

DISTRIBUTION AND RATE OF WATER USE IN SOUTH CAROLINA, 1994

by

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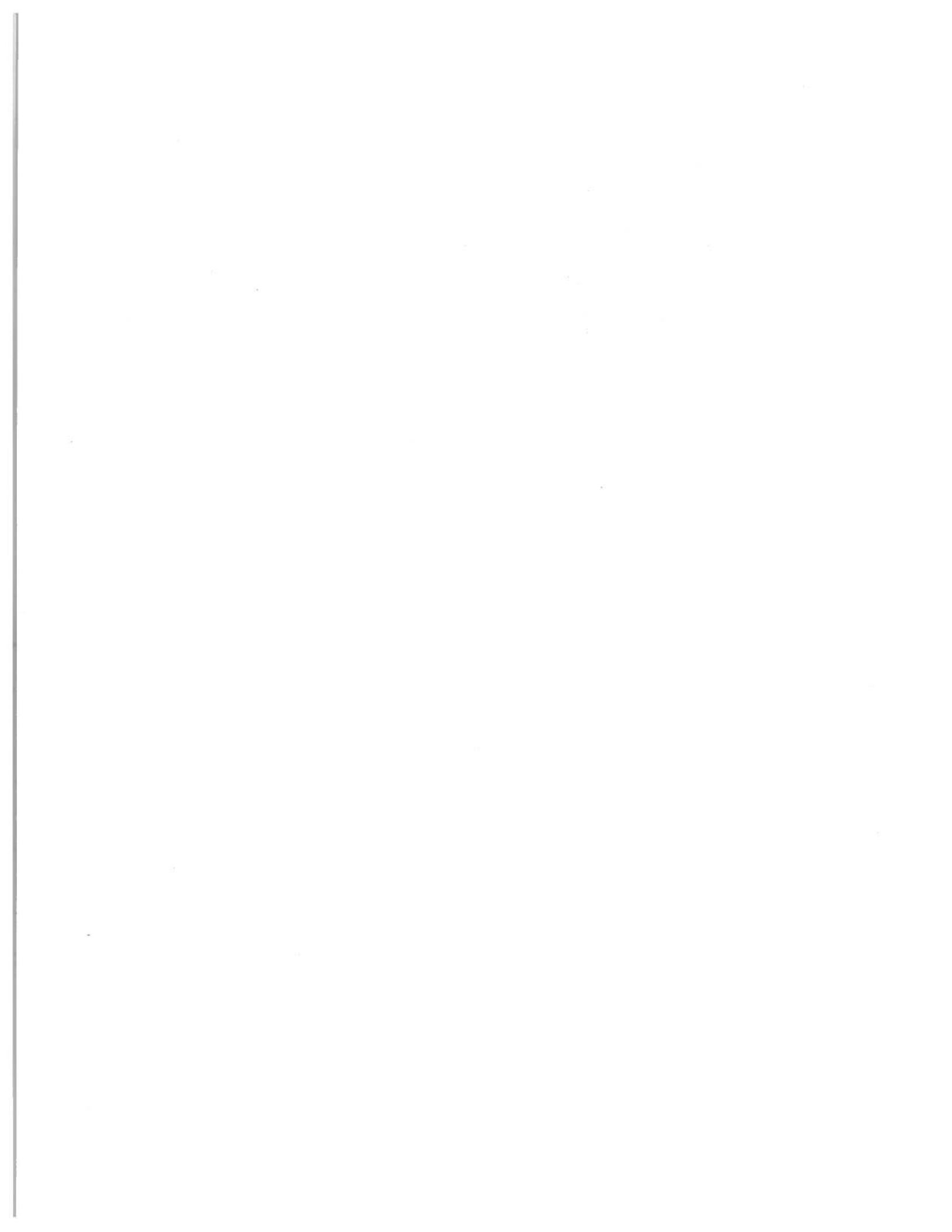
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**STATE OF SOUTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES**



WATER RESOURCES REPORT 18

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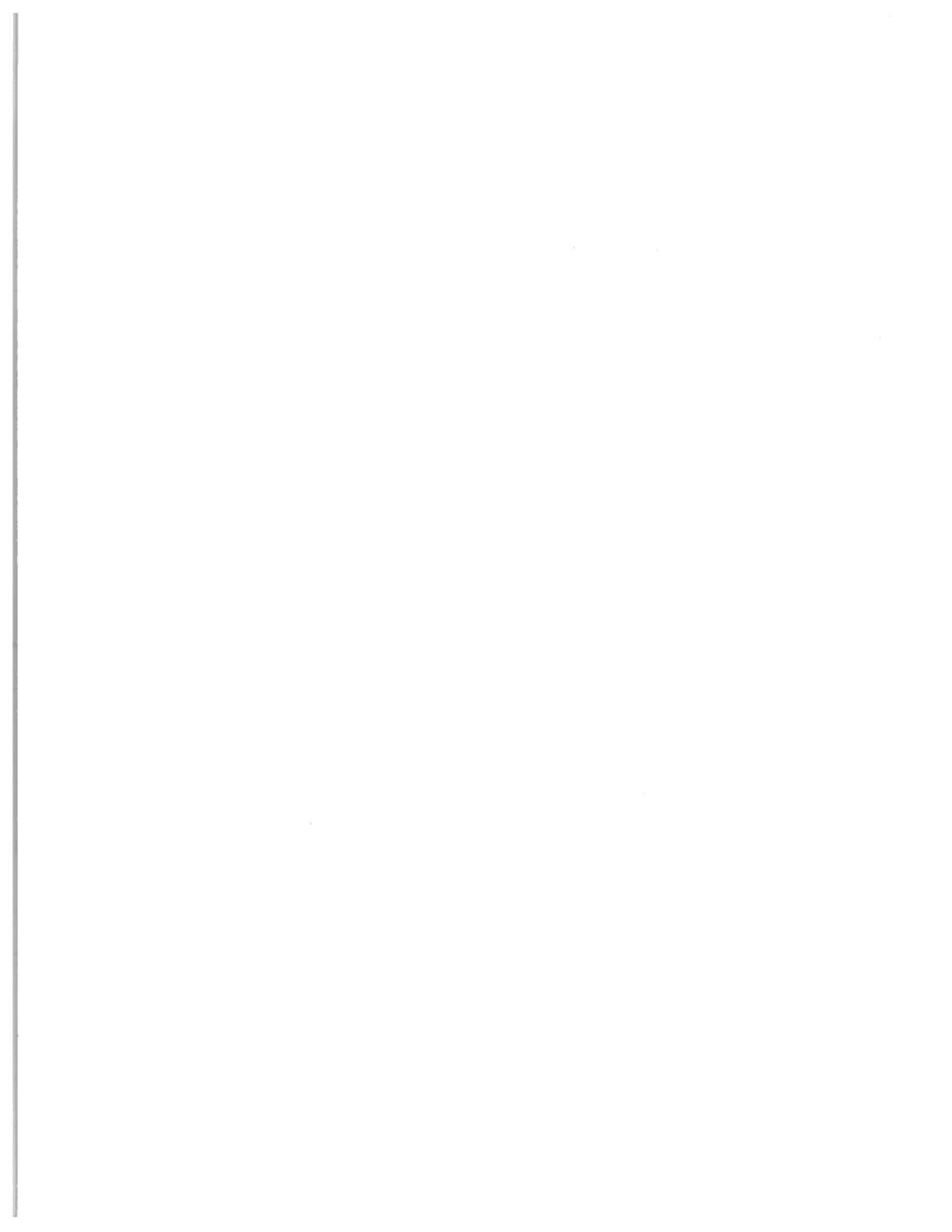
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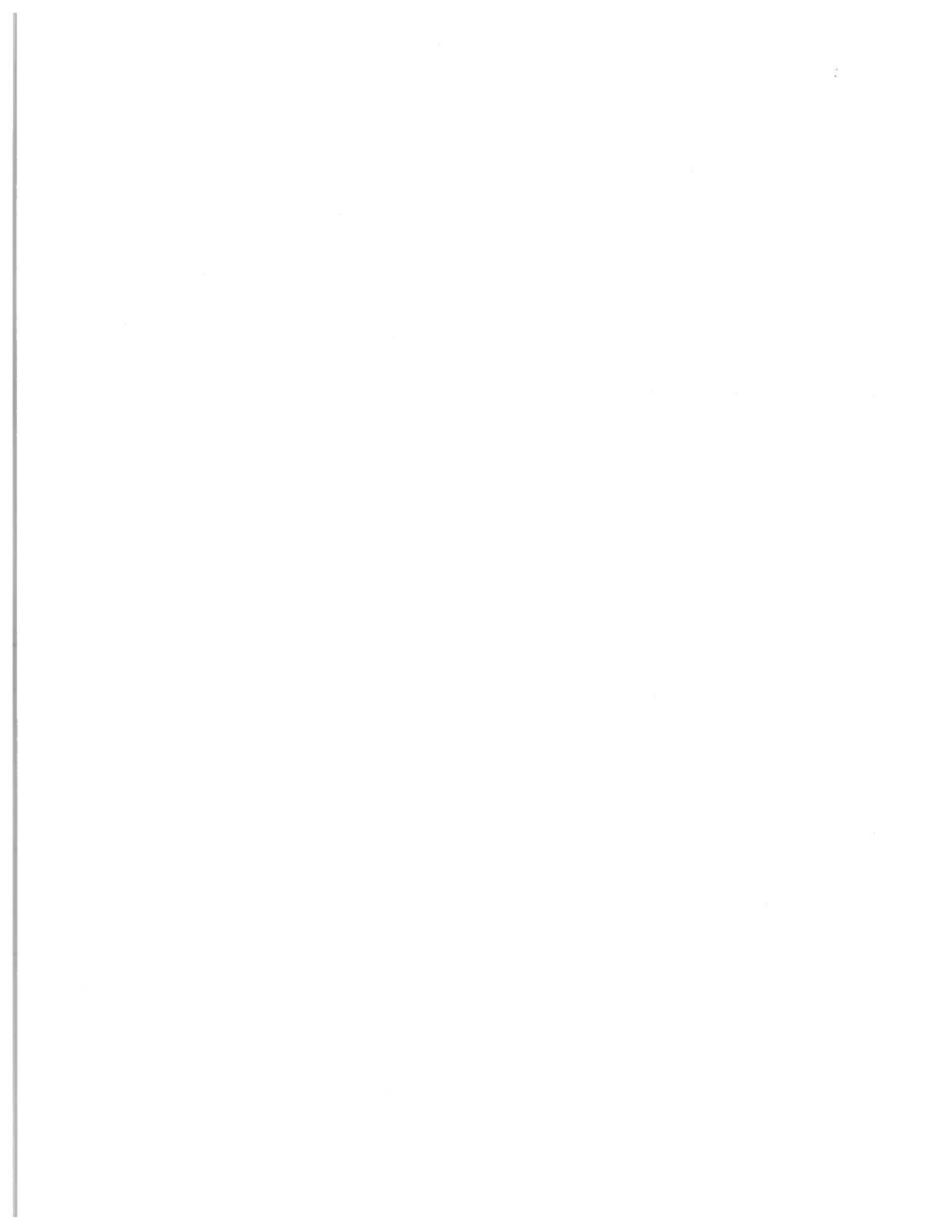
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Joffre E. Castro and Jun Hu

ABSTRACT

Water use in South Carolina during the past century has increased by 50 percent. In the early 1950's the State used 44 billion gallons of water per day and by the mid-1990's, 68 billion. This trend might well continue in the next century. Nearly 98 percent of the water withdrawn, which is mostly surface water, is used by power-generating facilities and is returned to the streams. Of the remaining 2 percent, most is used by public supplies and industries. In 1994, excluding usage for power-generating facilities, South Carolina used 1.1 billion gallons, and the usage was concentrated in five regions: (1) the northwest, the Greenville-Spartanburg-Rock Hill area; (2) the center, the Aiken-Columbia-Florence area; (3) the northeast, the Myrtle Beach-Georgetown area; (4) the southeast, the Charleston area; and (5) the south, the Beaufort-Hilton Head area.

INTRODUCTION

The South Carolina Department of Natural Resources is presently considering what the long-term water demand will be in South Carolina and whether the water-supply facilities will adequately meet the future demand. To that end, this study attempts to estimate the present water use. Although there are various water use programs, administered by the State government, that collect and manage this type of information, a reliable estimate of the State's water use has not hitherto been published.

Data used for this study were obtained from the South Carolina Departments of Health and Environmental Control (DHEC), Commerce (DOC), and Natural Resources (DNR). Our sincere appreciation goes to those agencies and their staffs that facilitated the acquisition of this information. Special thanks are given to Susan Alder and Doug Kinard of DHEC and Martin Roche and Amanda Drenning of DOC.

Six data bases with water use and related information were obtained from DHEC:

- a) WSINV.DBF, South Carolina Public-Drinking Water Inventory, is a compilation of public-supply systems.
- b) METER.DBF, Meter Systems, is a listing of public supply facilities that purchase water from other systems.
- c) CU_MONIT.DBF, Capacity Use Monitoring, is a compilation of ground water users in the two Capacity Use Areas: Low Country and Waccamaw.
- d) CAPUSE.DBF is a support file for the CU_MONIT.DBF that contains general information on users in the capacity use areas.

- e) WU_MONIT.DBF, Water Use Program, is a record of users that pump more than 100,000 gallons per day.
- f) WATERUSE.DBF is a support file for the WU_MONIT.DBF that contains basic information on the Water Use Program users.

Two data bases with geographic information on selected public supply systems were obtained from DOC:

- g) WATDAT.DBF has attribute data associated with public-supply service areas.
- h) COVERAGE ARC/INFO has service-area coverage for public supply systems by Council of Government (COG) region.

One data base with information on water wells was obtained from DNR:

- i) WELLTAB.DBF is an inventory of water wells in South Carolina.

These data bases were conjunctively used to compute an average usage of water, in million gallons per day (MGD), and to identify location of sources, types of use, and distribution of water use. All data bases were subjected to a limited quality-control check. Filters were run on the data to isolate gross errors. In many cases the records from one data base were cross-correlated with the other data bases to verify the information, mostly regarding location and use type; in a few cases, errors were corrected by contacting users; and several records were deleted because the data were unusable, for example, the reported usage was zero. Overall, the best source of information was the WSINV file and the worst was the WU_MONIT file. A reason for the difference in data quality may be that information for the WSINV comes from a program that is *mandatory* whereas information for the WU_MONIT comes from a program that is *voluntary*.

Previous Work

Since 1950, the U.S. Geological Survey has quinquennially reported, by states, the water use of the nation: MacKichan (1951 and 1957), MacKichan and Kammerer (1961), Murray (1968), Murray and Reeves (1972 and 1977), Solley (1983), and Solley and others (1988 and 1993). Additionally, the U.S. Geological Survey published National Water Summaries in 1984 and 1987. Viessman (1980) prepared a national water use study for Congress. In South Carolina, the Water Resources Commission and its successor, DNR, have published water use in the following reports: SCWRC (1970), Duke (1977), Lonon and others (1980), Snyder and others (1983), Harrigan (1985), Newcome (1990 and 1995), and reported water use in eight short unpublished reports, mostly tabulations, covering the years 1984-1991. The Strom Thurmond Institute at Clemson University prepared a series of reports under the title *The Situation and Outlook for Water Resources Use in South Carolina, 1985-2000*: First (1985), Second (1987), and Third (1988) Year Reports; and *Water for South Carolina's Future: Policy Issues and Options in the Development of a State Water Plan* (1989). The Second-Year Report includes an annotated bibliography by G. E. Varenhorst. There are also a few county-wide and area-specific reports, most published by the former Water Resources Commission, that discuss water use: Pelletier (1985), McCready (1989), Newcome (1989), and Rodriguez and others (1994).

Past and Present Water Use

A summary of the water use in South Carolina for 1950-1996 is presented in Table 1. The information from 1950 through 1991 was obtained from the previously mentioned reports, and from 1992 through 1996 from DHEC files. In this table and in the report the following convention has been followed:

- PS, public supply, includes water that is used mostly for drinking and household uses, although a considerable percentage may also be used for industrial and commercial purposes.
- IND, industrial, includes systems that use water for industrial and commercial purposes and are self-supplied.
- OTH, other purposes, includes golf-course and crop irrigation, mining, and most other types of water use not covered in this classification.
- Power, includes systems that use water for the production of energy, such as hydroelectric power (HP), nuclear power (NP), and thermal power (TP). Although NP is a type of TP, it has been listed separately to emphasize its importance. Nearly all of the water withdrawn for these types of uses is returned to the source.

For simplicity, the amounts given in tables have been reported in million gallons per day and were rounded upward. Table 1 shows that during the mid-1950's and the 1980's there was a decrease in water use for HP. During those years, South Carolina underwent prolonged drought, which in some months became severe. This illustrates the dependency that hydropower production has on surface water availability. Another interesting point is the decrease of IND usage after 1989, when the Savannah River Site shut down its nuclear reactors.

From 1994 to 1996, the total water use in South Carolina ranged from 59 to 68 billion gallons per day. More than 98 percent of that total was used for power generation, most of which was returned to the source, a small fraction being lost to evaporation. The remaining 2 percent, approximately 1.1 billion gallons per day, was used mostly for public supply and industrial purposes. By comparison, the aggregate daily flow of the rivers in South Carolina averages 33 billion gallons (SCWRC, 1983), which shows that, in South Carolina, surface water is used, on average, almost two times before it flows into the ocean; for the Nation, the average is three times. This suggests that South Carolina could be more efficient in the utilization of its water resources.

DATA ANALYSIS

Although the reported public supply (PS) use in the WU_MONIT data base (Water Use Program) is consistent for the reporting years, with the exception of 1987, it is different from the use reported in the WSINV (Public Drinking Inventory). To make this comparison meaningful, only public supplies in the WSINV data base producing 0.1 MGD or more were considered. For 1994 the difference is about 100 MGD. The WSINV shows 551 MGD and the WU_MONIT 450 MGD. Some of the disparity may be because the WSINV reports an **average use**, recorded during the latest DHEC inspection of the public supply system, whereas the WU_MONIT reports an **actual use**,

TABLE 1. Water Use in South Carolina 1950-1996
(Millions of gallons per day)

YEAR	NON-POWER GENERATION				POWER GENERATION		
	PS	IND	OTH	TOTAL	TP+NP	HP	TOTAL
1950	100	70	10	180	--	44,500	44,500
1955	150	170	30	350	400	29,000	29,400
1960	190	140	50	380	600	62,000	62,600
1965	260	240	30	530	1,000	60,000	61,000
1970	300	350	30	680	2,600	41,000	43,600
1975	320	350	30	700	5,800	--	---
1976	370	440	--	810	4,400	--	---
1980	380	910	70	1,360	4,400	--	---
1983	340	1,100	40	1,480	5,000	48,100	53,100
1984	340	1,110	40	1,490	4,700	57,400	62,100
1985	330	1,080	30	1,440	5,300	40,500	45,800
1986	400	1,200	70	1,670	4,400	39,300	43,700
1987	250	1,200	60	1,510	4,300	52,900	57,200
1988	300	1,110	70	1,480	4,600	39,000	43,600
1989	330	640	30	1,000	4,900	60,400	65,300
1990	350	630	60	1,040	4,800	60,000	64,800
1991	400	740	40	1,180	5,200	57,000	62,200
1992	430	710	60	1,200	6,400	57,300	63,700
1993	460	630	80	1,170	7,800	49,400	57,200
1994	480	580	80	1,140	7,400	51,000	58,400
1995	510	560	50	1,100	7,900	59,400	67,300
1996	590	570	10	1,170	7,600	58,600	66,200

which is reported by the user to DHEC four times a year. Most of the difference, however, appeared because not all public supplies reported their use to the Water Use Program, and therefore, the WU_MONIT file does not have all the information. It is suspected that the other use types, crop irrigation in particular, are affected by the same problem. Thus, the reported water use should be considered, at best, a low estimate. By contrast, the report from the power-generation users is considered to be reasonably accurate.

In the WSINV data base, purchased water in MGD (obtained from the METER file) was subtracted from the sellers' daily average usage. In the WU_MONIT data base, systems that purchased water are issued a separate identification number. To avoid duplication, these records were excluded from the analysis.

To study the water use in South Carolina, the 1994 data set was selected as more representative, because this set appeared to be more complete than the ones for 1995 or 1996. Conspicuously absent from all data sets is information on domestic self-supplied use (DOM), which is not required to be reported. In this study the DOM use was obtained by subtracting the service population, which is reported in the WSINV data base, from the county population (1994) estimated from the 1990 census. The water use was calculated by multiplying the resulting population by 65 gpd/p (gallons per day per person), which is an estimate of how many gallons of water a person uses per day in the rural area (Murray and Reeves, 1977). In a few instances, the service population reported in the WSINV file exceeded the 1994 projected population. The reason for this is that some public supplies deliver water to areas outside their county of location. In those cases, the self-supplied population was estimated by using the State average of 19 percent.

Table 2 provides a breakdown of water use in millions of gallons per day by county, where the public-supply values (PS) were obtained from the WSINV data base and only includes systems that produce more than 0.1 MGD. The self-supplied domestic (DOM) use was estimated from population as explained above. The information for the other types of use (IND, OTH, NP, TP, HP) came from the WU_MONIT data base.

Distribution and Use

Most water-use maps available today show rates of withdrawal and location of sources, but they provide no information as to where (distribution) the water is used. This study is most concerned with the distribution of the water use. This information will help in estimating long-term water demand, which will be based on economic and population growth.

Excluding power generation, public supply and industry are the largest water users in South Carolina (Fig. 1). Moreover, a large percentage of the public-supply demand is for industrial purposes. For example, Andrews in Georgetown County used 1.67 MGD for public supply in 1994 and had a per capita use of over 500 gpd/p. This per capita use is nearly three times the State's average (151 gpd/p), which suggests that two-thirds of the public-supply use in Andrews was for industrial purposes. Thus, forecasting industrial use, which is related to economic growth and development, is critical. This will be accomplished by using a combination of land-use/land-cover and population-density information, which will be explained and discussed in a future report.

TABLE 2. Water use in South Carolina counties, 1994
(millions of gallons per day)

	NON-POWER FACILITIES				POWER FACILITIES			TOTAL	
	PS	IND	DOM	OTH	HYDRO	THERMAL	NUCLEAR	NON-POWER	POWER
Abbeville	3.07	0.43	0.60		3,284			4	3,284
Aiken*	21.55	79.38	1.63	1.80		200		104	200
Allendale	1.68	2.38	0.22	1.44				6	
Anderson	19.42	2.84	0.50	0.11	2,933	50		23	2,983
Bamberg	1.34		0.50	1.20				3	
Barnwell	2.29		0.59	0.13				3	
Beaufort	19.88	0.41	0.09	4.68				25	
Berkeley	12.61	10.92	5.72	2.27	3,253	478		32	3,731
Calhoun	0.79	97.18	0.53	0.98				99	
Charleston	59.55	39.03	0.80	1.45				101	
Cherokee	10.34	2.15	0.72	0.19	1,910			13	1,910
Chester	5.73	0.34	1.11		6,563			7	6,563
Chesterfield	5.33	0.43	1.03	1.33				8	
Clarendon	1.55		0.91					2	
Colleton*	3.04		0.45	0.31		4		4	4
Darlington	6.34	21.11	0.77	0.11			8	28	8
Dillon	4.53	2.21	0.36	0.01				7	
Dorchester	9.80	3.25	1.65	0.02				15	
Edgefield*	2.61		0.24	0.06	3,561			3	3,561
Fairfield	1.88		0.59	0.25	5,823		664	3	6,487
Florence	15.29	36.12	2.95	0.56				55	
Georgetown*	6.76	35.12	0.62	4.93		7		47	7
Greenville	65.64	0.42	2.84	0.73	615			70	615
Greenwood	14.96	0.31	1.04	0.18	1,031			16	1,031
Hampton	1.68	0.67	0.47	0.84				4	
Horry*	22.77	0.35	1.88	6.49		81		31	81
Jasper	1.24		0.50	0.39				2	
Kershaw*	9.05	10.06	0.57	0.25	2,986			20	2,986
Lancaster	12.76	9.75	0.54		2,640			23	2,640
Laurens	6.84	0.06	1.05	0.12	118			8	118
Lee	1.09	1.98	0.79					4	
Lexington	13.26	43.28	5.96	4.85	1,257	131		67	1,389
Marion	4.28		0.49	0.28	5,621			5	5,621
Marlboro	9.12		0.55	0.02				10	
McCormick	0.77	6.55	0.07	0.29				8	
Newberry	4.06	0.10	0.82					5	
Oconee*	8.95	1.70	0.75	0.13	55		5,232	12	5,287
Orangeburg	11.51	5.44	1.13	7.61				26	
Pickens*	11.49	1.19	1.25	0.07	3,955			14	3,955
Richland	50.93	28.12	2.24	0.49	1,687	419		82	2,106
Saluda	1.02	0.36	0.75					2	
Spartanburg	39.50	5.55	2.61	0.10	148			48	148
Sumter	15.24	0.59	1.89	1.59				19	
Union*	7.46	3.08	0.39		1,300			11	1,300
Williamsburg	3.41	2.28	1.43	0.01				7	
York	18.81	84.91	2.39	0.08	2,247		101	106	2,348
TOTAL	551	540	55	46	50,986	1,371	6,005	1,193	58,363

* Self-supplied population set to 19 percent of county population

Methodology

In preparing a water-use map that shows distribution and rates, data were manipulated differently, depending on whether the data for public supplies included information on service areas. For several of the public supply systems, the Department of Commerce has digital information on location, length, and size of water lines. For these systems, which include the major public suppliers in the State, a map was created to show the service areas and, hence, the approximate location and distribution of the water use. For all other systems, the location of water use was assumed to be near the point of withdrawal.

The present water-use analysis excludes power-generation facilities, because most of the withdrawal for this type of usage is returned to or near the original source and, secondly, the use for power generation is anticipated to remain at the same level in years to come. Thermoelectric power generation, for example, has been projected to increase less than one half of 1 percent during the first quarter of the next century (Snyder and others, 1983).

To present the distribution of water use, the South Carolina was subdivided into 5-minute grid cells. For each cell, the water use for PS (public supply), IND (industry), OTH (other), and DOM (domestic) was aggregated. For public supplies with information on service areas, an average water use per cell was computed by dividing each system's use by the surface area of its service area and then multiplying this by each cell or fraction-of-cell area. For example, the Greenville public supply system, which is the largest in the State with an average production of 57.41 MGD, has an average

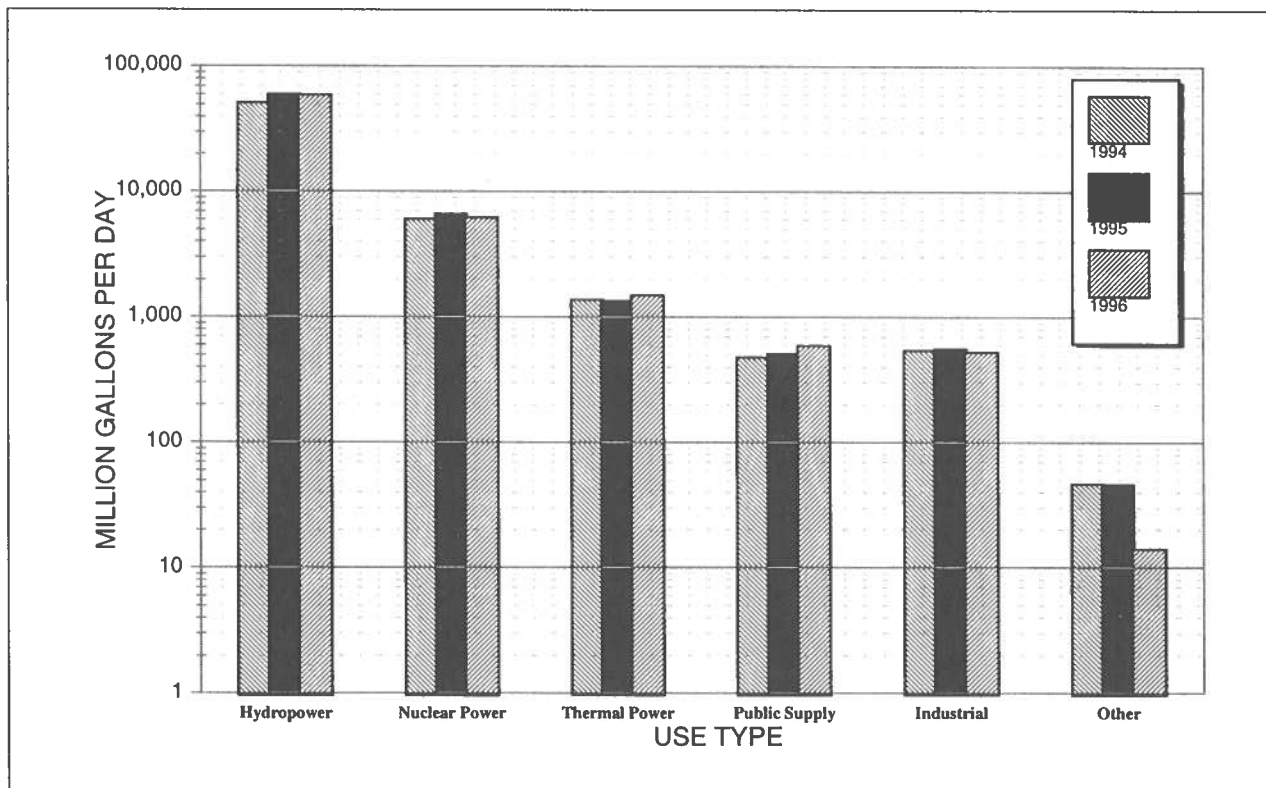


Figure 2. Water use in South Carolina by type, 1994-96.

use per cell ranging from 1 to 5 MGD (Plate in pocket). These moderate per cell uses, which are far from the largest, are a reflection of the large size of the Greenville public supply distribution system. For all other cases (no service area information), the use was aggregated and assigned to the cell where the water withdrawal was made. Exemptions to this rule were the withdrawals of Westinghouse-Savannah River Site, Westvaco Corporation/Kraft Division, and International Paper Co. For these, the area of use was assigned to cells where the actual use took place.

For domestic self-supplied (DOM) use, a total was obtained for each county as explained above. The total for each county was divided by the number of cells or fraction of cells not included in service areas of public supplies. This calculation introduced a small error by not accounting for the area of systems without service area information, thus overestimating DOM use. Systems without service area information, however, were small. The average production capacity was less than 0.1 MGD, and it is most likely that their service areas were also small. These systems represented less than 10 percent of the State's public supply use. Thus, the error introduced by not counting the service area in the calculation of the DOM use would be small.

After having computed a total use for each cell, three interpolation techniques were employed to generate a continuous distribution map of water use: kriging, inverse weighted distance, and triangulation. Kriging is based on regionalized variable theory and attempts to minimize the variance of errors generated during interpolation. Inverse weighted distance evaluates the influence of data points on the basis of their relative distances to the center of the cells. Triangulation interpolates between data points by creating triangles. The results from these three interpolation methods were compared. The triangulation method produced the best results and was adopted for this study.

The map shown in the Plate is one of the first attempts in South Carolina to show the actual distribution of water use. In 1994, most of the State showed a low water use (0.1 MGD or less per cell). Areas of moderate use (1 to 10 MGD) enveloped and expanded radially from points of high use (20 MGD or more). Areas of moderate and high water use appeared to be located along major highways, such as I-85 in the northwest, I-20 in the center, and SC-17 in the east.

Systems that used more than 0.3 MGD in 1994 are listed in Table 3. The table is organized by county and by 5-minute grid and is a good reference for extracting additional information from the Plate. In Table 3, some facilities in the same county may be listed more than once if they have water sources in different grids. The largest public supply system was Greenville with 57.41 MGD, and the largest water-user industry was Hoechst Celanese Corporation in Rock Hill with 46.78 MGD. Figure 2 shows the location of the counties of South Carolina.

SUMMARY AND RECOMMENDATIONS

South Carolina had a reported water use of 59.4 billion gallons per day in 1994, 68.4 in 1995, and 67.4 in 1996. More than 98 percent of the use was for power generation, in which most of the water withdrawn was returned to the original source. Of the remaining billion gallons per day, 48

percent was for public supply, 51 percent for industry, and 1 percent for other uses. Domestic self-supplied use was estimated to be 55 MGD. Except for power generation, the reported water use is believed to be, at best, a low estimate of the actual use.

To display water-use distribution in South Carolina, the State was divided into 5-minute cells. Within each cell, public-supply, industrial, domestic self-supplied, and other uses, excluding power-generation, were aggregated. Use was allocated to cells according to service areas or points of withdrawal. Use by power-generation facilities were not included in the Plate because that use, which is nearly 40 times the combined use by all others, would obscure the results of the analysis.

According to the Plate, South Carolina, in 1994, had few sites where use was high (more than 20 MGD), some areas with moderate usage (from 1 to 10 MGD), and most with low use (less than 0.1 MGD). The water use appeared to be concentrated in five regions: (1) the northwest, around Greenville-Spartanburg-Rock Hill; (2) the center, around Aiken-Columbia-Florence; (3) the northeast, around Myrtle Beach-Georgetown; (4) the southeast, around Charleston; and (5) the south, around Beaufort-Hilton Head.

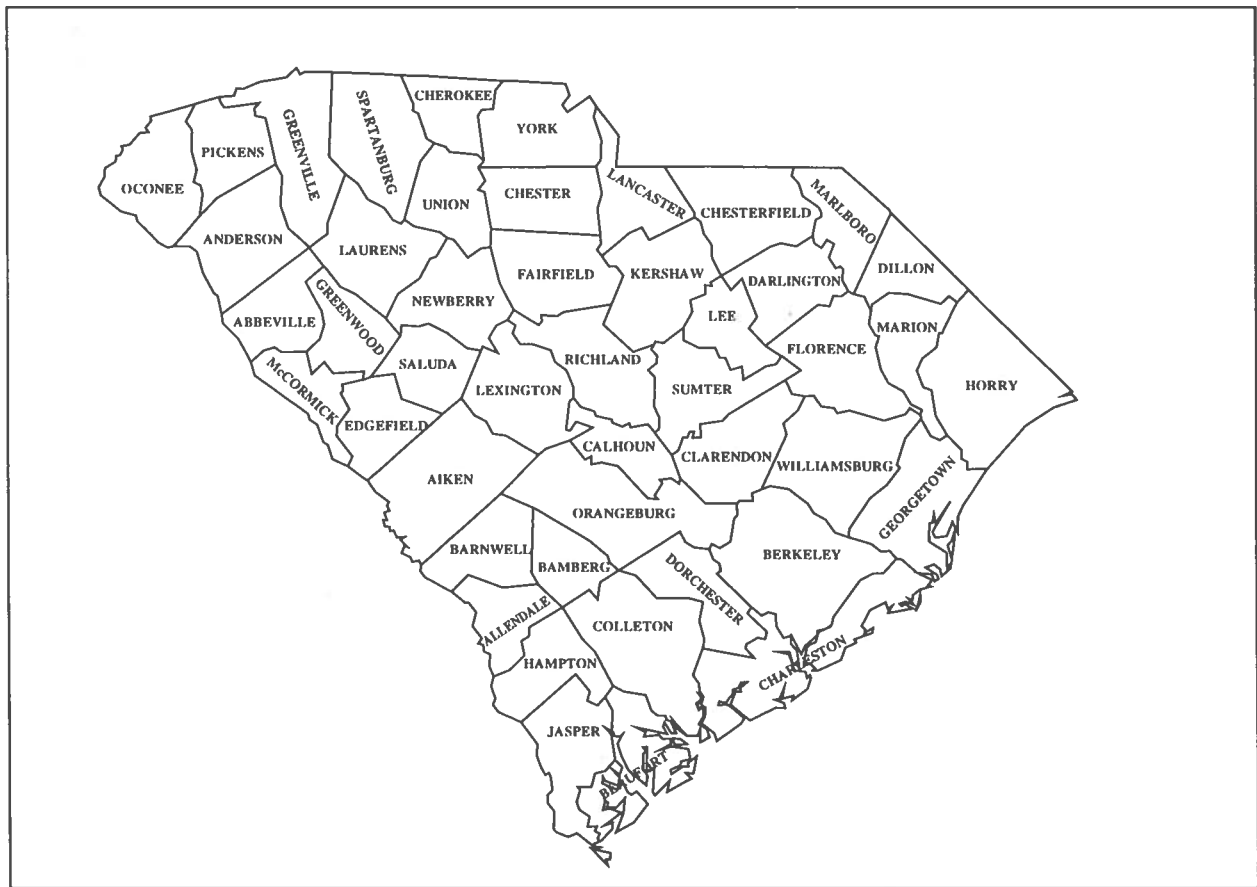


Figure 2. Map showing the counties of South Carolina.

For 1995 and 1996 a similar water use-analysis was completed. The distribution and rates of water use in 1995 were much like those of 1994. For 1996, however, the data appeared to be incomplete—there were fewer users that reported—and this prevented the drawing of significant conclusions as to the water-use pattern.

The Water Use Reporting and Coordination Act of 1982 opened the way for the State government to manage its water resources. Much progress has been made, but more is needed to develop a comprehensive water strategy for the future. The Act should be amended to make the Water Use Reporting program mandatory rather than voluntary. Provisions should be included in the Act for better reporting and for expanding the single daily threshold for reporting to monthly and annual limits. Additionally, the State should proceed to adopt a single overall plan that coordinates the efforts of existing and future water resources programs, with DHEC implementing the regulatory programs and DNR evaluating the impact of such programs on the resources.

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- _____, 1992b, South Carolina water use: South Carolina Water Resources Commission, for 1988, 1989, and 1990.
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TABLE 3. South Carolina facilities using more than 0.3 million gallons per day, 1994

COUNTY	GRID	SYSTEM	USE	MGD ¹
Abbeville	47M	ABBEVILLE, CITY OF	PS	1.43
	50N	CALHOUN FALLS, TOWN OF	PS	0.64
	47K	DONALDS-DUE WEST W/A	PS	0.53
	50N	KARASTAN BIGELOW	IND	0.43
	50N	MOHAWK INDUSTRIES	PS	0.43
Aiken	38Y	WESTINGHOUSE/SRS	IND	21.79
	39X	WESTINGHOUSE/SRS	IND	13.65
	37Y	WESTINGHOUSE/SRS	IND	11.12
	37X	WESTINGHOUSE/SRS	IND	10.90
	39U	AIKEN, CITY OF	PS	7.69
	41V	KIMBERLY-CLARK CORPORATION	IND	6.51
	40U	AVONDALE MILLS INC	IND	4.13
	39U	WESTINGHOUSE/SRS A,H,F-AREAS	PS	3.52
	42U	NORTH AUGUSTA, CITY OF	PS	3.14
	39W	WESTINGHOUSE/SRS	IND	2.76
	39X	WESTINGHOUSE/SRS	IND	2.70
	41U	AIR PRODUCTS AND CHEMICALS	IND	1.74
	40U	BREEZY HILL W/D	PS	1.43
	37T	J. M. HUBER CORPORATION	IND	1.23
	41V	BEECH ISLAND W/D	PS	0.89
	35U	EDISTO TURF FARMS	OTH	0.88
	39U	QUAIL RIDGE NURSERY-WEYERHAEUSER	OTH	0.44
	37U	QUAIL RIDGE NURSERY-WEYERHAEUSER	IND	0.44
	40U	AVONDALE MILLS INC.	PS	0.88
	39U	MONTMORENCI W/D	PS	0.37
40X	JACKSON, TOWN OF	PS	0.35	
40U	VALLEY PSA	PS	0.31	
Allendale	36AA	CLARIANT CORPORATION MARTIN PLNT.	IND	2.38
	35BB	SHARP & SHARP	OTH	1.13
	34AA	ALLENDALE, TOWN OF	PS	0.35
	33BB	FAIRFAX, TOWN OF	PS	0.44
	34AA	WHITLOCK COMB.	PS	0.33
Anderson	50I	DUKE POWER	PS	8.56
	48H	SOFT CARE APPAREL	IND	2.76
	50F	POWDERSVILLE WATER COMPANY	PS	2.14
	51H	SANDY SPRINGS WATER COMPANY	PS	1.65
	48I	BELTON, CITY OF	PS	1.30
	50I	WEST ANDERSON W/D	PS	1.01

¹ Millions of gallons per day

COUNTY	GRID	SYSTEM	USE	MGD
Anderson (continued)	51K	STARR-IVA W/D	PS	0.84
	47J	HONEA PATH, TOWN OF	PS	0.73
	48H	WILLIAMSTON, TOWN OF	PS	0.68
	48I	BIG CREEK W/D	PS	0.57
	50I	BROADWAY W/D	PS	0.57
	52H	PENDLETON, TOWN OF	PS	0.38
Bamberg	31X	BAMBERG-PUBLIC WORKS	PS	0.72
	32X	DENMARK TOWN OF	PS	0.48
	33Y	BRUBAKER ACRES, INC.	OTH	0.40
Barnwell	35Y	BARNWELL, TOWN OF	PS	1.32
	36W	WILLISTON, TOWN OF	PS	0.64
Beaufort	27HH	BJW&SA	PS	3.50
	27KK	SEA PINES PSD	PS	2.71
	27KK	HILTON HEAD PSD # 1	PS	2.60
	27KK	FOREST BEACH PSD	PS	2.42
	27KK	HILTON HEAD PLANTATION	PS	2.00
	27HH	BEAUFORT, CITY OF	PS	1.96
	27KK	BROAD CREEK PSD	PS	1.70
	27HH	BJW&SA - BLUFFTON	PS	0.92
	28JJ	COLLETON RIVER CO.	OTH	0.88
	26II	PARAGON PRODUCE CORPORATION	OTH	0.57
	26JJ	SEASIDE FARM INC.	OTH	0.34
	27KK	GREENWOOD DEVELOPMENT CO.	OTH	0.34
	27GG	LOBECO PRODUCTS	PS	0.33
	27KK	PLANTATION UTILITIES	PS	0.32
Berkeley	18Y	SANTEE COOPER REG. WATER	PS	6.04
	18BB	BAYER CORPORATION-BUSHY	IND	3.96
	18BB	AMOCO CHEMICALS- COOPER	IND	3.69
	18BB	BCPSA/SANGAREE W/D	PS	2.50
	19Z	CAROLINA NURSERIES	OTH	2.20
	18AA	E.I. DUPONT DE NEMOURS	IND	1.41
	18BB	GOOSE CREEK, CITY OF	PS	1.37
	18Y	C. R. BARD, INC.	IND	0.91
	18Y	MONCKS CORNER, CITY OF	PS	0.71
	19V	SANTEE COOPER- CROSS PLANT	PS	0.55
	15X	PROUVOST, USA	IND	0.42
	18W	GEORGIA PACIFIC CORPORATION	IND	0.41
	22Z	MACDOUGALL YOUTH CORP. CTR.	PS	0.40
	Calhoun	31Q	CAROLINA EASTMAN DIVISION	IND
29R		TEEPAK, INC.-SANDY RUN PLANT	IND	0.46
28T		ST MATTHEWS, TOWN OF	PS	0.39

COUNTY	GRID	SYSTEM	USE	MGD
Charleston	18DD	CHARLESTON CPW	PS	51.74
	23AA	WESTVACO CORP.-KRAFT DIVISION	IND	38.66
	17DD	MT PLEASANT W&S COMMISSION	PS	2.97
	19DD	KIAWAH ISLAND UTILITY	PS	1.60
	16DD	ISLE OF PALMS W/S COMMISSION	PS	1.09
	15DD	ISLE OF PALMS W/S COMMISSION	OTH	0.61
	20FF	KIAWAH ISLAND UTILITY, I	PS	0.58
	21GG	SEABROOK ISLAND, TOWN OF	PS	0.45
	12Z	SHELLMORE S/D	PS	0.38
	18FF	FOLLY BEACH, TOWN OF	PS	0.34
	17DD	SULLIVANS ISLAND, TOWN OF	PS	0.32
Cherokee	38C	GAFFNEY BPW	PS	8.64
	37B	MILLIKEN AND COMPANY	IND	2.15
	38C	GRASSY POND W/D	PS	0.59
	37B	BLACKSBURG, TOWN OF	PS	0.49
	38C	GOUCHER W/D	PS	0.34
Chester	36H	HOECHST CELANESE CORPORATION	PS	3.00
	29G	CHESTER METRO	PS	2.58
	35H	HOECHST CELANESE CORPORATION	IND	0.34
Chesterfield	17G	CHERAW, TOWN OF	PS	2.42
	24BB	(UNKNOWN)	OTH	1.06
	23H	JEFFERSON, TOWN OF	PS	0.90
	23F	PAGELAND, TOWN OF	PS	0.82
	20G	CHESTERFIELD RURAL WATER	PS	0.62
	22G	BREWER SAND COMPANY	IND	0.43
Clarendon	21S	MANNING, TOWN OF	PS	0.73
Colleton	27CC	WALTERBORO, CITY OF	PS	1.92
	22HH	EDISTO BEACH, TOWN OF	PS	0.76
Darlington	19K	SONOCO PRODUCTS COMPANY	IND	14.36
	17I	GALEY AND LORD, INC.	IND	5.40
	17L	DARLINGTON COUNTY W&SA	PS	3.46
	16M	HARTSVILLE, CITY OF	PS	1.54
	16L	WELLMAN, INC. - PALMETTO	IND	1.32
	17L	DARLINGTON, CITY OF	PS	1.18
Dillon	11J	TRICO WATER COMPANY	PS	2.41
	11J	ANVIL KNITWEAR	IND	2.28
	11J	DILLON, CITY OF	PS	1.36
	12K	LATTA, TOWN OF	PS	0.31
Dorchester	21AA	SUMMERVILLE, TOWN OF	PS	5.30
	24Y	HARLEYVILLE, TOWN OF	PS	1.81
	24Y	GIANT CEMENT COMPANY	IND	3.09
	22Z	RIDGEVILLE, TOWN OF	PS	1.23

COUNTY	GRID	SYSTEM	USE	MGD
Dorchester	21AA	DCWA/KNIGHTSVILLE	PS	0.32
Edgefield	42R	EDGEFIELD COUNTY W&SA	PS	2.60
Fairfield	32K	WINNSBORO, TOWN OF	PS	1.33
Florence	13N	STONE CONTAINER CORPORATION	IND	18.49
	13M	E.I. DUPONT DE NEMOURS	IND	15.25
	16M	FLORENCE, CITY OF	PS	9.48
	12R	WELLMAN INDUSTRIES	PS	2.59
	12R	WELLMAN INDUSTRIES	IND	1.64
	16Q	LAKE CITY, TOWN OF	PS	1.44
	12Q	WELLMAN INDUSTRIES	IND	0.55
	12R	JOHNSONVILLE, TOWN OF	PS	0.43
	18N	TIMMONSVILLE, TOWN OF	PS	0.35
	16Q	WOMACK NURSERY COMPANY, INC.	OTH	0.33
Georgetown	10S	INTERNATIONAL PAPER	IND	28.58
	11W	3-V INC.	IND	4.42
	14X	MARTIN MARIETTA AGGREGATES	OTH	3.83
	10W	GEORGETOWN STEEL CORP.	IND	1.95
	08V	GCPSD/WACCAMAW NECK	PS	1.72
	13V	ANDREWS, TOWN OF	PS	1.67
	10W	GEORGETOWN, CITY OF	PS	1.57
	10W	GEORGETOWN RURAL	PS	0.49
	09W	DE BORDIEU POBG	OTH	0.37
	08V	GCPSD/KILSOCK WATER SYSTEM	PS	0.35
	08V	PAWLEYS PLANTATION	OTH	0.34
Greenville	47E	GREENVILLE WATER SYSTEM	PS	57.41
	45D	GREER CPW	PS	6.30
	45D	BLUE RIDGE W/D	PS	1.46
	46D	JPS AUTOMOTIVE - TAYLORS	IND	0.39
	48D	GREEN VALLEY COUNTRY CLUB	OTH	0.32
Greenwood	44M	GREENWOOD CPW	PS	11.50
	45K	WARE SHOALS, TOWN OF	PS	2.70
	43M	NINETY SIX CPW	PS	0.54
Hampton	32CC	INTERNATIONAL PAPER/WEST	IND	0.67
	33DD	ESTILL, TOWN OF	PS	0.55
	32CC	HAMPTON, TOWN OF	PS	0.40
	33EE	YOUMANS FARM	OTH	0.40
Horry	05S	MYRTLE BEACH, CITY OF	PS	9.71
	07Q	GRAND STRAND W&SA	PS	4.45
	03R	NORTH MYRTLE BEACH, CITY OF	PS	3.44
	07Q	CONWAY, CITY OF	PS	1.63
	02Q	LITTLE RIVER W&SA	PS	0.88

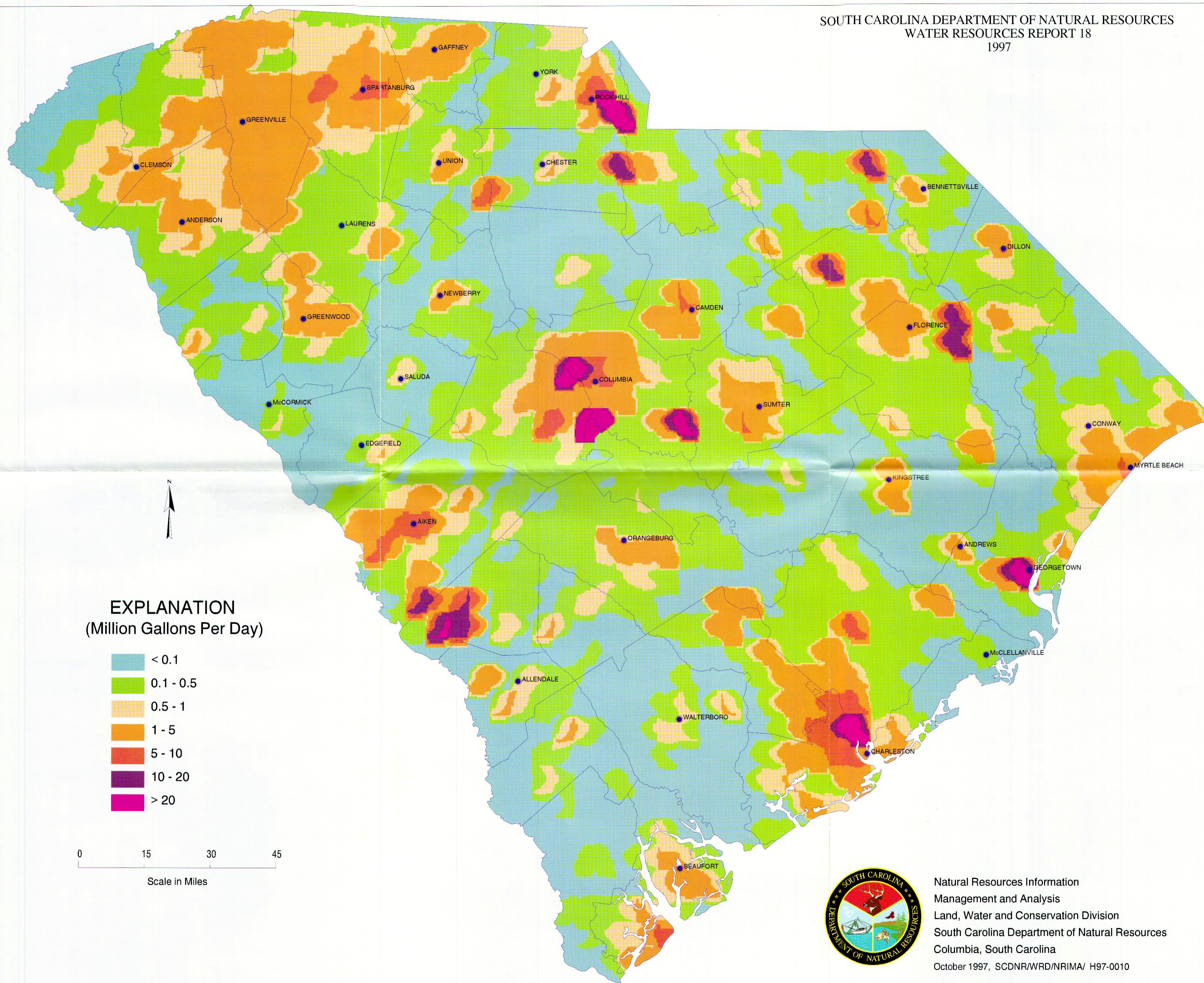
COUNTY	GRID	SYSTEM	USE	MGD
Horry (continued)	07S	LEGENDS-HEATHLAND, MOORE	OTH	0.77
	07Q	CONWAY RURAL	PS	0.71
	03P	SOUTHERN AGGREGATES	OTH	0.65
	07Q	BUCKSPORT WATER COMPANY	PS	0.65
	05S	MYRTLE BEACH FARMS	OTH	0.58
	06Q	THOMPkins & ASSOCIATES	OTH	0.39
	06R	WILD WING PLANTATION/SUWASO	OTH	0.33
Jasper	31JJ	HARDEEVILLE, TOWN OF	PS	0.64
	30HH	RIDGELAND, TOWN OF	PS	0.41
Kershaw	27M	WHIBCO, - BLANEY PLANT	IND	4.27
	26M	E.I. DUPONT DE NEMOURS	IND	3.89
	26L	DUPONT-MAY	PS	3.75
	26L	CAMDEN, CITY OF	PS	2.28
	24K	CASSATT WATER CO #1	PS	1.43
	30L	LUGOFF/ELGIN WATER AUTHORITY	PS	1.27
	22J	VERATEC, INC.- BETHUNE	IND	1.24
	28N	HARDWICKE CHEMICAL COMPANY	IND	0.32
Lancaster	29G	SPRINGS INDUSTRIES, INC.	IND	9.75
	28G	SPRINGS-GRACE BLEACHERY	PS	5.70
	28G	LANCASTER COUNTY WATER	PS	2.70
	29E	CATAWBA RIVER WTP	PS	1.97
	28G	LANCASTER, TOWN OF	PS	1.90
	26I	KERSHAW, TOWN OF	PS	0.35
Laurens	41J	CLINTON, TOWN OF	PS	3.13
	43I	LAURENS CPW	PS	2.26
	43I	LAURENS COUNTY WATER AND SEWER COMMISSION	PS	1.27
Lee	21M	REEVES BROTHERS, INC.	IND	1.98
	21M	BISHOPVILLE, TOWN OF	PS	1.02
Lexington	32O	ALLIED CORPORATION	IND	31.93
	33Q	U. S. SILICA-PENNSYLVANIA	IND	9.19
	31P	WEST COLUMBIA, CITY OF	PS	4.38
	31P	CAYCE, CITY OF	PS	3.30
	33O	PHILIPS COMPONENTS	IND	1.94
	33P	LEXINGTON, TOWN OF	PS	1.32
	33P	LEXINGTON COUNTY JMPSC	PS	0.60
	31P	CPS/I-20	PS	0.40
	33Q	RAWL & SONS FARM	OTH	0.37
	32R	GASTON RURAL WATER COMPANY	PS	0.32

COUNTY	GRID	SYSTEM	USE	MGD
Marion	11M	MARION, CITY OF	PS	1.70
	11M	MARCO RURAL WATER COMPANY	PS	1.36
	10M	MULLINS, TOWN OF	PS	1.12
Marlboro	17G	DELTA MILLS MARKETING CO.	PS	6.20
	15H	BENNETTSVILLE, TOWN OF	PS	1.69
	15H	MARLBORO WATER COMPANY	PS	0.52
	13G	McCOLL, TOWN OF	PS	0.37
McCormick	17G	DELTA MILLS MARKETING COMPANY	IND	5.82
	46Q	McCORMICK CPW	PS	0.47
	15J	OAK RIVER MILL	IND	0.72
Newberry	38L	NEWBERRY, CITY OF	PS	2.84
	37M	NEWBERRY COUNTY W&SA	PS	0.65
	38I	WHITMIRE, TOWN OF	PS	0.55
Oconee	54G	SENECA, TOWN OF	PS	4.13
	53H	J.P. STEVENS & CO., INC.	IND	1.68
	56H	WESTMINSTER, TOWN OF	PS	1.51
	55F	WALHALLA, TOWN OF	PS	1.36
	56H	PIONEER RURAL WATER DISTRICT	PS	1.17
Orangeburg	29V	ORANGEBURG DPU	PS	6.96
	24X	SANTEE CEMENT COMPANY	IND	3.65
	27V	PATTEN SEED COMPANY	OTH	2.89
	23X	HOLNAM CEMENT COMPANY	PS	2.80
	30U	MILLWOOD FARM	OTH	1.95
	28V	SHADY GROVE PLANTATION & NURSERY	OTH	0.95
	24X	GEORGIA-PACIFIC CORPORATION	IND	0.85
	29V	ALBEMARLE CORPORATION	IND	0.48
	29V	FASHION FABRICS OF AMERICA	IND	0.42
	33V	BACKMAN FARMS	OTH	0.42
	24V	SANTEE, TOWN OF	PS	0.36
Pickens	50F	EASLEY COMBINED UTILITY	PS	3.38
	52G	CLEMSON, TOWN OF	PS	1.43
	51E	PICKENS, TOWN OF	PS	1.43
	52G	CLEMSON UNIVERSITY	PS	1.35
	52H	PENDLETON FINISHING PLANT	IND	0.91
	51F	LIBERTY, TOWN OF	PS	0.91
	51F	SOUTHSIDE W/D	PS	0.75
	51E	SIX MILE W/D	PS	0.60
	51E	DACUSVILLE-CEDAR ROCK W/D	PS	0.59
	51E	BETHLEHEM-ROANOKE W/D	PS	0.59
Richland	29O	COLUMBIA, CITY OF	PS	45.09

COUNTY	GRID	SYSTEM	USE	MGD
Richland (continued)	26Q	UNION CAMP CORPORATION	IND	28.14
	31P	FORT JACKSON	PS	3.03
	27Q	UNION CAMP CORPORATION	PS	2.05
Saluda	40O	SALUDA CPW	PS	0.60
	38P	AMICK'S POULTRY FARM	IND	0.36
Spartanburg	42D	SPARTANBURG WATER SYSTEM	PS	24.49
	44D	SPRINGS INDUSTRIES - LYMAN	IND	7.55
	44D	SJWD WATER DISTRICT	PS	4.37
	43G	WOODRUFF ROEBUCK W/D	PS	2.94
	44C	INMAN-CAMPOBELLO W/D	PS	2.08
	41B	LCF WATER DISTRICT	PS	1.60
	44D	STARTEX UTILITY SYSTEM	PS	0.60
	42D	METRO SUBDISTRICT B	PS	0.52
	45A	LANDRUM, TOWN OF	PS	0.44
Sumter	23P	SUMTER, CITY OF	PS	12.70
	24O	HIGH HILLS	PS	0.86
	24O	H. C. EDENS, JR., AND SON	OTH	0.80
	23P	BIOENVIRONMENTAL ENG.	PS	0.58
	23Q	CAROLINA GOLDEN PRODUCTS	IND	0.54
	35Q	SUNSET COUNTRY CLUB	OTH	0.32
Union	36H	CONE MILLS CORPORATION	IND	2.92
	38G	UNION, TOWN OF	PS	2.88
	36H	CARLISLE CONE MILLS	PS	2.64
	38G	MEANSVILLE RILEY W/D	PS	0.74
Williamsburg	16T	FERMPRO MANUFACTURING LP	PS	3.90
	16T	KINGSTREE, TOWN OF	PS	1.07
	12R	HEMINGWAY, TOWN OF	PS	0.33
York	30D	HOECHST CELANESE CORPORATION	IND	46.78
	29E	BOWATER/COATED PAPER & PULP	IND	37.20
	31D	ROCK HILL, CITY OF	PS	8.66
	31D	HOECHST CELANESE CORPORATION	PS	3.65
	33D	YORK, TOWN OF	PS	0.95
	30D	ROCK HILL PRINTING & FINISHING	IND	0.93
	30C	FORT MILL, TOWN OF	PS	0.85
	33D	YORK CO/EAST	PS	0.45
	31D	LAKE WYLIE MHP	PS	0.41
	31C	TEGA CAY	PS	0.34
	31C	CPS/RIVER HILL S/D	PS	0.32

Distribution and Rate of Water Use in South Carolina, 1994 (Excluding Power Generation)

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WATER RESOURCES REPORT 18
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Natural Resources Information
Management and Analysis
Land, Water and Conservation Division
South Carolina Department of Natural Resources
Columbia, South Carolina
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