

SECTION 8. STATEWIDE WATER USE

Developing a picture of overall water use across the state requires pulling together information from different sources collected at different times for different purposes. For water use other than water supplied by local government water systems, the Division of Water Resources relies heavily on the U.S. Geological Survey's *Estimated Water Use, by County, in North Carolina, 1995* (Walters, 1997).

8.1 Total Water Use in North Carolina

The most recent estimate of total water use in North Carolina was compiled by the U.S. Geological Survey (USGS) in the mid-1990s. They estimated that total water use in North Carolina was 9,286 million gallons per day, 80 percent of which was used in thermoelectric power generation. There was 8751 MGD of surface water and 535 MGD of ground water withdrawn for all uses. Public water systems withdrew 633 MGD of surface water and 136 MGD of ground water. Table 8-1 shows a breakdown of water use and consumption by type of supplier and type of use. Mining water use in Table 8-1 represents water used to process the extracted materials and does not reflect water withdrawn to keep the operation dry enough to work.

Table 8-1. Statewide Water Use and Consumption in 1995 by Type of Use						
(all figures in Million Gallons per Day, MGD)						
Type of Use	Self-supplied Surface Water	Self-supplied Ground Water	Public Water Supply (PWS)	Total Use	Returned Flow	Consumptive Use
Domestic	0	172	332	504	341	163
Commercial	0.3	7.3	138	146	138	7
Industrial	308	61	193	562	450	112
Mining	4.3	11.7	-	16	6.7	9.3
Irrigation	181	57	-	238	0	238
Livestock	207	90	-	297	171	125
Thermoelectric	7,417	0.1	0.4	7417	7,343	74
PWS Losses	-	-	105	105	-	-
Total	8118	399	769	9286	8,451	730
Source: Figure 2, Estimated Water Use, by County, in North Carolina, 1995. USGS Open File-Report 97-599.						

Thermoelectric use dominates water uses in the state. While using water to cool electric generating facilities can have an impact on water temperature and sometimes on water quality, almost all of the water withdrawn is returned within a short distance and is available for other uses downstream. Therefore, with the focus of this report being water supply planning, unless specifically

noted, the discussions, tables, and analysis throughout this report do not include thermoelectric generation uses.

In the mid-1990s domestic (or residential) water use averaged about 504 MGD of drinking water to meet the demands of about 7.2 million persons or about 70 gallons per day (gpd) per person. If this rate stays the same, in 2020, when the population is estimated to reach about 9.6 million persons, we will be using about 672 MGD of drinking water to meet our domestic water needs. USGS estimates that about two-thirds of the state's population is served by public water supply systems, with the other third getting their water from individual household wells. Of the two-thirds that are publicly-supplied, systems submitting local water supply plans (LWSPs) serve over 95 percent of those residents. The remaining publicly served population are served by privately-owned public water systems that are not required to prepare LWSPs.

Public water systems supplied an estimated 769 MGD for all of its system needs. About 43 percent of public water system use was for domestic (residential) purposes, with an equal amount being used for commercial and industrial uses combined. Public water system losses (leaks and unaccounted-for water uses) comprised the remaining 14 percent.

Excluding thermoelectric uses, we withdrew 1868 MGD of ground and surface water in 1995. Based on a population of about 7.2 million persons in 1995, we withdrew about 259 gpd of water for each person in the state to support the North Carolina economy. Of this 259 gallons per day, an estimated 154 gallons were discharged back to surface water. If this rate of use stays the same, in 2020 we will be withdrawing 2486 MGD of water to support these activities.

8.2 Water Use by Local Water Supply Plan Systems

As mentioned above, local water supply plan (LWSP) systems supply the vast majority of all the water supplied by public water systems across the state. Table 8-2 provides a summary of water use by LWSP water systems in 1997.

Table 8-2. Reported Water Use by LWSP Systems in 1997
(million gallons per day)

Residential	357
Non-residential	357
Backwash	28
Unaccounted-for	125
Total	867

Many water systems purchase water from another system. In 1997, LWSP systems sold an average of 89 million gallons of water per day to other water systems. However, to avoid double-counting, water sales are not included in the water use figures in this section.

Water systems reported water use of about 688 million gallons per day in their 1992 LWSPs. This represents a 26 percent increase in water use by LWSP systems from 1992 to 1997. For this same period, the population served by LWSP systems increased by 20 percent. L W S P systems projected their water supply needs through the year 2020. LWSP systems project that water demands for their systems will reach 1415 million gallons per day by 2020, a 63 percent increase above 1997 levels. Service population and demand projections through 2020 are shown in Table 8-3 below.

Table 8-3. Projected Water Supply Needs for LWSP Systems

Year	Population Served	Demand (million gallons per day)
1997	5,029,056	867
2000	5,602,217	987
2010	6,814,855	1193
2020	8,001,907	1415

The water sources available for use vary across the state. Almost all LWSP systems in the Coastal Plain depend on ground water pumped from an extensive system of aquifers. In the Piedmont and Mountain areas, many systems rely on reservoirs or direct withdrawals from streams for their water supply, with numerous systems also relying on ground water where feasible. Many systems simply purchase water from a neighboring water system to meet their water supply needs. Figure 8-1 shows the water supply source types for LWSP systems in 1997.

The Division of Water Resources (DWR) encourages water systems to maintain demand-to-supply ratios such that average daily demands do not exceed 80 percent of their available water supply. Generally, water systems with demand-to-supply ratios greater than 0.8 are at greater risk of water supply shortages during periods of peak use and especially during drought. For water systems with high seasonal demands, DWR recommends that demand-to-supply ratios be based on these higher seasonal demands. LWSP projections indicate that 111 systems had demands exceeding 80 percent of their available water supply in 1997, and that 141 systems will exceed this threshold in 2010. These systems are shown in Figure 8-2. These systems were required to include a specific plan in their 1997 LWSP for meeting their future water supply needs.

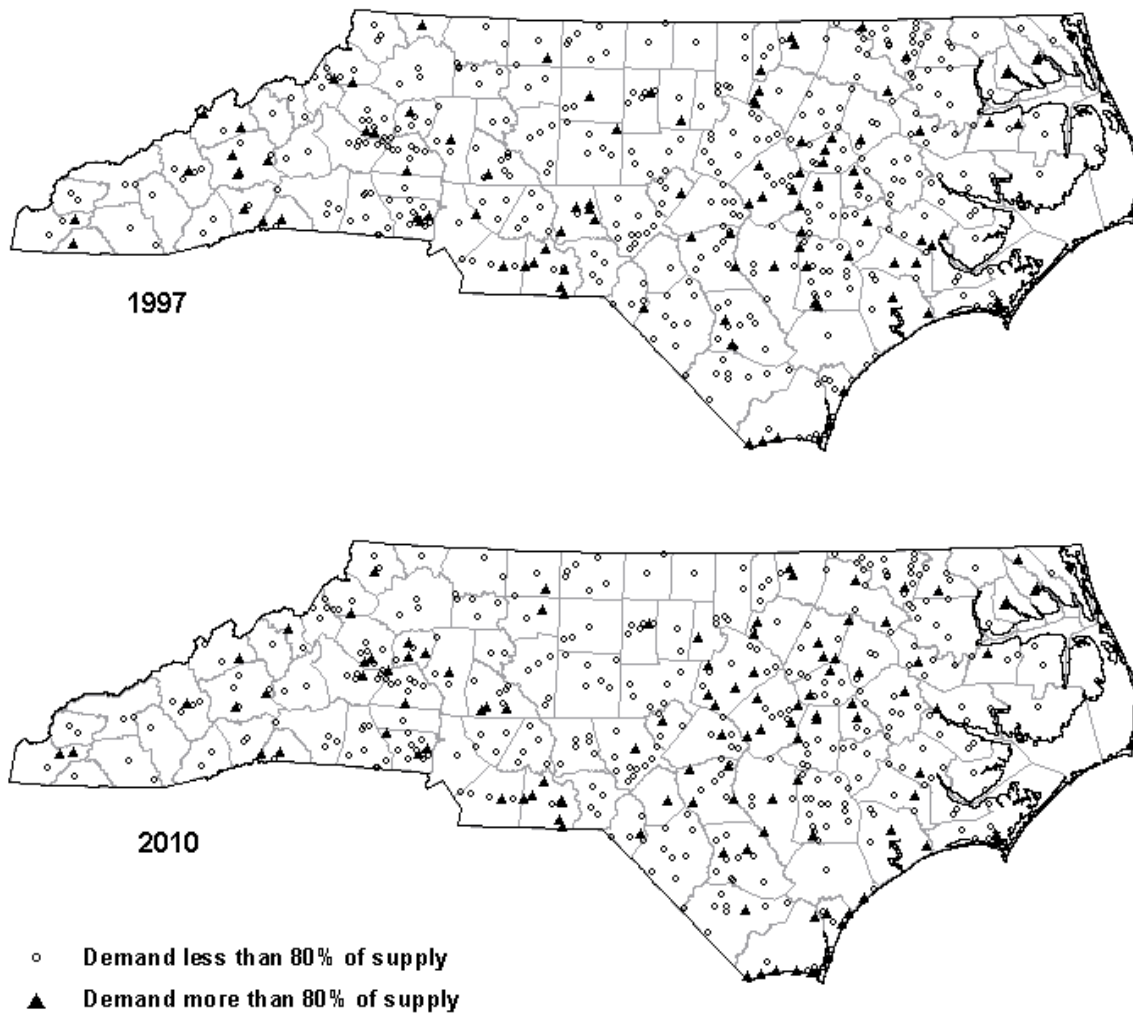


Figure 8-2. Comparison of Supplies for 1997 and 2010 for all Water Supply State Systems

8.3 Registered Water Withdrawals

The Local Water Supply Plans provide very good information on local government water systems, plus some private water systems that also submit LWSPs. However, there are many other water users, including most private water systems and self-supplied industry and agriculture, that together use large amounts of water. Having specific information, such as withdrawal amounts and locations, for these other users is also very important.

Information from these other users comes from the state's water withdrawal registration program. This program requires anyone withdrawing 1.0 million gallons per day or more for agricultural uses or 100,000 gallons per day for all other uses to register those withdrawals with the Division of Water Resources every five years. Withdrawals during calendar year 1999 were due by March 1, 2000. An additional source of registration data comes from water users in Capacity Use Area #1 in eastern North Carolina, whose monthly water use report satisfies their registration requirement.

Water withdrawal registration data is summarized in Table 8-4 for the various type of water uses across the state. Water use for power generation greatly exceeds water use for other uses, as discussed in Section 8.1. Registered water use for power generation is reported in Table 8-4, but is not included in the following discussion and analysis.

Agricultural water users registered 236 million gallons of daily water use. Irrigation of crops during the growing season accounted for 75 percent (160 MGD) of registered agricultural use, with surface water being used for 90 percent of this irrigation use. Since irrigation is so weather dependent, the amount of water used can vary drastically from year to year. Nearly all of the remaining water use was for aquaculture operations (fish farms) mainly in the mountains and coastal plain. No livestock operations registered any water use. Additional work needs to be done to determine if the 1.0 million gallon per day threshold is too high to trigger the registration requirement for most livestock operations.

Non-agricultural water users registered 900 million gallons of daily water use. Industrial surface water use accounted for 80 percent (726 MGD) of the non-agricultural uses. Mining operations registered 107 million gallons of withdrawals, which includes pumping to de-water or de-pressure a site as well as surface water withdrawals for process water and dust control. Private water systems registered over 31 MGD of public water supply withdrawals, which is in addition to water withdrawn by Local Water Supply Plan systems. Golf courses registered 11 million gallons of water use for irrigation, 10 MGD of which came from surface water. Other non-agricultural uses included snowmaking at several ski resorts, pipeline pressure testing, recovery wells, and maintaining waterfowl impoundments.

Water withdrawal registration data will be available on the Division of Water Resources web site in early 2001.

**Table 8-4. Registered Water Withdrawals in 1999
(million gallons per day)**

Type of Use	Surface Water	Ground Water	Total Use
Agricultural			
Irrigation	160	19	179
Livestock	0	0	0
Aquaculture	34	19	53
Other ¹	4	0	4
SUBTOTAL	198	38	236
Non-Agricultural (excluding Power Generation)			
Public Water Supply ²	7	24	31
Industrial	726	18	744
Mining	72	35	107
Golf Course	10	1	11
Other ³	6	1	7
SUBTOTAL	821	79	900
TOTAL (excluding Power Generation)	1,019	117	1,136
Power Generation			
Hydroelectric Power	16,362	0	16,362
Thermal Electric Power	8,747	0	8,747
Subtotal	25,109	0	25,109
TOTAL (including Power Generation)	26,128	117	26,245

Notes: ¹ surface drainage

² excludes water use by local water supply plan systems

³ includes snowmaking, pipeline testing, recovery wells, and waterfowl impoundments

Water Sources for 1997 Local Water Supply Plan Systems

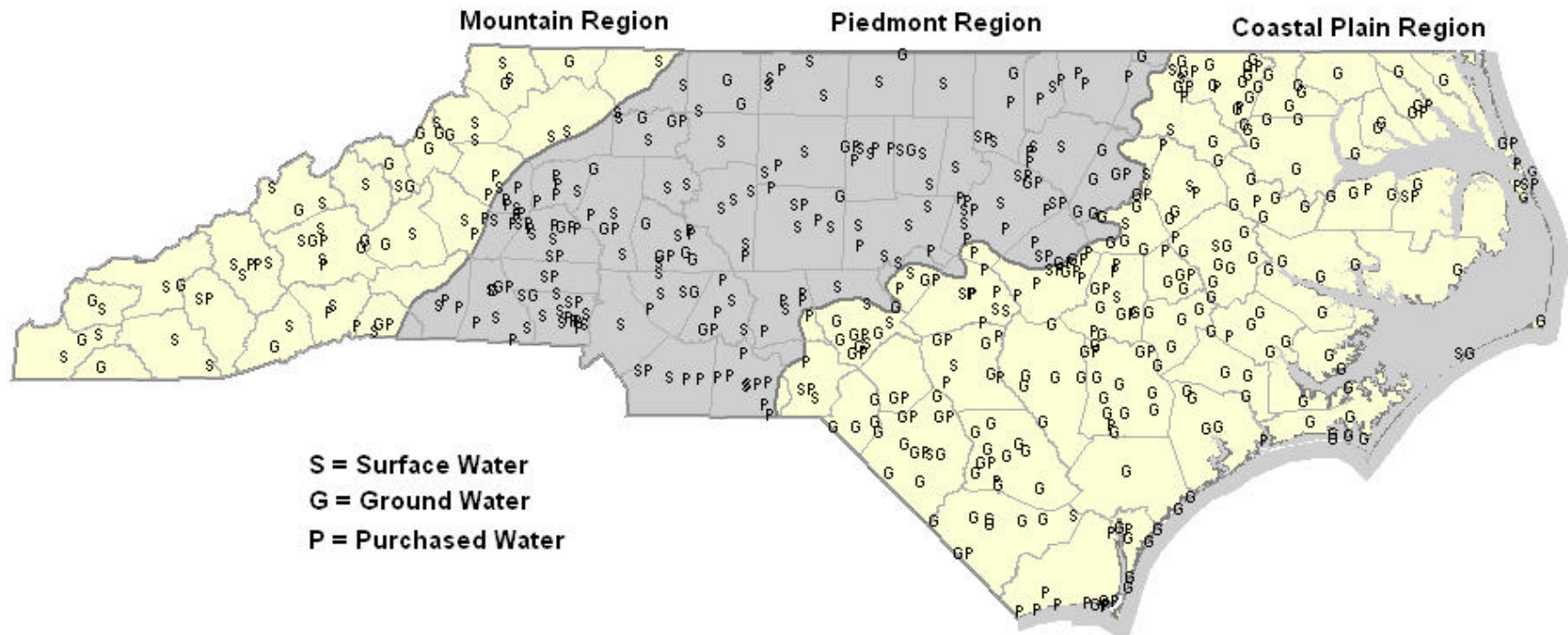


Figure 8-1. Water Source Types for 1997 Local Water Supply Plan Systems