WATER USE IN SOUTH CAROLINA JULY-DECEMBER 1983

by
Joseph A. Harrigan

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ABSTRACT

Since July 1, 1983, water use data have been collected under the authority of Act 282, the Water Use Reporting and Coordination Act of 1982. Water users with single-day maximum water usage equal to or exceeding 100,000 gallons are required to report their water usage to the South Carolina Water Resources Commission. Not all water users have complied with the Act.

During the six-month period July-December 1983, water withdrawals averaged 6,456 mgd (million gallons per day), which is 11.7 percent more than in 1980. Surface water was the source for 6,347 mgd, or 98.3 percent, and 109 mgd was withdrawn from ground water sources.

Thermoelectric power generation accounted for 77.1 percent of the water use, industry 17.1 percent, public supply 5.2 percent, and agriculture irrigation 0.6 percent. Golf course irrigation, heated wastewater evaporation, and wastewater return are not considered.

INTRODUCTION

Water-Use Reporting

This report represents the first effort at analyzing water usage data gathered through the Water Use Reporting Program under the authority of Act 282 of 1982, The Water Use Reporting and Coordination Act. Starting July 1, 1983, all water users who use, withdraw, divert, obtain, or discharge a single-day maximum of 100,000 gallons or more, "began to be responsible" for reporting their water use to the South Carolina Water Resources Commission. These reports are to be submitted to the Commission on a quarterly basis, except for agricultural irrigators who, because of the seasonal and variable nature of their water usage, report annually. In addition, all water users who are required to report by this Act must also complete a one-time-only Water Use System Report in which they describe their water use system and its location.

An important aspect of this reporting law is the coordination requirement. Water users who already report their water usage to the Commission or another State agency will continue that procedure and not duplicate their efforts. The Commission will obtain the required water use reports from the appropriate agency. Examples of existing reporting programs are the Capacity Use Program of the Commission and the wastewater discharge and public supply water treatment reports of DHEC.

Any water usage not already reported elsewhere must be reported to the Commission. Form WU-1, the Water Use Report, has been developed for reporting monthly water use on a quarterly basis and fulfills the requirements of the law. For example, a water user who reports only discharge data and does not report withdrawal usage must start reporting that usage on Form WU-1. This form can be mailed directly to the Commission or attached to the other form the reporter uses to satisfy current reporting requirements.

This Act now gives the Commission legislative authority to properly collect water data and partially satisfy the legislated responsibility of the Commission to "give proper and adequate consideration . . . of the beneficial use" of the State's water resources. The task of setting up the mechanism for administering the requirements of Act 282 has not been completed, but significant progress has been made and this report summarizes this progress and the associated problems.

Definition of Terms

The following are terms and expressions commonly used in the discussion of water use:

Consumptive water use — The use of water that results in a difference between the amount withdrawn from a source and the amount returned after a short period of time to, in most cases, a surface water body. Water is consumed by evaporation, incorporation in manufactured products, absorption by soil, transpiration by plants, and in other ways.

Ground water — Water in the zone of saturation below the earth's surface, including spring seeps and artesian flow.

Hydroelectric power water use — The use of water for turning the turbines of a hydroelectric power plant. This is a "pass-through" or non-withdrawal water use.

Industrial water use — The use of water for the purpose of manufacturing a product, including water employed in once-through cooling.

Irrigation water use — Application of water to any agricultural crop for the purpose of maturing that crop. Watering of golf courses is not included.

Million gallons per day (mgd) — A common unit of measurement used to express the large rates of water movement or use that are typical in water use studies. For very large rates, billion gallons per day (bgd) may be used for ease of reference.

Non-withdrawal water use — Any use of water that does not require removal of the water from its source. Examples are hydroelectric power generation, recreation, and instream flow requirements of fish and wildlife.

Public supply water use — The use of water for public supply, whether for household use, commercial use, fire protection, industrial use, or other. This water is supplied by public, commercial, or industrial concerns.

Purchased-water use — The use of water, by any type of user, which is purchased from a supplier of water and not withdrawn directly from a natural water source such as a well or stream.

Surface water — All water located on the land surface, including streams, ponds, lakes, and man-made reservoirs.

Thermoelectric power water use — The use of water by power plants that generate electricity by the passage of steam through turbines. This includes that used for once-through cooling.

Water source — The naturally occurring location of the water being utilized, such as a stream, reservoir, or aquifer. This also refers to the supplier of water to one who purchases water.

Water usage — The rate at which water is used, commonly expressed in millions of gallons per day (mgd).

Water use — The utilization of water by man for any purpose.

Withdrawal water use — The use of water which requires its removal from its source, no matter how short the time the water is away from the source, such as in once-through cooling.

Acknowledgments

Many people contributed to the work that has resulted as this report. The staff of the South Carolina Water Resources Commission helped greatly in developing the reporting forms and preparing the mail-out of water use reporting materials to the various water users. Special thanks are extended to Jennifer Kean and Cindy McIlvaine for gathering water usage data from the South Carolina Department of Health and Environmental Control and partially processing this data. Teresa Greany was instrumental in processing and cross-checking the data provided on the Water Use Report forms and proofing the computer-entered data. Janis Braxton entered into the computer the nearly 84,000 pieces of information. William C. Campbell spent many weeks in the development of the various data entry programs and, more recently, the programs to analyze the water usage data for the report tables. The use of the facilities and equipment of the Social and Behavorial Sciences Laboratory at the University of South Carolina in producing the computer mapping products is greatly appreciated.

Finally, appreciation is expressed to the U.S. Geological Survey and to the South Carolina Department of Health and Environmental Control (DHEC) and other State agencies for their assistance in gathering water usage data from their files or in directing the author in locating other necessary data.

PREVIOUS INVESTIGATIONS

The South Carolina Water Resources Commission has previously published four water use reports. In 1971 the Commission published "Water Use in South Carolina 1970" (SCWRC Report Number 103). This report summarized the available water usage data for 1970, by drainage basin, and included county tabulations and county maps showing the location of various water users. The second water use report, "Municipal and Industrial Water Use in South Carolina" (SCWRC Report Number 127), was published in 1977. This report also summarized water data for 1976 by drainage basin and included withdrawal water as well as recycled water usage.

Two reports dealing with the water usage data for 1980 were published. The "State Water Assessment," (SCWRC Report Number 140) is a portion of the State Water Plan and summarizes all aspects of South Carolina's water resources. Water usage is presented, by drainage basin, for all major water use categories and includes estimates of water consumptionfor 1980 and projections of water usage and consumption through 2020. "Water Use in South Carolina, 1980" (SCWRC Report Number 138) summarizes the same water usage data in both county and drainage basin tabulations.

Another source of water usage data for South Carolina, as well as the other 49 states, is the national assessment of water usage, published every fifth year by the U.S. Geological Survey since 1950. The information in these reports provides useful estimates of past water usage, but it has some limitations. For example, the water usage is totaled, by source, for each use type and not by county or by state drainage basin. Also, the source of the water usage data in reports prior to 1970 is not stated, and this detracts from its credibility.

PRESENT INVESTIGATION

The first collection of water use data under authority of Act 282 of 1982 was made during the last six months of 1983. The work scheduled for the first year of the program included identifying potential water users and obtaining mailing addresses, developing reporting forms, putting together water use reporting material packets and mailing the packets, processing the returned data, computer entering the data, and other handling related to data-base creation. Only a summary tabulation of water usage data, as shown in the table, was scheduled for this first report. Future reports will contain more detailed analysis.

The water users who received the reporting material packets are those believed to have a maximum single-day water usage equal to or greater than 100,000 gallons. The packet cover letter informed the water users of the requirements of Act 282 and asked them to respond by completing and returning the Water Use System Description Report forms or informing the Commission that they do not exceed the minimum water usage level. The results of the first mailing are as follows:

Type of use	Number sent	Number returned	Percentage response
Agricultural irrigation....	681	269	40
Power utilities.....	52	50	96
Industrial.....	432	346	80
Public supply.....	268	101	38
Total.....	1,433	766	53

Even though only slightly more than half of those contacted responded, their water usage represents roughly 85 percent of the estimated total withdrawal water usage. Excluding thermoelectric power water usage, those responding represent about 75 percent of the remaining withdrawal water usage. However, within that group of non-responders were some large water users, and it was necessary to follow up with a second mailing.

Before the second mailing was attempted, an investigation was pursued to determine possible reasons for the number of non-responders. As a result, the mailing list for the second mailing was broken down into several groups, each with a common possible reason for not responding. Each of these groups had a special cover letter developed to address their suspected problem. This second mailing went out in early June 1984 and included a first-time contact of golf course water users.

The results of this mailing so far are as follows:

Type of use	Number sent	Number returned	Percentage response	Percent of total
Agricultural irrigation.....	412	126	30	58
Power utilities...	2	2	100	100
Industrial.....	86	55	64	93
Public supply....	167	81	49	68
Subtotal.....	667	264	39	72
Golf course.....	180	51	28	28
Total.....	1050	315	30	68

This second mailing netted another 20 percent of the water users originally contacted, and many more responded after June 1984. All the responding water users through October 1984 represent roughly 95 percent of the total withdrawal water usage and about 87 percent of the withdrawal water usage, excluding that for thermoelectric power generation. Efforts are made on a continuing basis to contact non-responders and inform them of their legal responsibility to report and to advise them of the benefits of this program. For instance, their water use report becomes an official record documenting their water usage and will be useful in the case of conflicting water uses. Also, the Commission will be able to compare reported water needs with the available water resources and thereby identify water-deficient areas. Existing or potential water users in a given area could be informed of the likelihood of insufficient water supplies and encouraged to make plans for avoiding or correcting the situation.

The second part of the water use reporting program is the collection of water usage data. Whereas all reporting water users had to complete the system description reports, roughly one-third of those that have to report water usage already report it elsewhere. As of October 1984, all the water usage data for 1983 had been collected from these other data collectors, and some of these data had been entered into computer storage.

The table on the following page shows a summary of the results, as of October 1984, of the water use data collection phase. Each of the water user types will be described in the sections following. In general, the rates of water usage listed are similar to those listed in the 1980 water use report for South Carolina. This usage similarity both substantiates the 1980 data collection and indicates that most of the major water users are represented in the current inventory. However, the water usage represents incomplete reporting, owing in part to total lack of response by some users and in part to failure of some responders to send usage data. Also, anyone who responded to the second mailing, which took place in early 1984, most likely would not have submitted 1983 water usage data unless they reported water usage data elsewhere, such as to DHEC on their water use report form 1972.

Another group of "missing" data is represented by water users whose usage is less than 100,000 gallons per day. Before Act 282 was passed it was estimated that these lesser water users represented 5-7 percent of the industrial and public supply water usage. It is not possible, at this time, to check the estimate of the water usage for those who do not have to report water usage data. This is planned for future Water Use Reports.

Other modifications to the 1980 water use data base have resulted from new information regarding users that recycle water, industries that have closed or have modified their operations to use less water, and water users that have more than the one previously reported water source. In addition, some water users have abandoned one water source for another, such as purchasing water instead of using wells. All these changes have altered the water usage totals from those tabulated in 1980, but the present totals are believed to be much close to the actual water usage.

Water Usage For South Carolina, July-December 1983

All usage values in million gallons per day (mgd)
GW-ground water, SW-surface water, PW-purchased water

	Public Supply			Industry			Ag. Irrigation		
County Name	GW	SW	PW	GW	SW	PW	GW	SW	PW
Abbeville	—	2.260	0.219	—	4.560	0.970	—	—	—
Aiken	1.521	4.720	—	5.940	809.301*	1.368	0.304	0.046	—
Allendale	—	—	—	1.050	—	—	2.556	1.436	—
Anderson	0.127	14.470	1.188	—	0.620	2.400	—	—	—
Bamberg	—	—	—	—	—	—	1.371	1.100	—
Barnwell	0.200	—	—	—	—	1.233	0.529	0.552	—
Beaufort	8.332	0.381	1.483	0.190	—	—	0.969	—	—
Berkeley	—	—	0.875	0.360	3.440	5.370	—	—	—
Calhoun	0.429	—	—	—	45.080	—	1.586	1.392	—
Charleston	1.493	—	2.185	0.161	24.790	1.390	0.081	0.001	—
Cherokee	—	7.380	—	—	2.790	0.899	—	0.240	—
Chester	—	2.670	0.011	0.030	0.530	0.750	—	0.101	—
Chesterfield	0.106	4.650	—	—	0.970	0.548	0.006	0.143	—
Clarendon	0.028	—	—	—	—	—	—	0.648	—
Colleton	2.936	—	—	—	—	0.546	0.058	0.513	—
Darlington	4.356	—	—	2.460	16.260	—	0.205	0.182	—
Dillon	1.051	—	—	0.260	—	—	0.039	—	—
Dorchester	2.097	46.204	1.530	—	—	—	—	—	—
Edgefield	—	1.510	—	—	—	—	0.001	0.291	0.108
Fairfield	—	1.030	—	—	—	—	—	—	—
Florence	7.689	—	—	1.960	2.450	0.523	0.107	—	—
Georgetown	3.524	1.150	—	0.061	19.200	3.101	—	—	—
Greenville	—	51.950	0.722	0.030	—	6.376	0.011	0.090	—
Greenwood	—	8.110	—	0.070	9.400	1.401	—	—	—
Hampton	—	—	—	1.120	—	—	1.098	2.248	—
Horry	16.785	—	—	2.002	—	0.001	0.040	—	—
Jasper	0.583	5.749	—	—	—	—	0.188	—	—
Kershaw	0.675	3.170	—	2.740	5.330	0.349	—	—	—
Lancaster	—	1.890	—	—	13.080	1.063	—	—	—
Laurens	—	2.650	—	—	0.430	0.257	—	0.006	—
Lee	0.277	—	—	—	—	0.016	1.006	0.213	—
Lexington	0.438	12.787	—	0.250	30.940	1.259	0.352	0.519	0.091
McCormick	—	0.710	—	—	—	0.522	—	—	—
Marion	—	—	—	0.130	—	0.090	0.775	—	—
Marlboro	0.096	—	—	—	7.860	0.094	0.535	0.218	—
Newberry	0.365	3.490	—	—	—	0.148	0.079	0.103	—
Oconee	—	5.450	0.154	—	0.950	0.483	—	0.044	—
Orangeburg	0.024	5.467	—	7.050	0.500	0.469	4.688	6.453	—
Pickens	—	10.180	0.731	—	1.880	1.080	—	—	—
Richland	—	42.490	—	0.080	0.460	0.232	0.206	0.136	—
Saluda	0.166	—	0.367	—	—	—	0.119	0.153	—
Spartanburg	—	24.720	4.383	—	4.760	5.140	—	0.776	0.045
Sumter	8.327	—	—	—	0.100	3.652	3.178	0.593	—
Union	—	3.470	0.054	0.120	2.580	0.229	—	—	—
Williamsburg	0.163	—	—	—	—	0.628	0.033	—	—
York	—	7.640	—	0.200	69.880	0.076	0.050	0.200	—
Subtotal	61.788	276.348	13.902	26.264	1078.141**	42.663	20.230	18.397	0.244
Total-1 (=GW & SW)		338.14			1104.40			38.63	
Total-2 (=GW & SW & PW)					1147.17			38.87	

*Surface water withdrawal for Savannah River Plant (SRP) is 791.30 mgd.
**Industrial surface water usage (1078.14 mgd) minus SRP usage = 286.84 mgd.

County Name	Thermoelectric Fossil GW	Thermoelectric Fossil SW	Thermoelectric Nuclear GW	Thermoelectric Nuclear SW	Withdrawal Water Total GW	Withdrawal Water Total SW	Withdrawal Water Total GW	Hydroelectric Power SW
Abbeville	—	—	—	—	—	6.820	1.189	—
Aiken	—	59.11	—	—	7.765	837.177	1.368	—
Allendale	—	—	—	—	3.606	1.436	—	—
Anderson	—	157.80	—	—	0.127	172.890	3.588	2013.
Bamberg	—	—	—	—	1.371	1.100	—	—
Barnwell	—	—	—	—	0.729	0.552	1.233	—
Beaufort	—	—	—	—	9.491	0.381	1.483	—
Berkeley	—	169.45	—	—	0.360	172.890	6.245	7304.
Calhoun	—	—	—	—	2.015	46.472	—	—
Charleston	—	6.87	—	—	1.734	31.661	3.575	—
Cherokee	—	—	—	—	—	10.410	0.899	1255.
Chester	—	—	—	—	0.030	3.301	0.761	4602.
Chesterfield	—	—	—	—	0.112	5.763	0.548	—
Clarendon	—	—	—	—	0.028	0.648	—	—
Colleton	—	156.27	—	—	2.994	156.783	0.546	—
Darlington	—	—	—	730.86	7.021	747.303	—	—
Dillon	—	—	—	—	1.350	—	—	—
Dorchester	—	—	—	—	2.097	46.204	1.530	—
Edgefield	—	—	—	—	0.001	1.801	0.108	3015.
Fairfield	—	3.18	—	799.07	—	803.280	—	5213.
Florence	—	—	—	—	9.756	2.450	0.523	—
Georgetown	0.027	9.94	—	—	3.612	30.290	3.101	—
Greenville	—	—	—	—	0.041	52.040	7.098	412.
Greenwood	—	—	—	—	0.070	17.510	1.401	726.
Hampton	—	—	—	—	2.218	2.248	—	—
Horry	0.227	56.54	—	—	19.054	56.540	0.001	—
Jasper	—	—	—	—	0.771	5.749	—	—
Kershaw	—	—	—	—	3.415	8.500	0.349	2569.
Lancaster	—	—	—	—	—	14.970	1.063	1994.
Laurens	—	—	—	—	—	3.086	0.257	807.
Lee	—	—	—	—	1.343	0.213	0.016	—
Lexington	—	134.84	—	—	1.040	179.086	1.350	1076.
McCormick	—	—	—	—	—	0.710	0.522	3436.
Marion	—	—	—	—	0.905	—	0.090	—
Marlboro	—	—	—	—	0.631	8.078	0.094	—
Newberry	—	—	—	—	0.444	3.593	0.148	—
Oconee	—	—	—	2193.79	—	2200.234	0.637	—
Orangeburg	—	—	—	—	11.762	12.420	0.469	—
Pickens	—	—	—	—	—	12.060	1.811	8944.
Richland	—	440.00	—	—	0.286	483.086	0.232	427.
Saluda	—	—	—	—	0.285	0.153	0.367	—
Spartanburg	—	—	—	—	—	30.256	9.568	130.
Sumter	—	—	—	—	11.505	0.693	3.652	—
Union	—	—	—	—	0.120	6.050	0.283	2157.
Williamsburg	—	—	—	—	0.196	—	0.628	—
York	—	—	—	56.82	0.250	134.540	0.076	2012.
	0.254	1194.00	—	3780.54	108.54	6347.42	56.81	48,092.

(GW = 0.254)(SW = 4974.5)
4974.8

6455.96
6512.8

WITHDRAWAL WATER USE
Public Supply Water Usage

Public supply water use is 338.1 mgd, representing 5.2 percent of the total withdrawal water usage. Surface water is the source for 81.7 percent, or 276.3 mgd, of this usage, with ground water being the source for 61.8 mgd. About 13.9 mgd is purchased by public water suppliers in South Carolina, mostly from other public suppliers, but in a few instances from local industries. Figures 1-4 show the distribution, by county, of public supply water usage for each of the three water sources.

As shown in Figure 1, most ground water withdrawals for public supply are in the Coastal Plain, the largest withdrawing counties being, in decreasing order, Horry, Beaufort, Sumter, and Florence. The largest public supplier in the State, as well as in the Coastal Plain, is the city of Charleston, whose surface water withdrawal point is in Dorchester County. Figure 2 shows that the Piedmont region depends heavily on surface water. Figure 3 shows, in general, that the counties with the greatest purchased public supply usage are, or are adjacent to, those counties with the greater surface water withdrawals for public supply. Figure 4, displaying the total public supply water usage roughly highlights the distribution and density of population in the State, the higher water usage being in the counties with the greater population.

Since 1980, public supply water usage has increased by 16.2 percent, or 47.1 mgd, with all the increase occurring in surface water usage. The cities of Greenville and Anderson showed significant increases in their surface water usage.

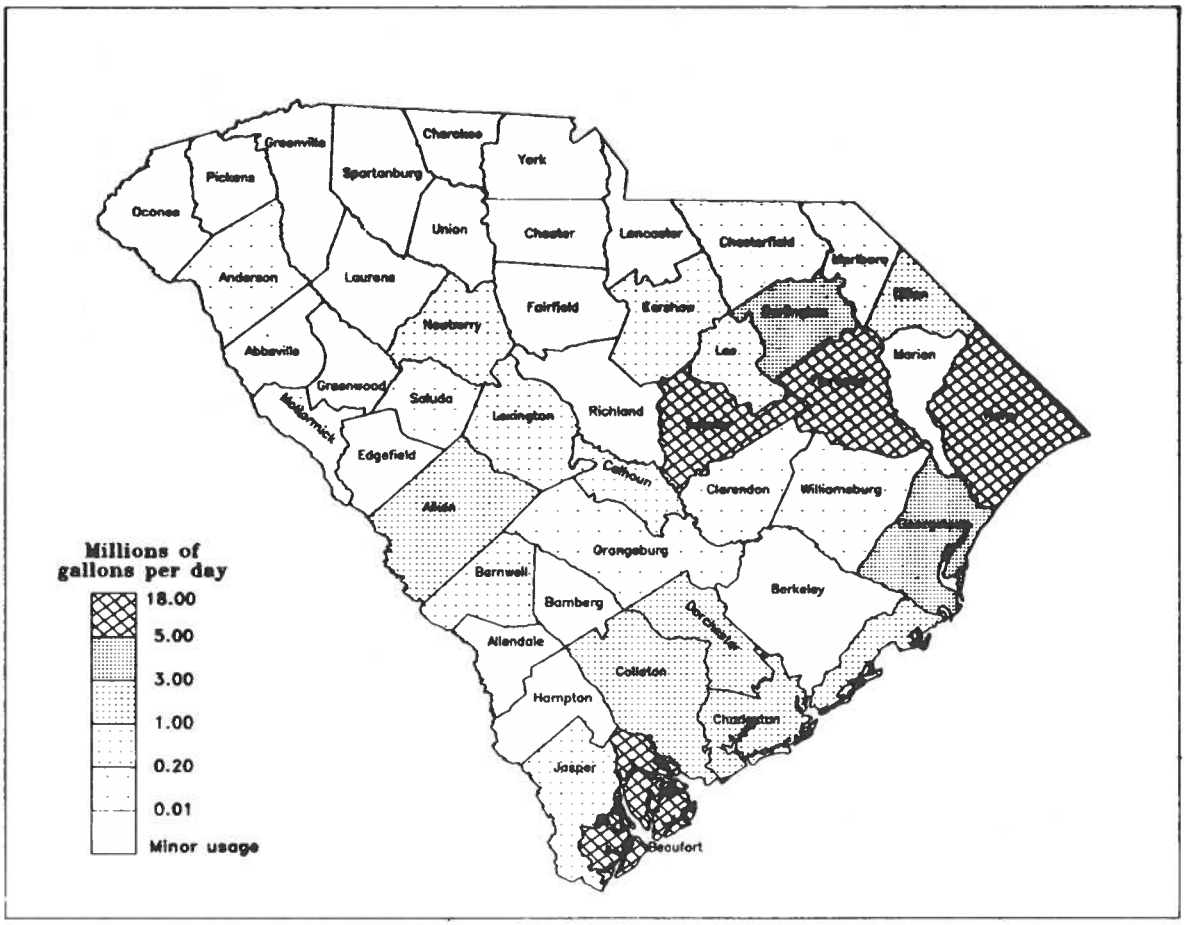

Figure 1. Total public supply ground water usage, July-December 1983.

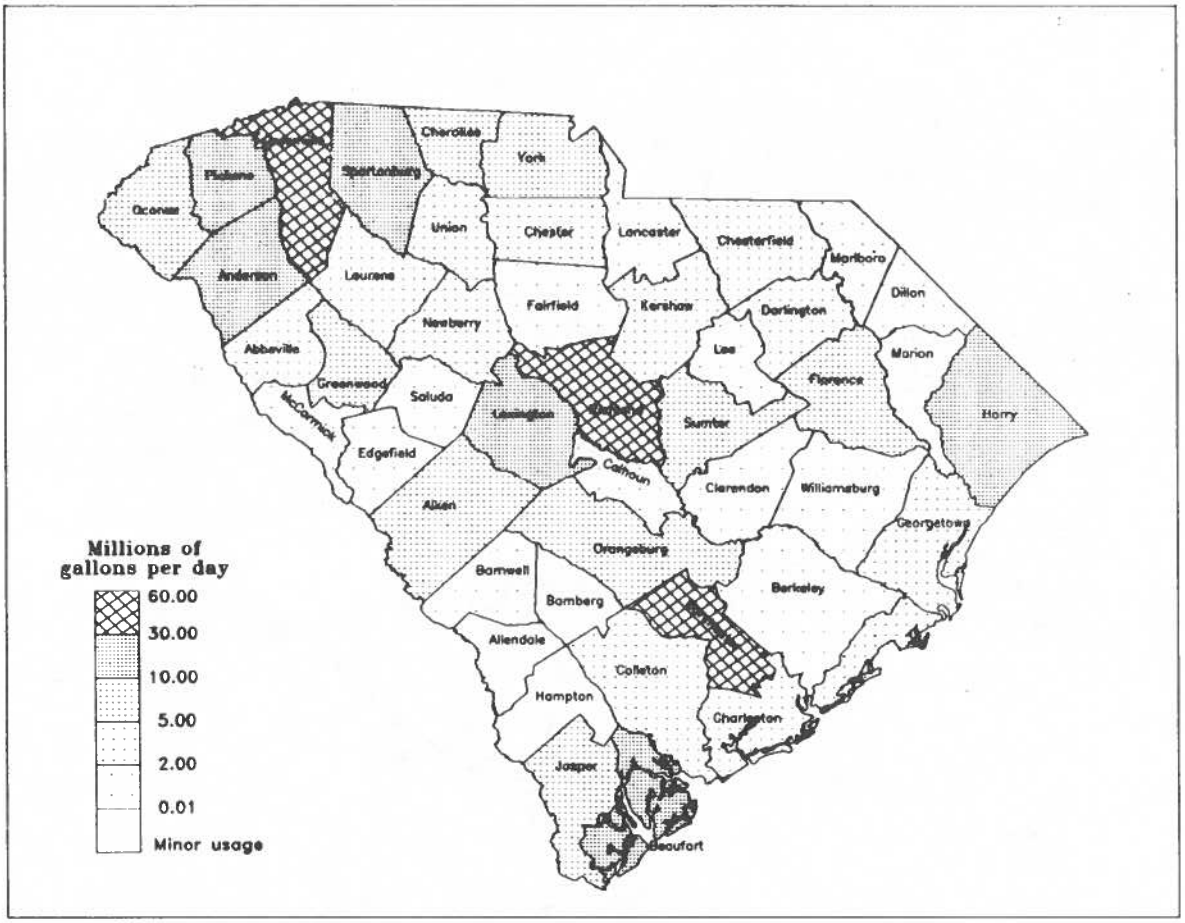

Figure 2. Total public supply surface water usage, July-December 1983.

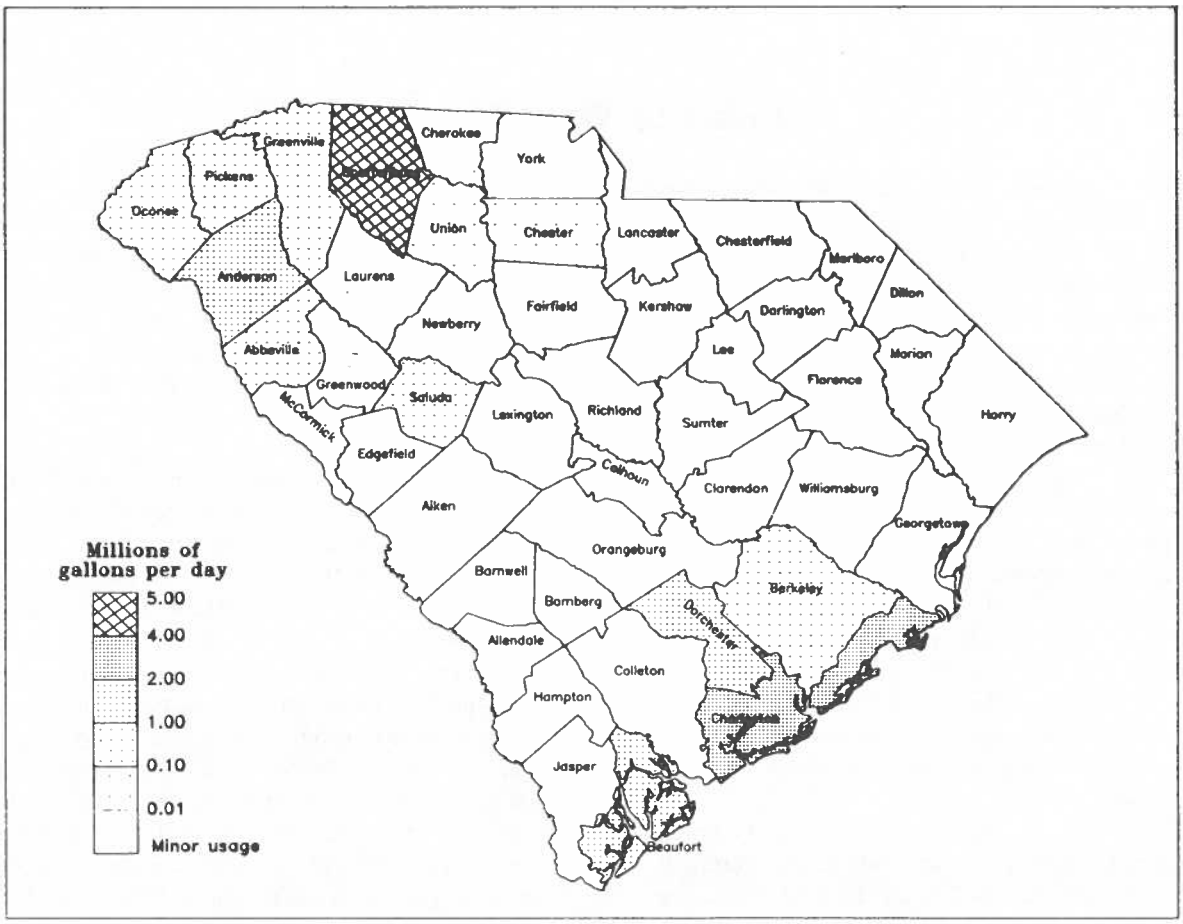

Figure 3. Total purchased public supply water usage, July-December 1983.

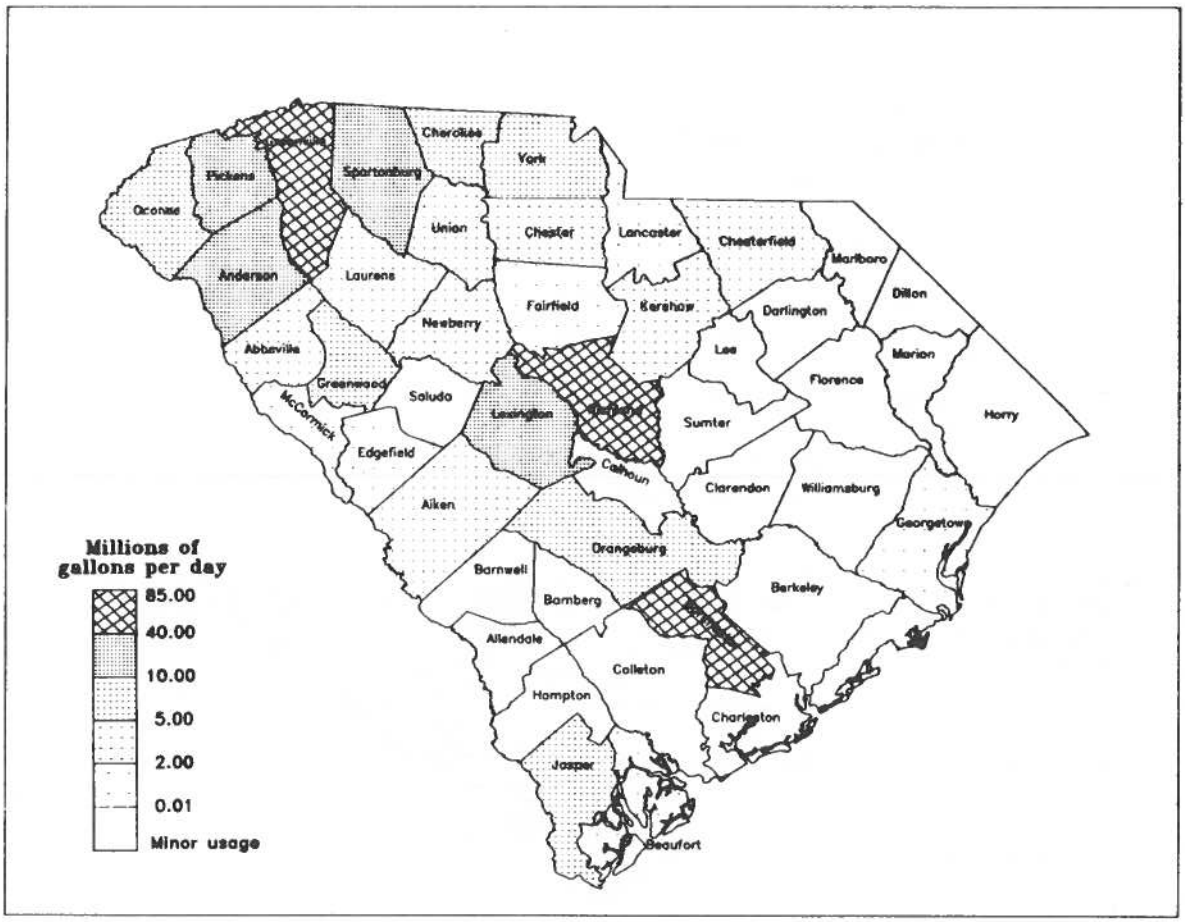

Figure 4. Total public supply water usage, July-December 1983.

Industrial Water Usage

Industrial water use is the second largest withdrawal water usage in South Carolina, representing 17.1 percent of the total, or 1,104.4 mgd. Surface water is used to supply 97.6 percent, or 1,078.1 mgd, of the total, with ground water supplying 26.3 mgd. In addition, approximately 42.7 mgd of water is purchased by industries from either local public suppliers or other industries. Figures 5-8 show the distribution of water usage, by county for each source of water supply. Figure 5, displaying total industrial water usage, shows that water used for industrial purposes is distributed throughout the State, with 9 counties accounting for greater than 10 mgd average usage and 2 counties greater than 50 mgd. Figure 6 shows ground water use by industries to be greatest in the Coastal Plain, with Orangeburg and Aiken counties having the largest withdrawals. Surface water withdrawals, as shown in Figure 7, are large in both Coastal Plain and Piedmont counties. Industries that purchase water, shown in Figure 8, generally are in or adjacent to counties with large public suppliers.

Since 1980, total industrial water usage, including ground water, surface water, and purchased water, increased 15.5 percent, or 154.2 mgd. However, industrial water usage, excluding that for the Savannah River Plant (SRP), decreased 19.2 percent, or 68 mgd. Several industries ceased operation during the 3-year interval, so their water usage was zero, and some industries' usage was less in 1983 than 1980. The few industries' water usage that increased during the period, particularly that for SRP, which increased 57 percent, or 288 mgd, more than made up for the decrease in the remaining industrial water usage.

Some data-base shifting of water usage between water sources has occurred. Both the ground water and purchased water usages have decreased to only about one-half the 1980 usages, while surface water usage increased by one-quarter. Because surface water usage is many times greater than that for the other two sources, the smaller fractional increase represents more than all that was "lost" by the other two sources. One major reason for the change in usage by source is the quality and condition of industrial water use data employed in 1980. At that time, the data contained only estimates of the percentage of reported total water usage from each of the three sources. Data for 1983 are reported by actual source and thus provide a greatly improved division of water usage.

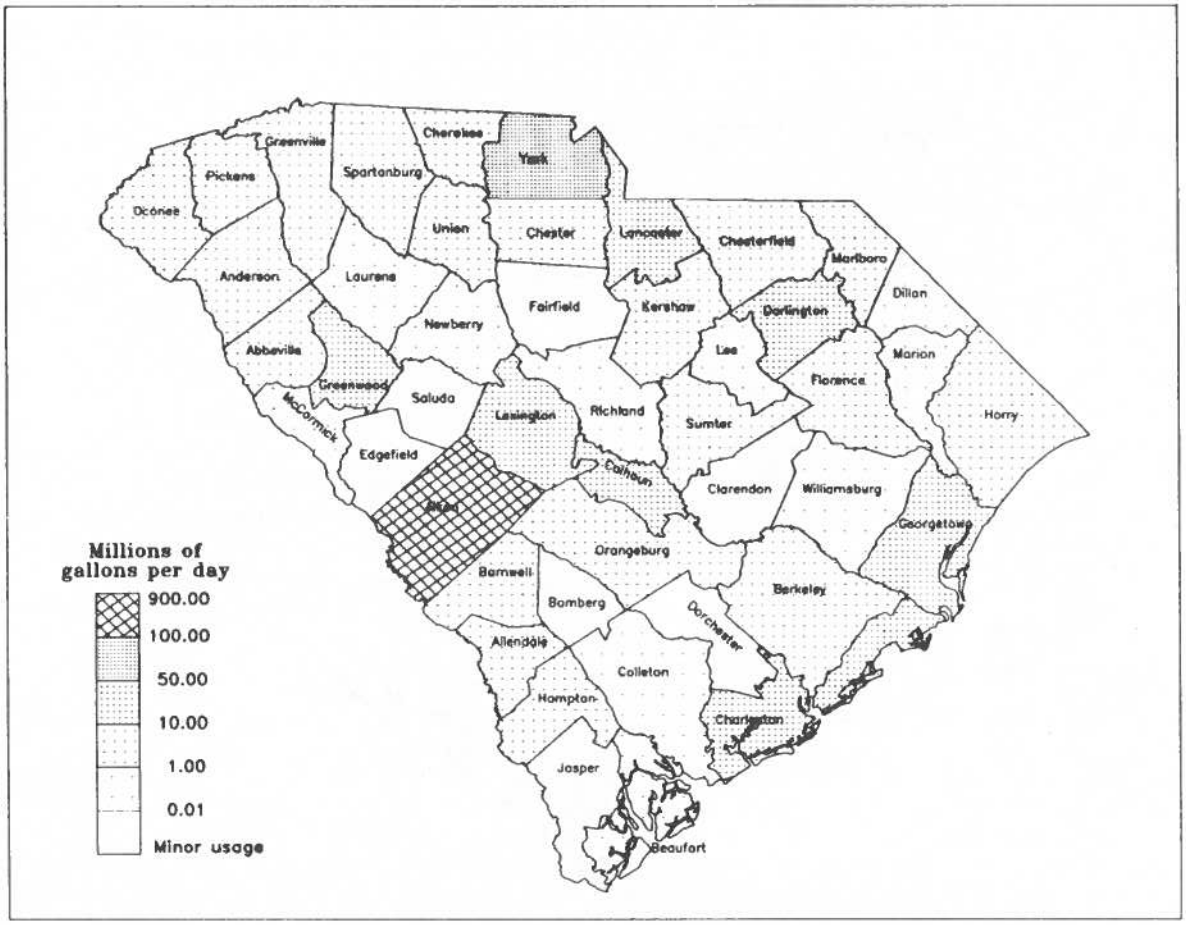

Figure 5. Total industrial water usage, July-December 1983.

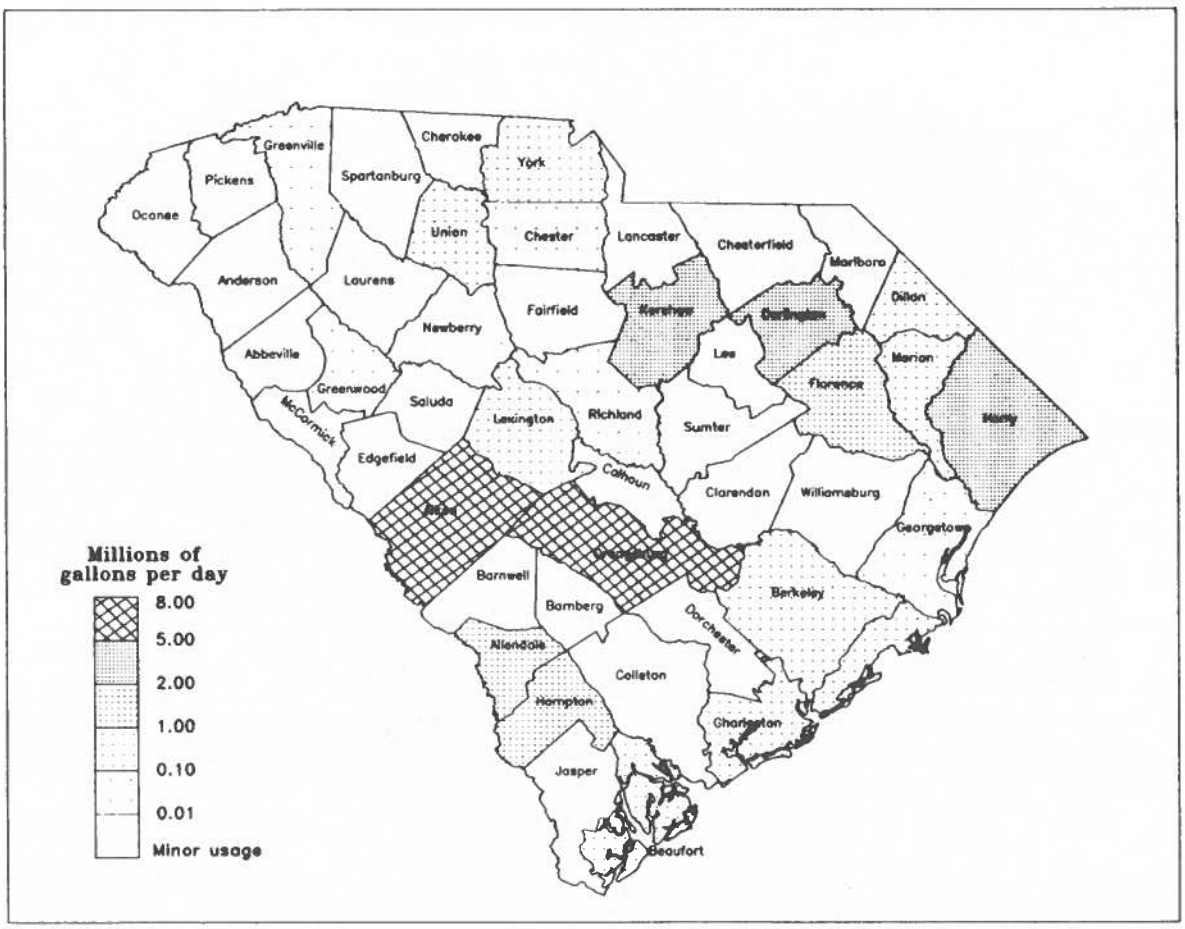

Figure 6. Total industrial ground water usage, July-December 1983.

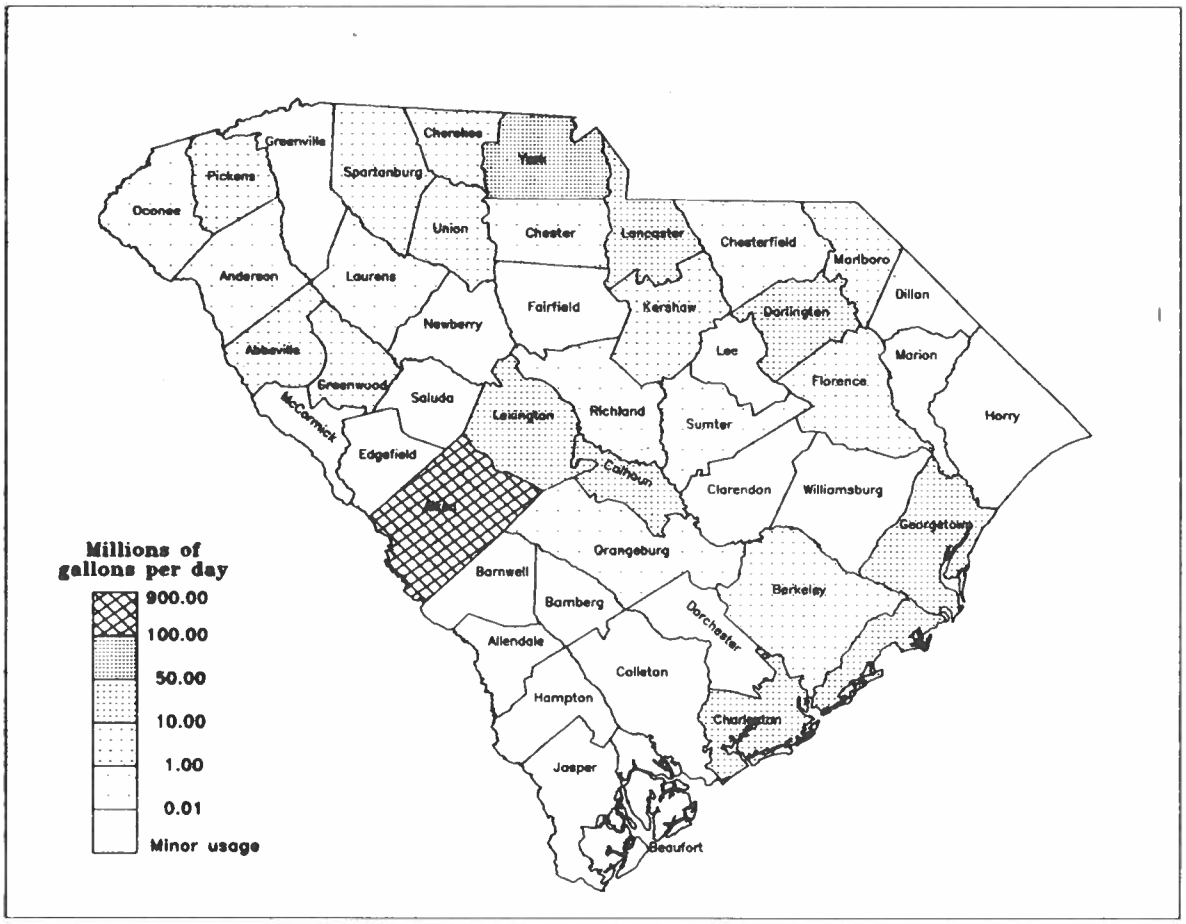

Figure 7. Total industrial surface water usage, July-December 1983.

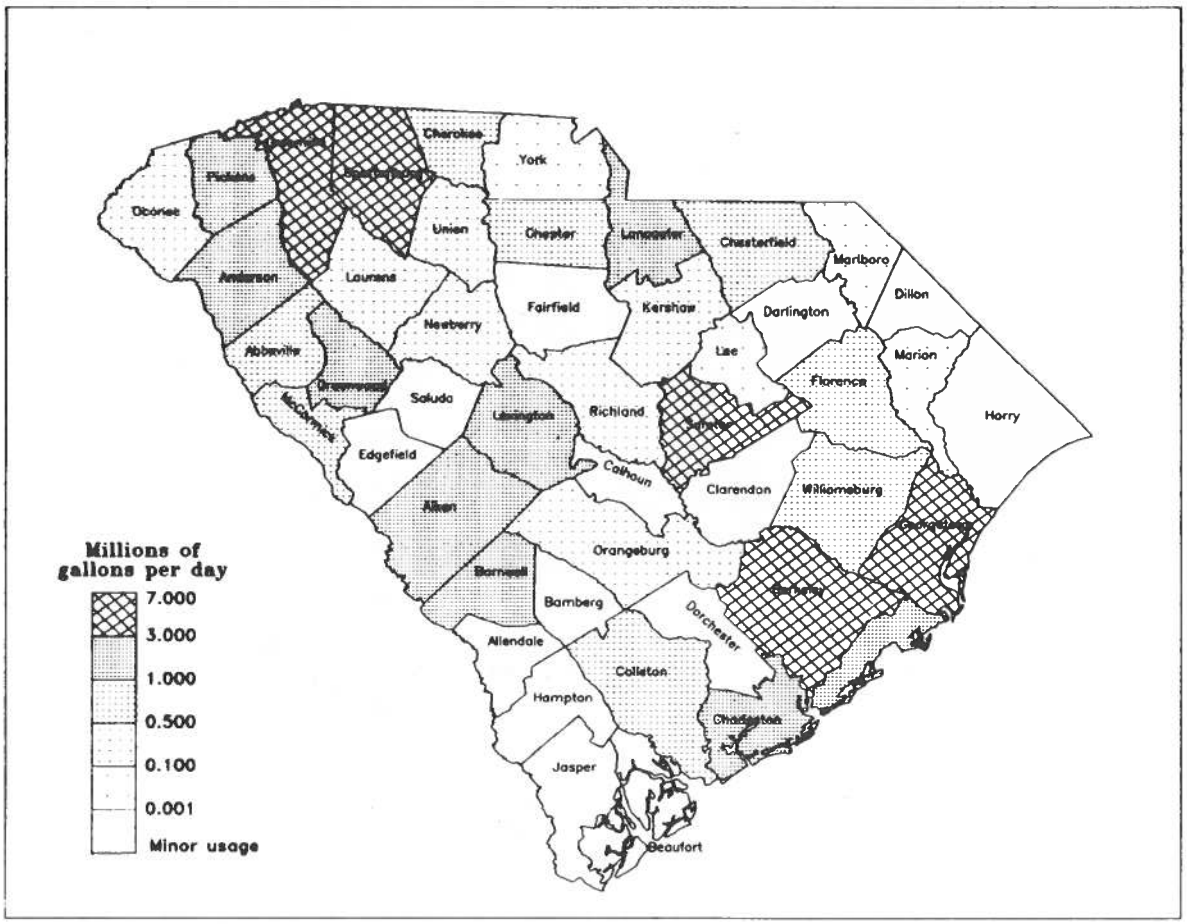

Figure 8. Total purchased industrial water usage, July-December 1983.

Agricultural Irrigation Water Usage

Agricultural irrigation water usage figures have been the most difficult to obtain, for various reasons. Experience indicates that many farmers have had problems in completing the forms, or they did not irrigate and assumed that no report indicates no usage. Some simply have no intention of reporting. Efforts have been made by both SCWRC staff and Clemson University County Extension Service agents to persuade and assist the farmers toward the goal of complying with Act 282.

The maps, Figures 9-11, and the totals in the table represent only the reports received by October 1984. The table data show that agricultural irrigation represents 0.6 percent, or 38.6 mgd, of the total withdrawal water usage, or 2.6 percent of withdrawal usage excluding that for thermoelectric power generation. Even though these figures are lower than those for 1980, they probably are more representative of the amount of water used for irrigation in South Carolina.

Agricultural irrigation is greatest, in general, in a band running southwest to northeast along the middle of the Coastal Plain region as shown in all three maps, Figures 9-11. Orangeburg County has the greatest irrigation ground water and surface water withdrawals. The only notable exception to this trend is the moderate surface water irrigation usage for peaches in Spartanburg and Cherokee Counties.

One notable change from the 1980 water use report is the much lower surface water usage which is only 45 percent of the 1980 usage. At least two factors are involved in this decline. Much of the peach crop in South Carolina, which is irrigated largely from surface water, was destroyed by the late freeze in 1983. Also, many farmers think that Act 282 is only for ground water usage and thus have not reported.

Ground water usage has shown a 35-percent increase since the 1980 report. The 1984 report will be more complete, so it should be possible to ascertain if the ground water usage increase reflects an overall increase in irrigation water usage or if estimates in 1980 were skewed towards surface water usage.

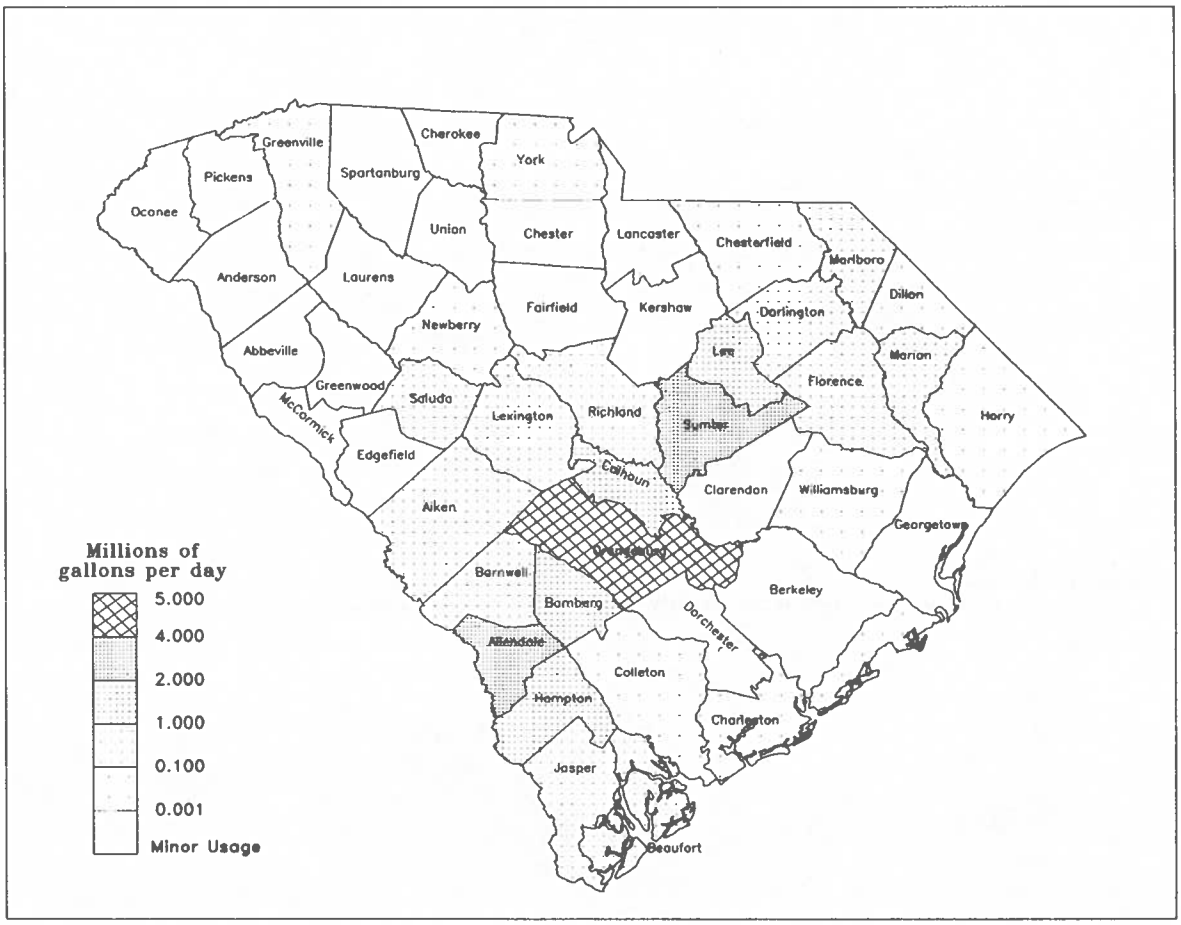

Figure 9. Total irrigation ground water usage, July-December 1983.

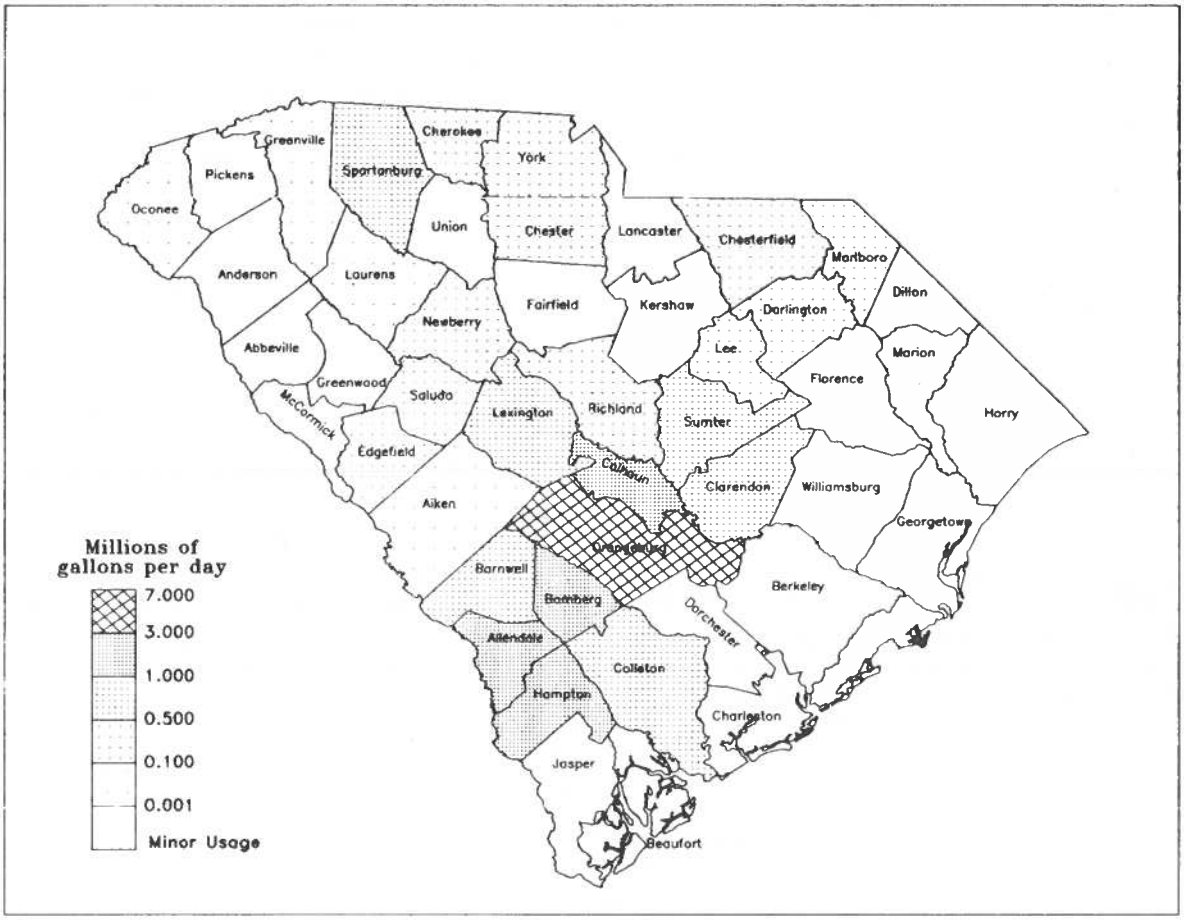

Figure 10. Total irrigation surface water usage, July-December 1983.

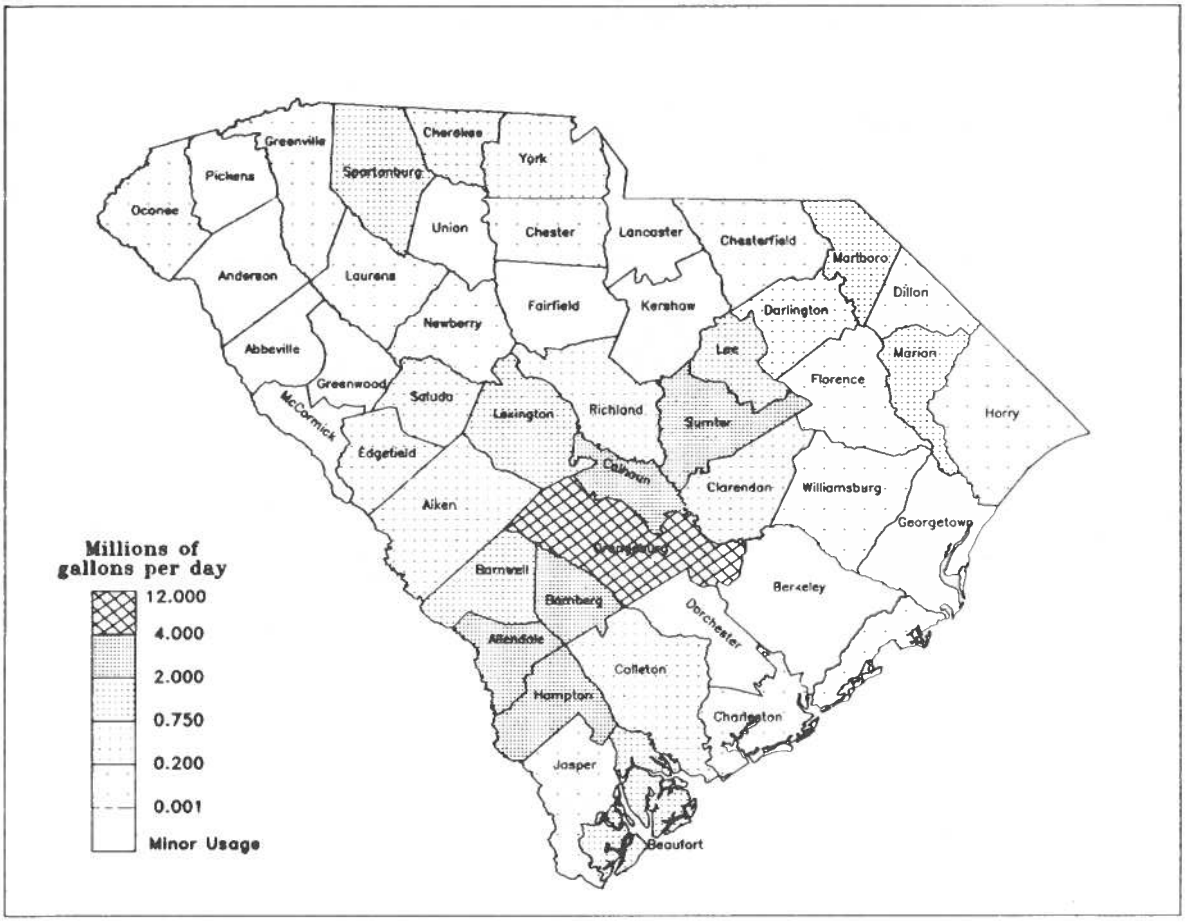

Figure 11. Total irrigation water usage, July-December 1983.

Thermoelectric Power Water Usage

Thermoelectric power generation is the largest withdrawal water use in South Carolina, representing 77.1 percent of the total. Again, surface water is the source most heavily depended upon with 99.995 percent, or 4,974.5 mgd, of the total usage, being withdrawn from that source. Ground water is used to a minor extent at these facilities and represents 0.005 percent, or 0.254 mgd, of the total.

An added reporting responsibility of the thermoelectric power companies is that for increased evaporation caused by their discharging heated wastewater into streams or lakes. As of October 1984, these figures had not been computer entered nor tabulated and thus do not appear in the table.

This usage is broken down into that for fossil-fuel and nuclear-fuel plants. Their water usage schemes are basically the same, but the water usage by fuel type was thought to be of interest.

Fossil-Fuel Plants

A total of 13 thermoelectric power generation plants in South Carolina use fossil fuel, mostly coal. Their water usage is nearly all from surface water sources, withdrawing 1,194 mgd with 0.254 mgd pumped from ground water sources. Fossil-fuel plant water usage represents 24.0 percent of the total usage for thermoelectric power generation. The water usage is 15 percent less than that reported in 1980 for fossil-fuel thermoelectric plants. Again, the difference could lie in the fact that 1980 usage was estimated after the end of the year and in 1983 the withdrawals were reported monthly. This would possibly result in higher water usage rates in 1980 than actually occurred. Also, power generation by these plants in 1983 could have been less than 1980, with more power being generated by the new nuclear-fuel plants, but no figures are on hand to determine this. Figure 12 shows the distribution of this water usage by county.

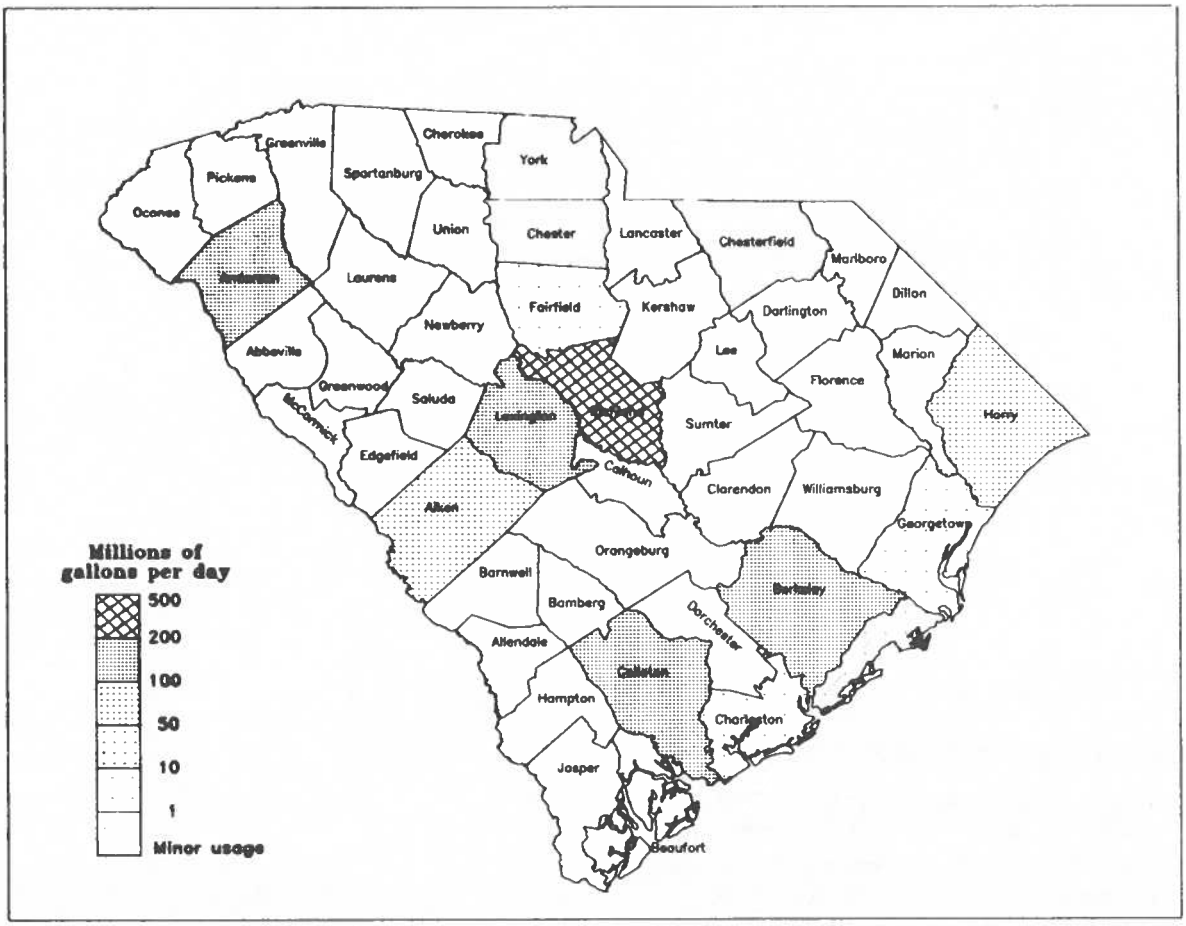

Figure 12. Total thermoelectric, fossil-fuel surface water usage, July-December 1983.

Nuclear-Fuel Plants

There are four nuclear power generating plants in South Carolina, two of which have come on line since 1980. Their usage, all from surface water sources, is 3,781 mgd, or 58.7 percent of the total withdrawal water usage, and 76 percent of that for all thermoelectric power generation.

Since 1980, this water usage has increased 36 percent, or 1,006.5 mgd, mostly due to the addition of the new plants, one in York County and the other in Fairfield County. The two plants that reported for both years 1980 and 1983 had closely equal usages both years. Figure 13 shows the distribution of this water usage.

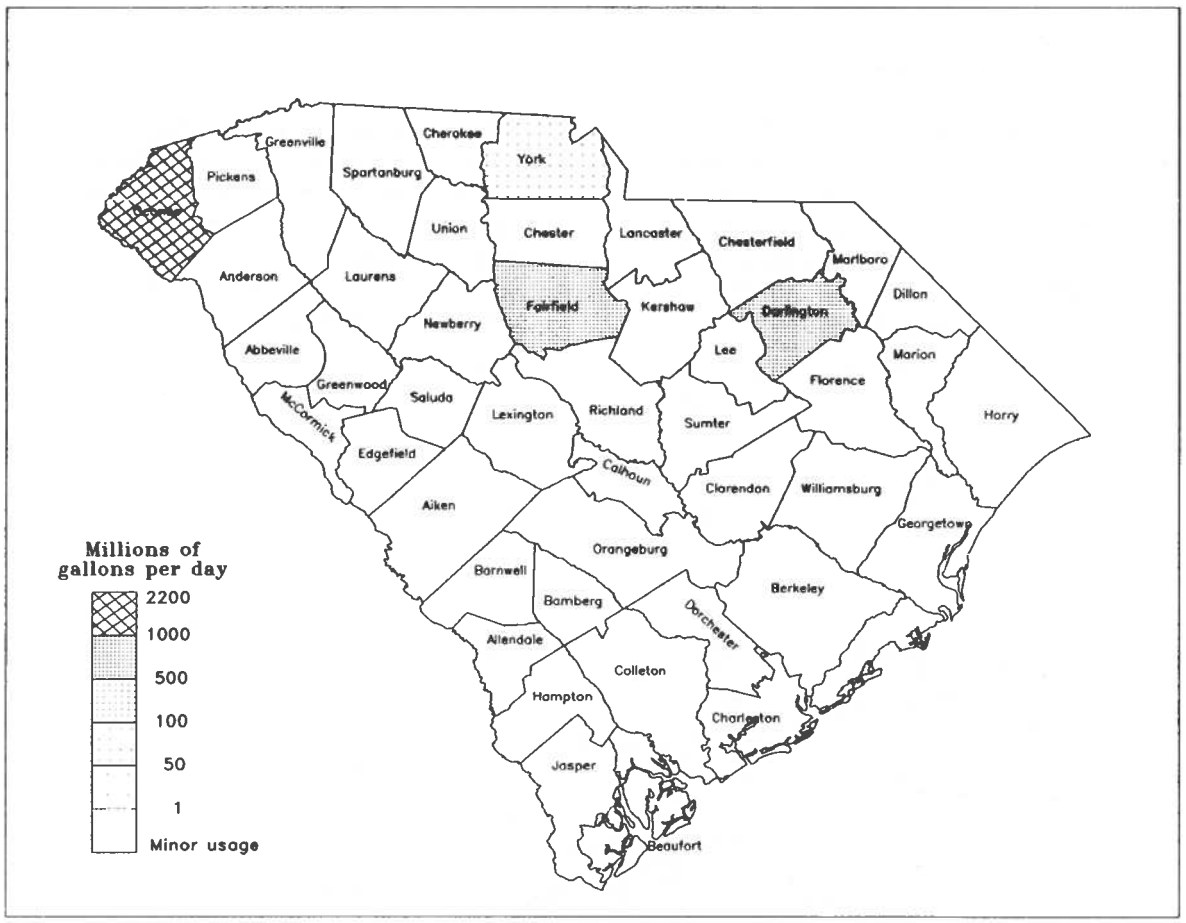

Figure 13. Total thermoelectric, nuclear-fuel surface water usage, July-December 1983.

Consumptive Water Usage

No usage values on consumption are tabulated for the 1983 report, owing to the fact that the discharge data have not been entered into the computer, water budget calculations have not been developed, and the computer programs have not been written. This is one of the major tasks scheduled for the next report (1985).

NON-WITHDRAWAL USE

Hydroelectric Water Usage

Hydroelectric power generation is the only non-withdrawal water use tabulated under this program. The hyroelectric power plants that report water usage represent 96.8 percent of the electrical generating capacity reported in the 1980 water use report. Of the remaining 3.2 percent of capacity, 2.8 percent are in Georgia and would be accounted for in their water use reports, 0.1 percent is now out of commission, and 0.3 percent is generated by industries and did not report water usage for hydroelectric power generation.

During the last 6 months of 1983, the reporting hydroelectric plants used 48,092 bgd of water. This represents only 80 percent of the water used in 1980 for hydropower production. However, the energy generated in 1983, 4,008,790 mwh (megawatt-hours), is about 73 percent of the 5,475,200 mwh of power generated in South Carolina in 1980, which explains the lower water usage figures. Figure 14 shows the distribution of this water usage by county. As could be expected, nearly all hydropower water usage is in the Piedmont region where hydraulic head potential is greatest. The notable exceptions are the two hydropower stations on the Santee-Cooper lakes in Berkeley County.

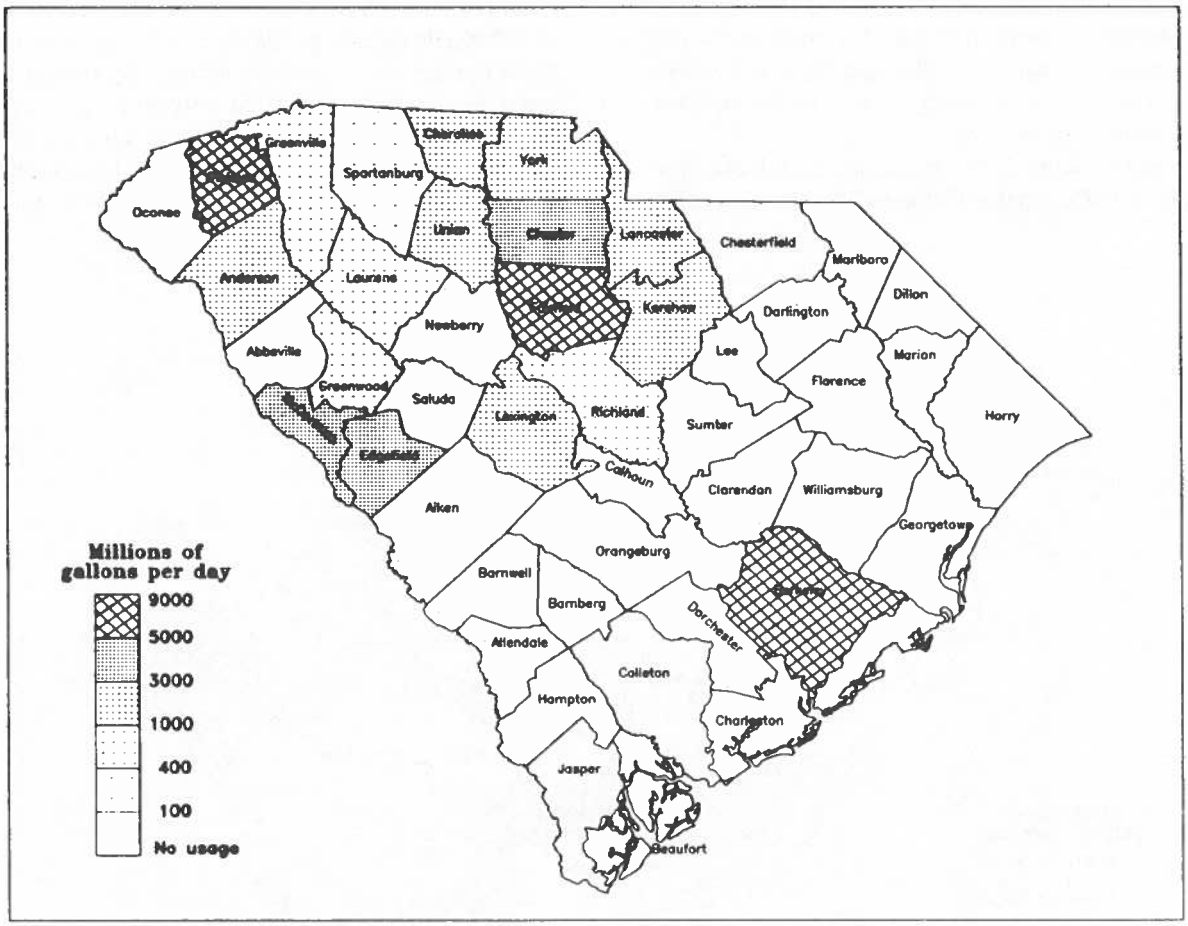

Figure 14. Total hydroelectric, non-withdrawal surface water usage, July-December 1983.

FUTURE WORK AND REPORTING

The quarterly water usage collection phase of the program will continue, but it should not require the effort that was necessary to start the program. The task is now being pursued to make the water use data collection phase a simplified paper-handling procedure. This will allow the clerical staff to quickly process the returned forms and the data-entry staff to then enter the data into computer files for use by various report generating programs.

Program Activities 1984-85:

- — Streamline water usage data handling and computer entry;
- — Collect, process, and enter wastewater information, including system description data and discharge volume data;
- — Incorporate the water usage reporting portion of the Capacity Use program with the Water Use program;
- — Complete task of collecting system description reports from the remaining non-responders;
- — Develop various analytical and report-generating computer programs.

SUMMARY

The Water Use Reporting and Coordination Act, Act 282 of 1982, calls for the coordinated and centralized collection of water-use information by the South Carolina Water Resources Commission. Two types of information are collected: (1) information that describes the water user, the sources of water supply, and how and where the water is used; and (2) quarterly reports on the monthly volume of water that is used.

Because water usage data were collected for only the second half of 1983, what is presented here are averages for that period. It is not known if water usage patterns are similar throughout the year or if significant differences exist between the first and second halves of the year. Future reports will attempt to address this question.

Only about 68 percent of those believed to use more than 100,000 gallons per day submitted reports. However, those that reported represent a major portion of the water usage in South Carolina. The percentage of users (by use type) that report water usage varies greatly. For example, 100 percent of the power utilities report, more than 90 percent of industry, nearly 70 percent of public sup-

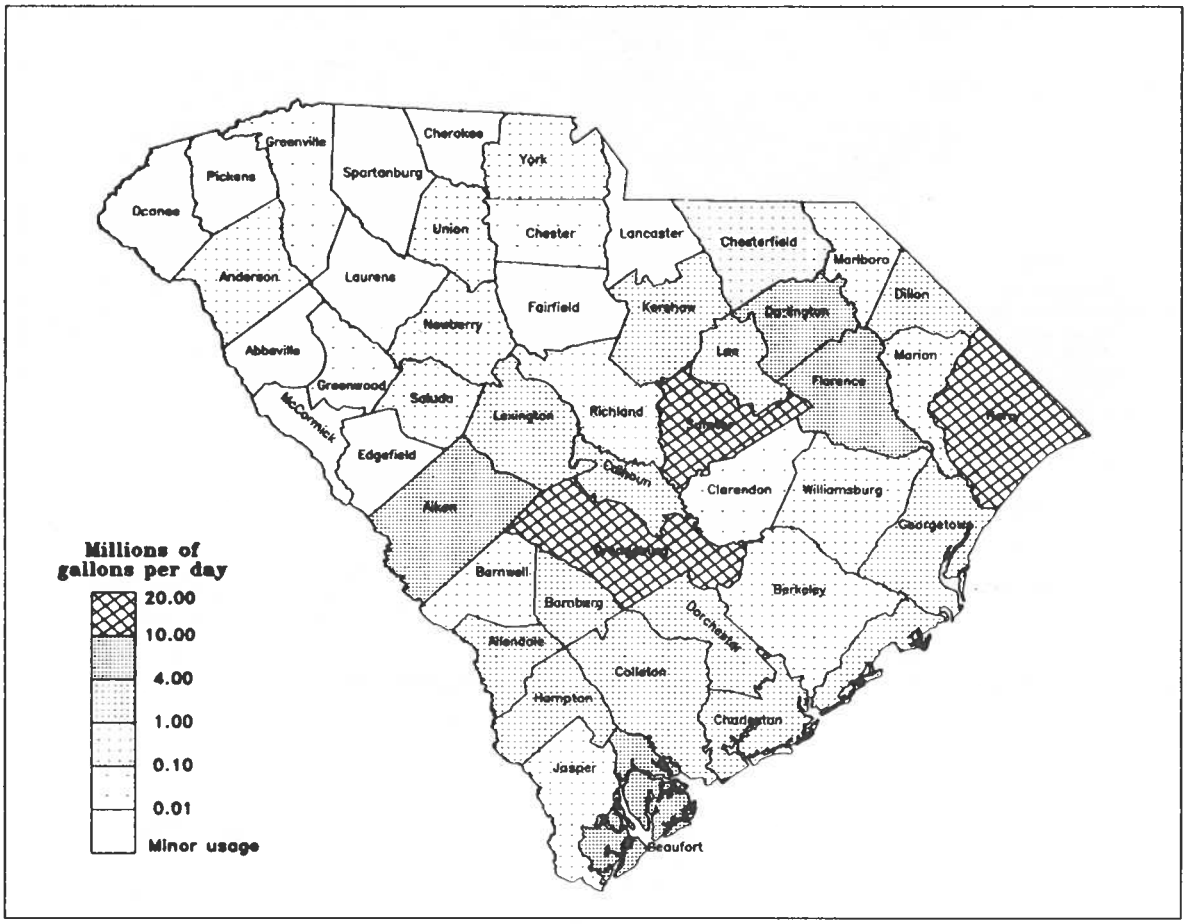

Figure 15. Total ground water usage by county, July-December 1983.

pliers, but only 60 percent of agricultural irrigators. Therefore, the water usage presented herein is less than the actual total.

During the period July through December 1983 the average withdrawal water usage was 6.46 bgd (billion gallons per day), of which 98.3 percent, or 6.35 bgd, was from surface water sources and the remainder was from ground water sources. Of this remainder, approximately half, or 56.8 mgd (million gallons per day), was purchased from other water suppliers for uses such as public supply, industry, and irrigation. The usage, by county, of water from each source is displayed in Figures 15, 16, and 17.

Ground water usage is greatest in the Coastal Plain counties, shown in Figure 15, Horry County being the largest user at just over 19 mgd, mostly for public supply. Orangeburg County is the second largest ground water user, owing to industrial and irrigation withdrawals, and Sumter County is third, owing mostly to public supply and irrigation uses.

Surface water withdrawal occurs throughout the State, shown in Figure 16, with the greatest use being in counties with thermoelectric power generation. The only exception is Aiken County, where industrial withdrawals by the Savannah River Plant make this county's usage the second largest.

Purchased-water usage, in general, is greatest in and near the counties with the larger public suppliers, shown in Figure 17, such as the cities of Charleston, Greenville, Spartanburg, and Anderson (in decreasing order of water usage).

As in the past, the largest withdrawal water usage remains that for thermoelectric power generation, representing 77.1 percent of the total withdrawal water usage. The remaining withdrawal water usage, 1.481 bgd, by use type was 22.8 percent for public supply, 74.6 percent for industry, and 2.6 percent for irrigation. Hydroelectric power generation water usage, a non-withdrawal water usage, averaged 48.092 bgd over the last 184 days of 1983.

Other types of water use are not included for various reasons. Some examples are individual users whose maximum daily usage is less than 100,000 gallons; excluded are small industries, small community water suppliers, most livestock operations, and self-supplied domestic. Another group excluded are those users who have reported but their data have not yet been added to the computer files; an example is golf-course irrigators.

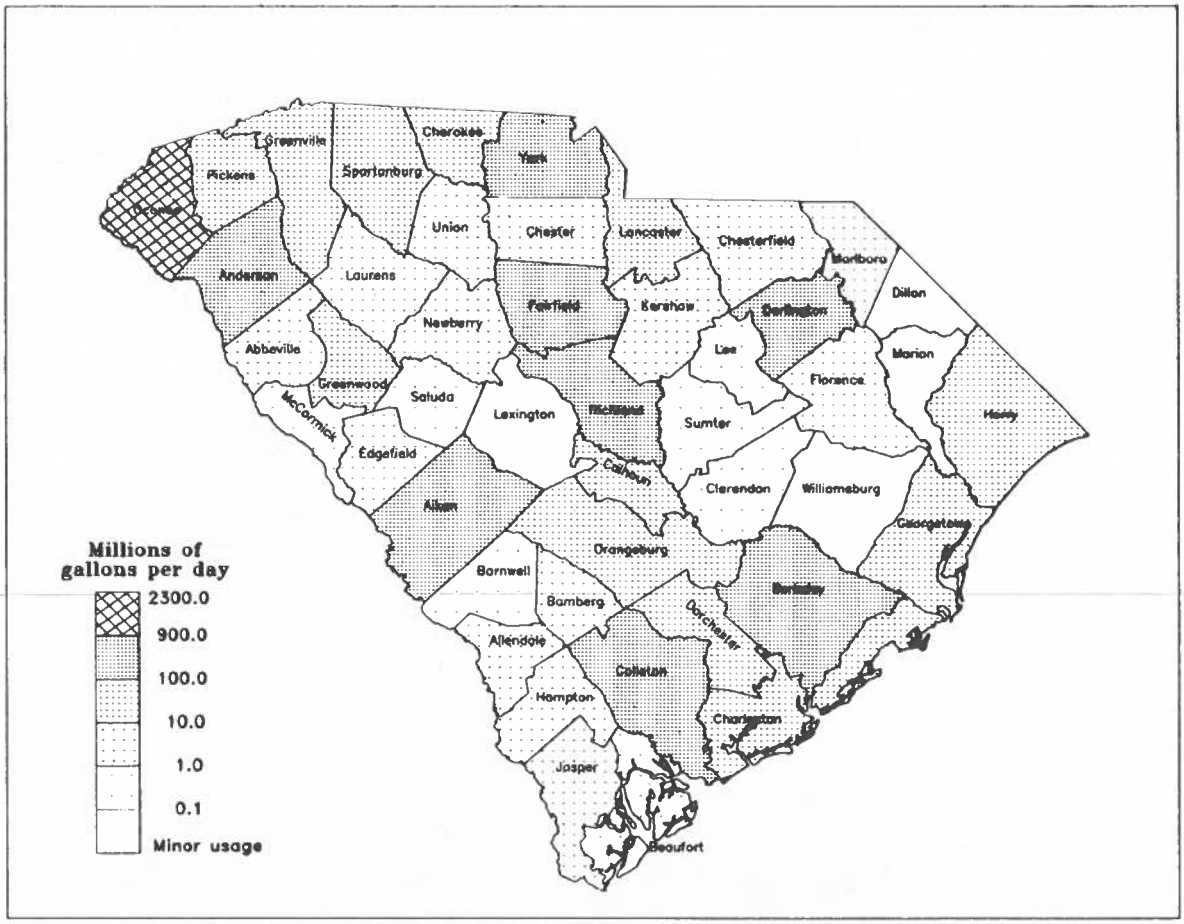

Figure 16. Total surface water usage by county, July-December 1983.

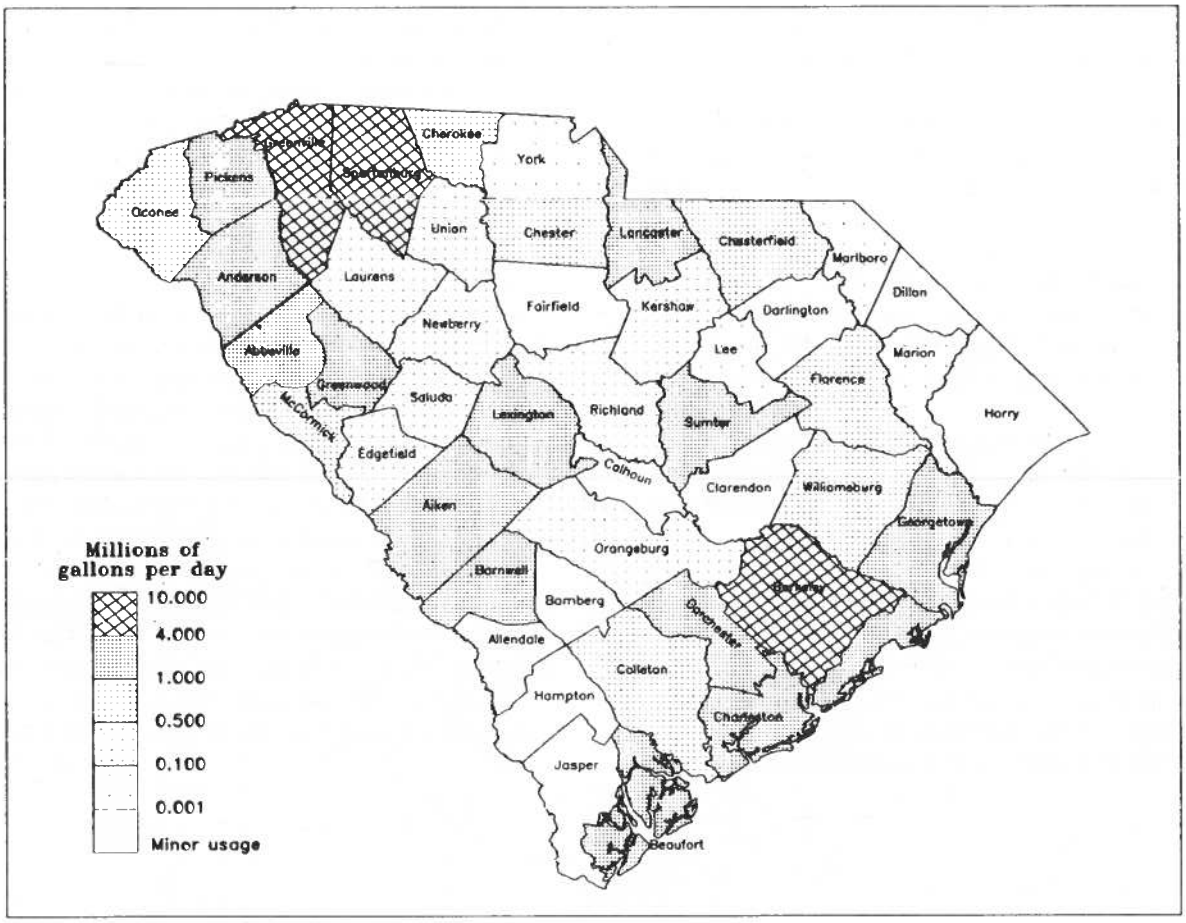

Figure 17. Total purchased water usage by county, July-December 1983.