolina; Accessed April 2, 2024).

Charleston Aquifer

The Charleston aquifer provided water to 14 Capacity Use wells in the Pee Dee Area and accounted for approximately 3% of all reported withdrawals in 2023; however, there are currently no SC Groundwater Monitoring Network wells screened within the Charleston aquifer in the Pee Dee Area.

Gramling Aquifer

While the Gramling aquifer is present in the Pee Dee Area and SC Groundwater Monitoring Network wells are screened within it, no Capacity Use wells currently withdraw water from the Gramling aquifer in this region. Consequently, the Gramling aquifer accounted for 0% of all reported withdrawals in the Pee Dee Area for 2023; however, monitoring well MRN-0078 (Fig. 16, L) in Marion County shows that water levels in the Gramling aquifer have been steadily declining at a rate of approximately 1 foot per year since 2001.

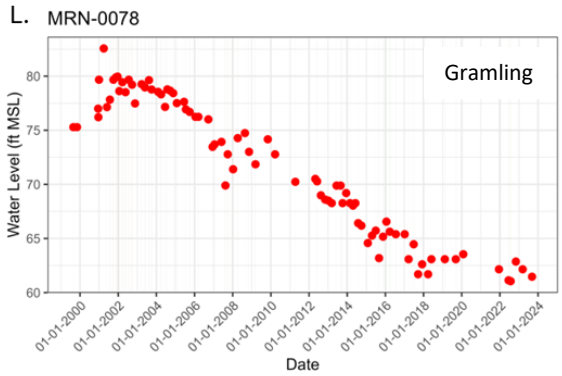

Figure 16. Gramling aquifer water level plot from a SCDES Hydrology monitoring well in the Pee Dee Area. Water levels are shown in feet relative to MSL. The red dots represent manual water level measurements. (http://hydrology.SCDNR.sc.gov/groundwater-data/; Accessed April 2, 2024).

Potentiometric Maps

Water level measurements also indicate the surface of the water table or the potentiometric surface at the well location (Fig. 17). The water table is the free surface of the groundwater in the Surficial aquifer that receives recharge directly from precipitation. The potentiometric surface is the water level measured in a confined aquifer and represents the pressure of the overlying water and sediment at that location (the pressure surface). Concurrent water level measurements at several locations within a single aquifer can be combined to create a water table (surficial aquifer) or potentiometric (confined aquifer) map. Just as contour maps are made of the land surface by connecting points of equal elevation, water table and potentiometric maps are created by connecting points of equal water elevation or pressure.

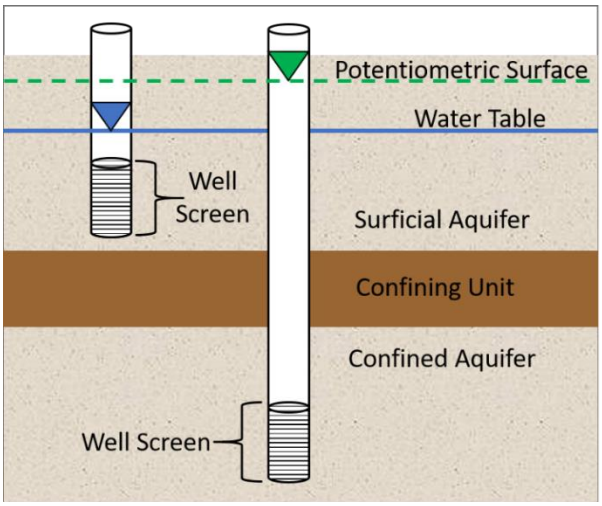

Figure 17. Illustration of a water table and potentiometric surface. Water levels in the wells are indicated by the blue (water table) and green (potentiometric surface) triangles.

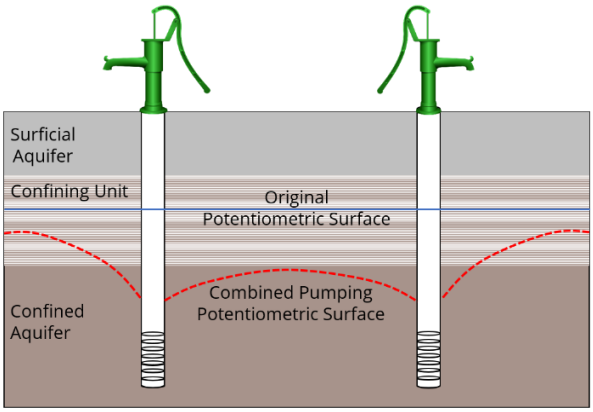

Figure 18. Illustration of the effect of combined pumping on a potentiometric surface.

Water table and potentiometric maps are essential tools for assessing groundwater conditions, as they visually represent changes in groundwater levels via contour lines. Changes to the contour lines are especially important to note in confined aquifers, where recharge rates are slower. In such areas, intensive pumping from high-capacity wells in close proximity can create cones of depression, or pumping cones, which can significantly alter the potentiometric surface over extensive distances from the pumping center (Fig. 18).

The contours of a potentiometric surface also indicate shifts in the direction of groundwater flow, as groundwater flows perpendicular to the contour lines from areas of higher to lower water elevation, or pressure. Pumping cones alter these flow paths inland, potentially introducing contaminants to nearby wells, reducing flow rates in adjacent wells, and decreasing discharge to local streams and rivers. Understanding these dynamics is essential for effectively managing sustainable groundwater use and minimizing potential impacts on aquifer sustainability.

Pre-development potentiometric maps were digitized by SCDNR from the maps in a 1985 USGS report (Aucott & Speiran, 1985), and are considered to be the potentiometric surfaces of the aquifers in the year 1900. In 1987, SCDNR began publishing potentiometric maps from water level measurements in the aquifers of the CPSC. In addition to the SC Groundwater Monitoring Network wells presented previously, other wells belonging to a variety of water suppliers, irrigators, and industrial users are also used to create these maps.

The following figures are a combination of these potentiometric maps overlain with Pee Dee Area water use data for the corresponding years to illustrate how the pressure surface and groundwater flow paths have changed over time. Clusters with darker shading represent higher concentrations of groundwater withdrawals and areas with lighter, or no, shading represent lesser quantities of groundwater withdrawals.

Crouch Branch Aquifer

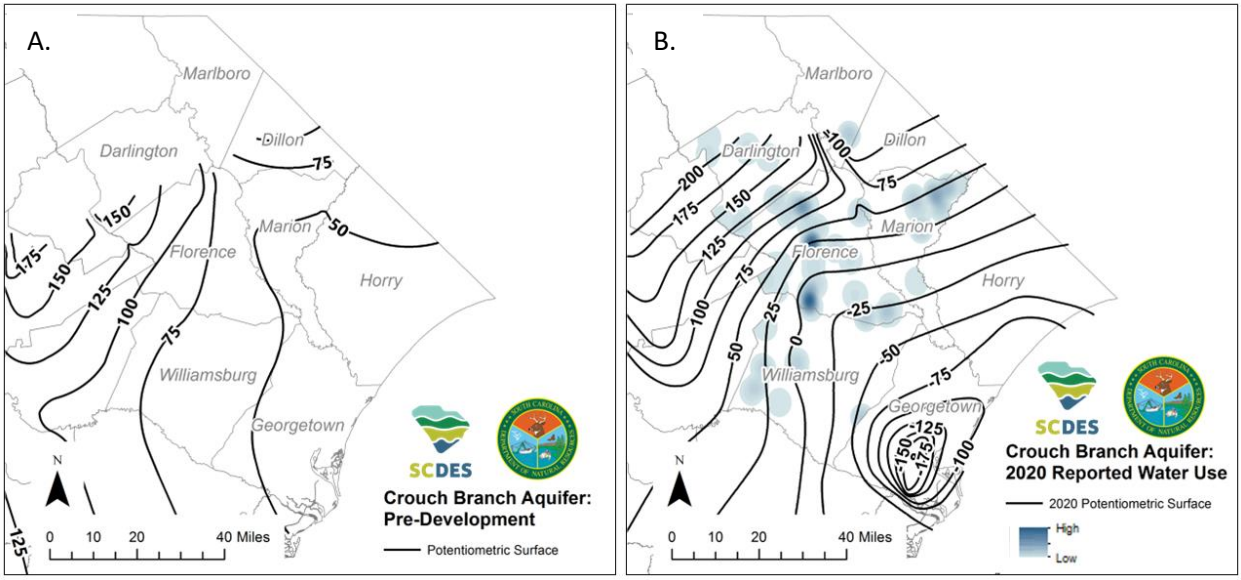

Figure 19. A. Pre-development potentiometric map of the Crouch Branch aquifer in the Pee Dee Area (Aucott & Speiran, 1985). B. 2020 potentiometric map of the Crouch Branch aquifer (Czwartacki & Wachob, 2021). Water levels are displayed in feet relative to MSL. Although Georgetown and Horry Counties are not part of the Pee Dee Area, they have been included here for geographic reference.

The pre-development potentiometric surface of the Crouch Branch aquifer indicates a predominantly east to southeasterly groundwater flow direction, with water levels ranging from approximately 150 feet above MSL in Darlington County to 50 feet above MSL in Florence, Marion, and Williamsburg Counties (Fig. 19, A; Aucott & Speiran, 1985). Subsequent assessments reveal varying changes in groundwater levels across the region. By 2020, Darlington, Dillon, and Marlboro Counties have shown minimal changes in water levels since pre-development, likely due to increased access to recharge in these areas. Conversely, Marion County has experienced a lowering of the potentiometric surface by 25 feet, Florence County by 75 feet, and Williamsburg County by up to 100 feet (Fig. 19, B; Czwartacki & Wachob, 2021). These declines in Florence, Marion, and Williamsburg Counties are likely influenced by the cone of depression that has formed in the Crouch Branch aquifer in neighboring Georgetown County, which has impacted the regional groundwater flow dynamics.

McQueen Branch and Charleston Aquifers

The McQueen Branch, Charleston, and Gramling aquifers are collectively known as the Middendorf Aquifer System in South Carolina. Although they are now referenced individually as the McQueen Branch, Charleston, and Gramling aquifers, the pre-development potentiometric map was created for the Middendorf Aquifer System as a whole, and the most recent potentiometric surface produced by the SCDNR Hydrology Section in 2022 combines data from both the McQueen Branch and Charleston aquifers; therefore, it is not possible to determine the pressure surface changes unique to each aquifer.

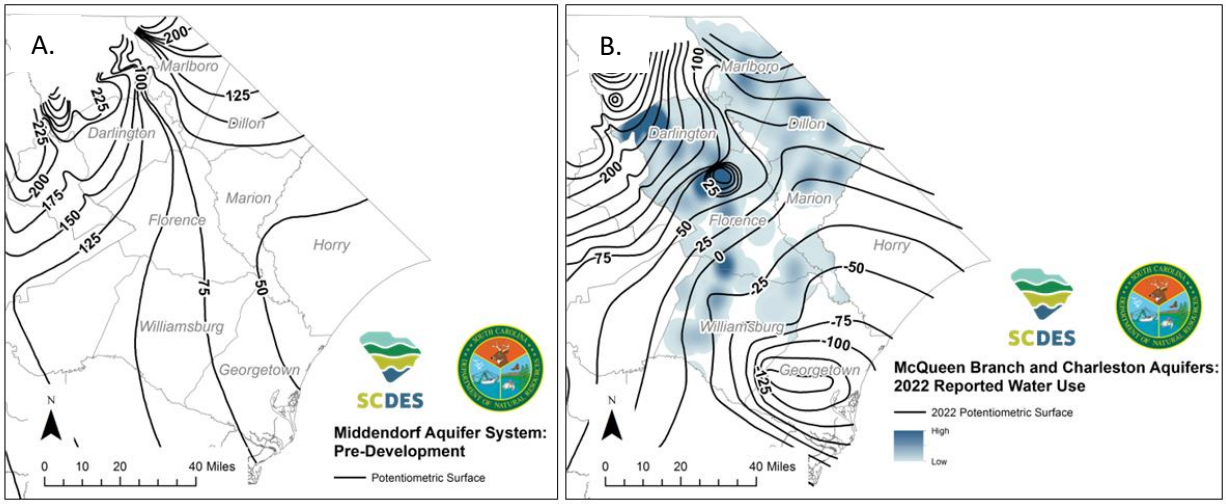

Figure 20. A. Pre-development potentiometric map of the Middendorf Aquifer System in the Pee Dee Area (Aucott & Speiran, 1985). B. 2022 potentiometric map of the McQueen Branch and Charleston aquifers (Czwartacki & Wachob, 2022). Contour lines are in feet relative to MSL. Although Georgetown and Horry Counties are not part of the Pee Dee Area, they have been included here for geographic reference.

The pre-development potentiometric surface of the Middendorf Aquifer System indicates that groundwater flowed in an east to southeasterly direction across much of the Pee Dee Area, and water levels ranged from approximately 225 feet above MSL in Darlington and Marlboro Counties to 50 feet above MSL in eastern Florence, Marion, and Williamsburg Counties (Fig. 20, A; Aucott & Speiran, 1985).

Due to increased access to recharge, the potentiometric surface of the McQueen Branch and Charleston aquifers have not been significantly altered since pre-development in Darlington County; however, by 2022, water levels have declined by 100 feet or more in eastern Florence, Marion, and Williamsburg Counties (Fig. 20, B; Czwartacki & Wachob, 2022). These declines in the McQueen Branch and Charleston aquifers mirror trends observed in the Crouch Branch aquifer and are also likely influenced by the cone of depression that has formed in the McQueen Branch aquifer in Georgetown County.

Notably, the smaller cone of depression in northwestern Florence County has been recovering since the late 1990s when the cone reached an all-time low of 92 feet below MSL. In the early 2000s, the Florence cone of depression began a multi-decadal recovery but has remained stable at approximately 25 feet below MSL since 2019 (Czwartacki & Wachob, 2020). This timeline coincides with high-capacity groundwater withdrawers in the area transitioning from groundwater to surface water sources in an effort to reduce demand on the aquifer.

Groundwater Evaluation

Groundwater conditions in the Pee Dee Area vary based on location and aquifer. In the western region of the Pee Dee Area, groundwater levels have remained relatively stable due to proximity and access to recharge; conversely, in the eastern region of the Pee Dee Area, considerable groundwater declines have been observed. Monitoring wells in the Crouch Branch aquifer show that water levels have declined by 7.3 to 47.3 feet across Dillon, Florence, Marion, and Williamsburg Counties. Similarly, the McQueen Branch aquifer has also exhibited water level declines at an average rate of 1.3 feet per year in Dillon, Florence, and Williamsburg Counties. These water level trends can be attributed to a combination of factors such as climatic conditions, access to recharge, concentrated high-capacity groundwater withdrawals, and influence from the cone of depression in Georgetown County.

As of 2022, the cone of depression centered in northwestern Florence County has recovered by approximately 70 feet since reaching a record low of 92 feet below MSL in the late 1990s (Czwartacki & Wachob, 2022). Observations from monitoring well FLO-0128 show the initial drawdown period in the 1990s, subsequent recovery through 2019, and recent stabilization of water levels (Fig. 15, I). This recovery holds significant implications for groundwater management efforts across the state, underscoring the importance of continued monitoring and taking proactive measures to ensure the sustainable use of the State's groundwater resources.

Recommendations

The Crouch Branch aquifer and the McQueen Branch Aquifer have experienced water level declines in the Pee Dee Capacity Use Area. To both protect the groundwater resources in the Pee Dee Area counties, as well as continue sustainable development of groundwater as a resource, SCDES has issued the following recommendations for groundwater management.

Crouch Branch and McQueen Branch Aquifers

- No increases in permitted groundwater withdrawal rates should be approved for existing wells screened in the Crouch Branch aquifer or McQueen Branch aquifer in Florence County or Williamsburg County. This hold should remain in effect until the Pee Dee Area undergoes its next 5-year review in 2030 at which time the hold on withdrawal rate increases should be re-evaluated based on new water level information.
- No new wells with associated groundwater withdrawal rate increases should be permitted for construction and production in the Crouch Branch aquifer or McQueen Branch aquifer in Florence County or Williamsburg County. This hold should remain in effect until the Pee Dee Area undergoes its next 5-year review in 2030 at which time the hold on new construction should be re-evaluated based on new water level information.
- Staff evaluations of Groundwater Withdrawal Permit Applications for withdrawal increases to existing permits and new groundwater withdrawal permits in areas of concentrated, high-capacity pumping should include a groundwater model assessment to determine the potential for the development of pumping cones and potential interference on any neighboring wells.
- Encourage the use of Aquifer Storage and Recovery (ASR) wells and increase the use of Artificial Recharge (AR) to mitigate effects and aid in the recovery of the pumping cone in southern Georgetown County.

Pee Dee Capacity Use Area

- New and renewal Groundwater Withdrawal Permit Applications with requested withdrawal rate increases should be diverted to surface water sources, when available, to meet water demands in the region. Groundwater should be used as a supplemental and/or backup source, if possible.
- In the portions of the Pee Dee Area where confining units are present, encourage groundwater withdrawers to discontinue using and properly abandon wells that have been screened across multiple aquifers, and ensure that all future wells are screened in the target aquifer only, with appropriate grouting starting at the plug above the screen interval or the first confining bed immediately above the target aquifer to the top of land surface.
- Work toward educating all South Carolinians on best practices for water conservation must continue in cooperation with all stakeholders.
- Work in conjunction with local, state, and federal partners to expand the SC Groundwater Monitoring Network in Pee Dee Area aquifers by identifying wells scheduled for abandonment that may be incorporated and of benefit to the monitoring well network.

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Appendix A: Historic Drought Conditions

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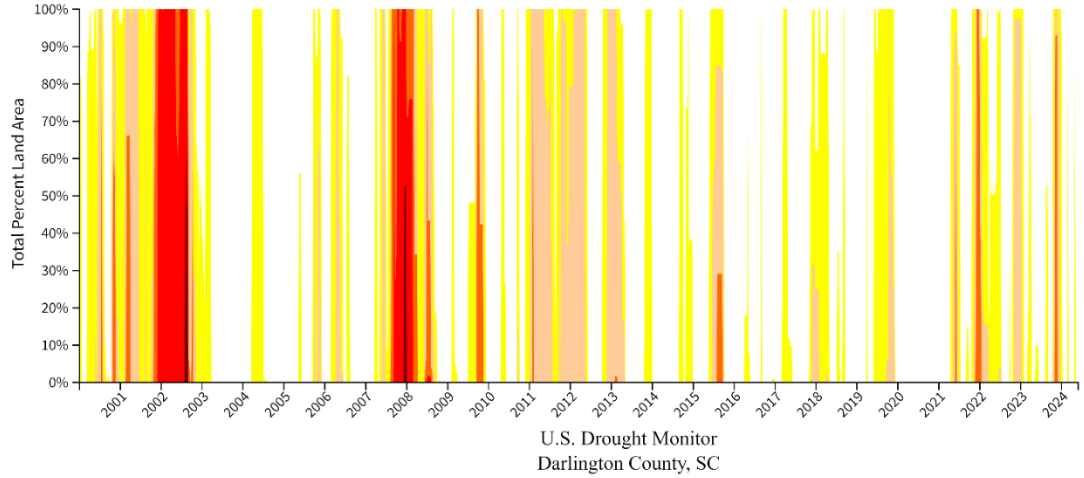
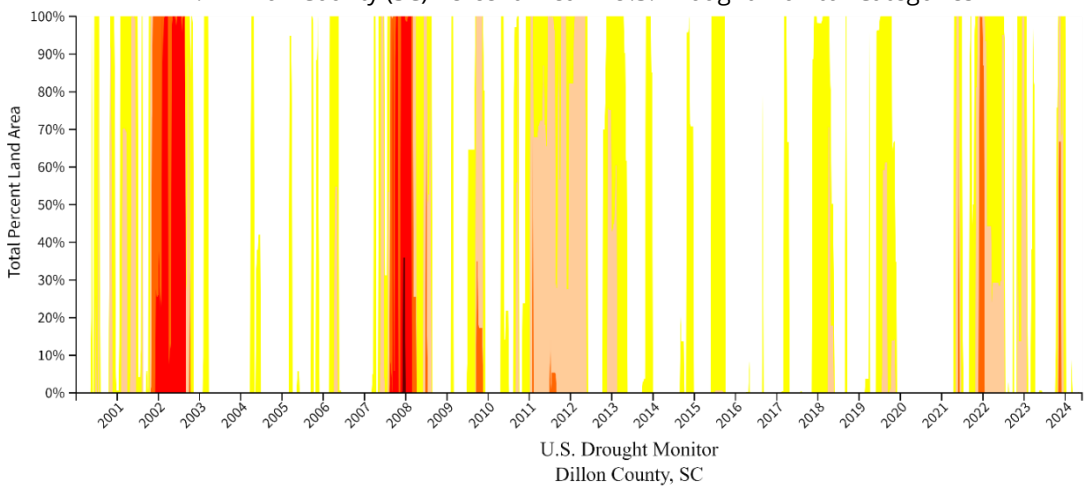
A. Darlington County (SC) Percent Area in U.S. Drought Monitor Categories



B. Dillon County (SC) Percent Area in U.S. Drought Monitor Categories



C. Florence County (SC) Percent Area in U.S. Drought Monitor Categories

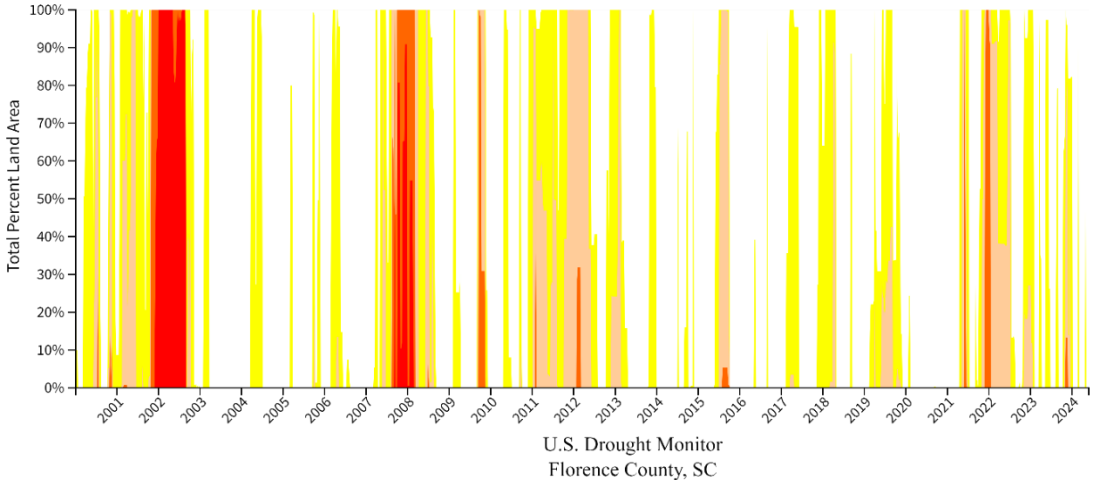
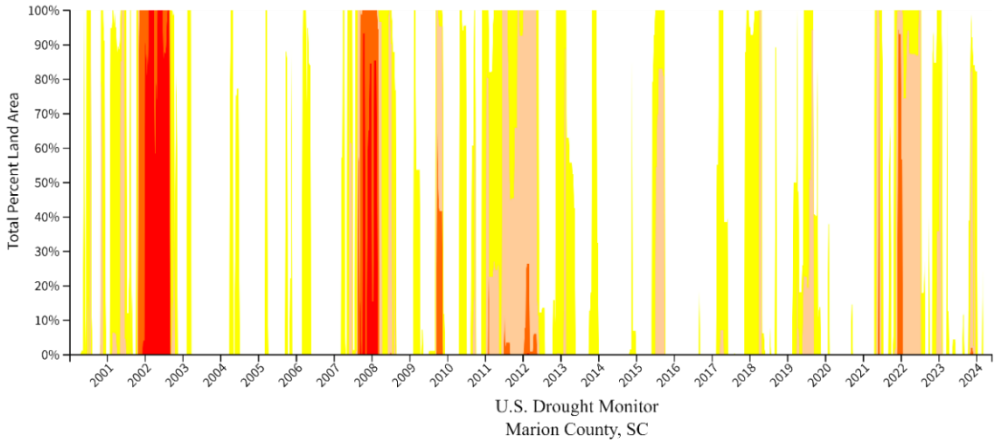
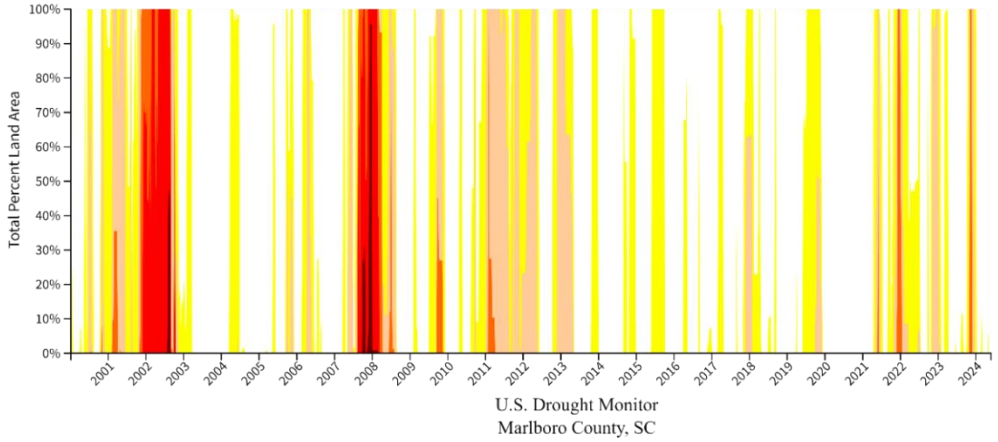


Figure A1, A-F. Severity and percent drought coverage for Pee Dee Area counties. D0 represents abnormally dry periods and D4 represents periods of exceptional drought (https://www.drought.gov/; accessed May 2024).

D. Marion County (SC) Percent Area in U.S. Drought Monitor Categories



E. Marlboro County (SC) Percent Area in U.S. Drought Monitor Categories



F. Williamsburg County (SC) Percent Area in U.S. Drought Monitor Categories

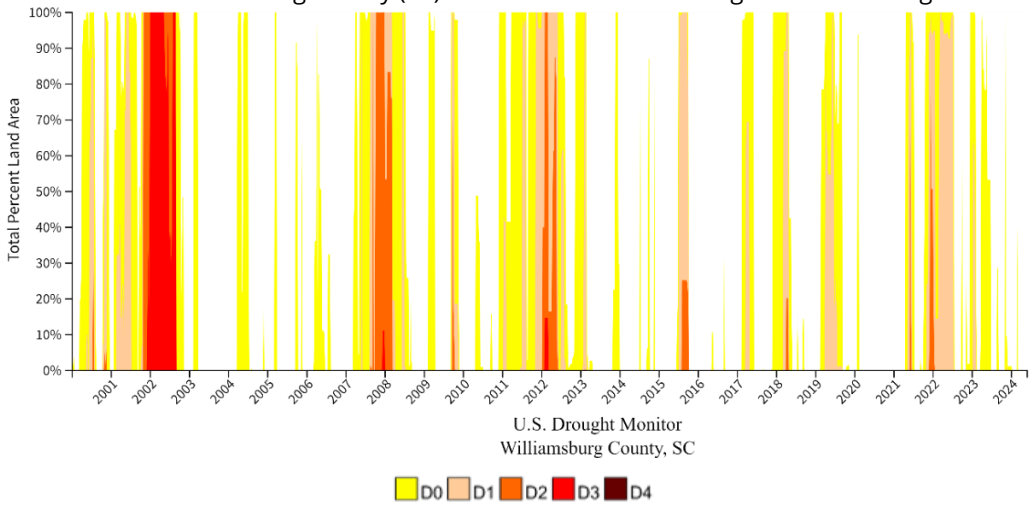


Figure A1, continued.

Appendix B: South Carolina Groundwater Monitoring Network

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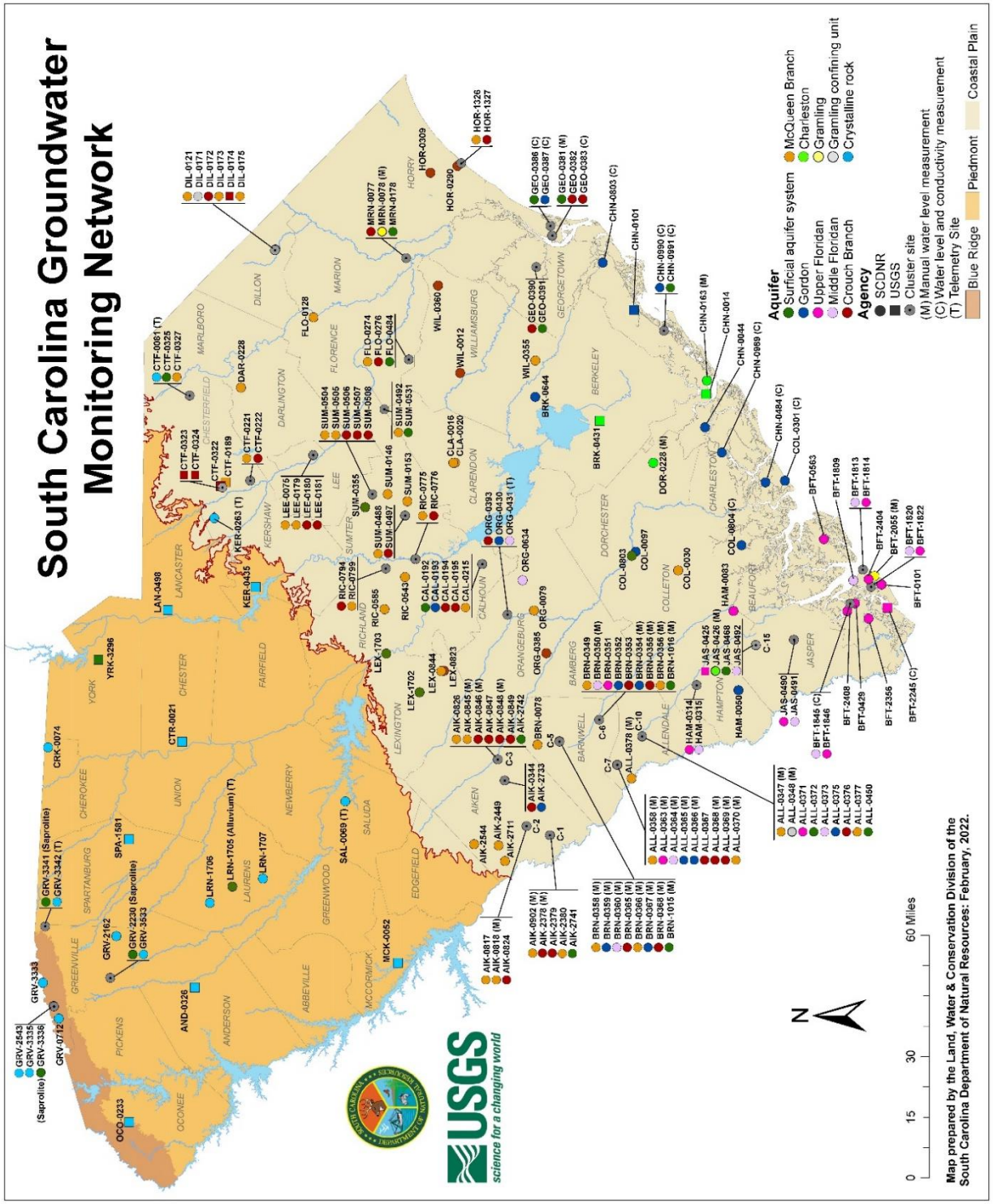

Figure B1. Map of wells included in the South Carolina Groundwater Monitoring Network (https://hydrology.SCDNR.sc.gov/; accessed March 6, 2023).