from the Cumberland River. This was the largest surface-water withdrawal in the State during 2000, and represents a 13-percent increase since 1995 (Hutson, 1999). Large amounts of surface water were withdrawn from the Tennessee River in the Chattanooga and Knoxville metropolitan areas (Supplement A). Surface water was not a primary source for public water-supply systems in the Lower Mississippi hydrologic region of West Tennessee, primarily because of abundant and easily available ground-water supplies (Hutson, 1999; Hutson and Morris, 1992). The distribution of surface-water withdrawals in Tennessee counties during 2000 is shown in figure 6. Additional information about surface-water sources and withdrawal rates are presented in Supplements A, B, and C.

Ground Water

Ground water supplied about 321 Mgal/d in 2000 (fig. 4), an increase of approximately 45 Mgal/d (about 16 percent) since 1995 (Hutson, 1999). Almost 80 percent of the ground water withdrawn for public supply during 2000 was reported from West Tennessee. In Shelby County, Tennessee, alone, ground-water withdrawals yielded 188 Mgal/d (fig. 7), providing potable water for more than 764,000 customers. The largest total withdrawal (167 Mgal/d) by a single water system in Tennessee occurred in Memphis by MLGW, which served a population of 644,275. Approximately 257 Mgal/d of ground water were withdrawn from the Tertiary sand, Cretaceous sand, and alluvial aquifers (figs. 8 and 9). In contrast to the large amount of ground water used in West Tennessee, the combined withdrawals from aquifers in Middle and East Tennessee yielded about 66 Mgal/d for more than 730,000 customers.

A review of historical ground-water use reported by large public water-supply systems withdrawing 1 Mgal/d or more in Tennessee from 1988 through 2000 indicates that, within the 13-year period, several of these systems substantially increased their withdrawal rates (table 4). Thirty-four systems reported increased withdrawals in 2000, and 10 systems increased withdrawals by more than 1 Mgal/d. The greatest total increase (44.34 Mgal/d, table 4) in withdrawal rates was reported by systems located in the Lower Mississippi hydrologic region of West Tennessee. More than 60 percent (166.73 Mgal/d) of the ground-water withdrawals in this region were by MLGW in Shelby County, which reported an increase of about 26 Mgal/d in withdrawals since 1988.

Springs are used by public water-supply systems as a ground-water source in Middle and East Tennessee. In 2000, springs provided about 42 Mgal/d to 53 systems in 34 counties in this area. Ten public water-supply systems withdrew 1 Mgal/d or more of water from springs in the Mississippian carbonate aquifer of Middle Tennessee and from the crystalline rock aquifer and Cambrian-Ordovician carbonate aquifer in East Tennessee. About 62 percent (27 Mgal/d) of the total spring water withdrawals was from springs emerging from the Cambrian-Ordovician aquifer. Public water-supply systems in Carter, Hamilton, Montgomery, and Washington Counties reported withdrawals from springs ranging between 3.7 and 5.4 Mgal/d. The highest withdrawal from a single spring (4.42 Mgal/d) during 2000 was in Montgomery County. Elizabethton, in Carter County, withdrew the most spring water, 5.39 Mgal/d, from three springs in 2000. Most of the public water-supply systems withdrawing spring water for their supplies are in East Tennessee (fig. 10).

Gross Per Capita Water Use

Gross per capita water use is the calculated amount of water used in gallons per day per person, and is a means of normalizing or approximating the distribution of water use for county populations within a state or for populations across state lines.

For this report, the gross per capita (in gallons per day) for a public water-supply system was calculated from the gross water use divided by the number of customers (population) served by the system. The gross water use is calculated from the amount of water (million gallons per day) withdrawn and purchased from specific sources, less the amount of water sold to other public water-supply systems. An average of all gross per capita values was calculated for 2000 and compared to previous years' values. Because some public water systems provide water only to large corporations or industry, the gross per capita values for these systems are extremely large (greater than 1,000 gal/d) and do not reflect the actual population being served by a system. Per capita values for such systems were not included in the per capita average calculation for 2000 for Tennessee.

Gross per capita water use in Tennessee for 2000 was about 136 gal/d. This value is less than reported in 1995 (176 gal/d) by Hutson (1999). Per capita values for all public water-supply systems (using surface water, ground water, and purchased water) that were active in Tennessee during 2000 are listed in Supplements A, B, and C.

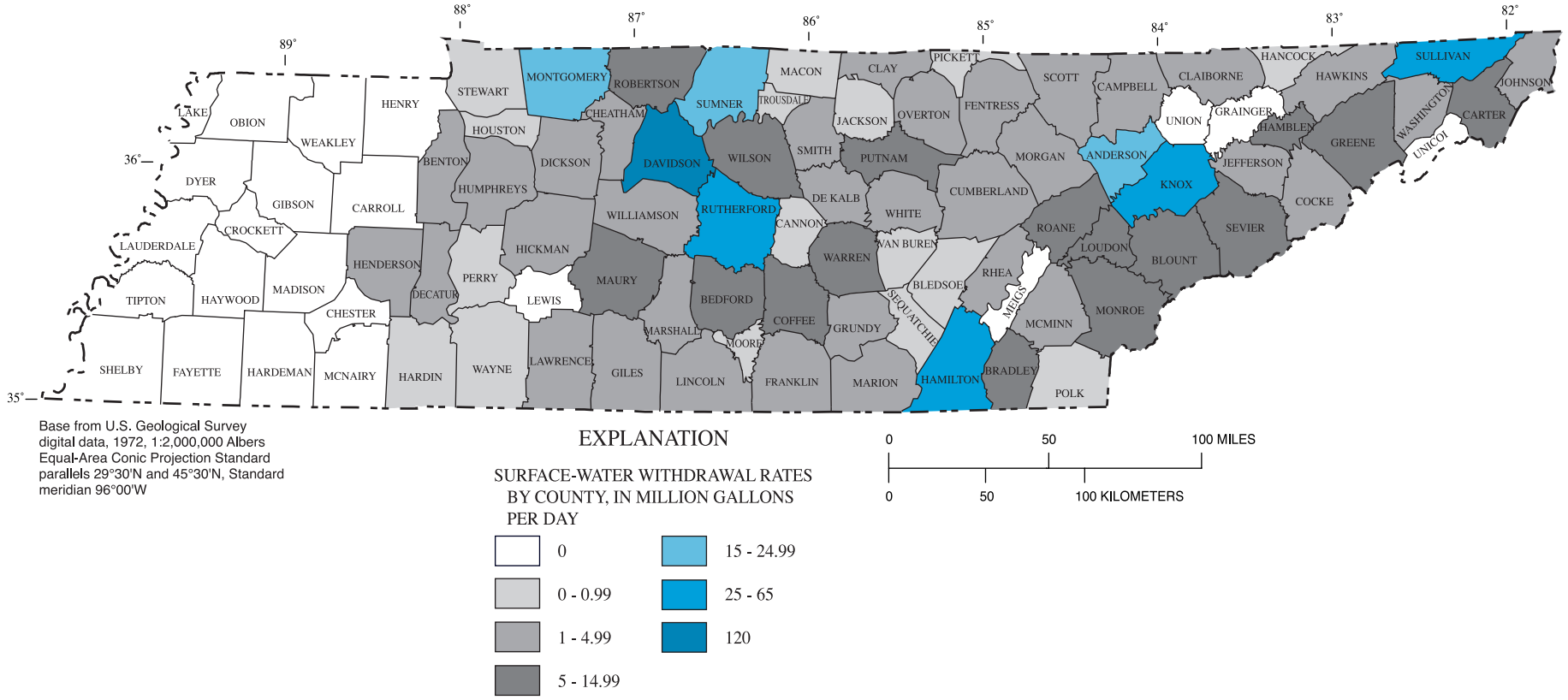


Figure 6. Surface-water withdrawal rates for Tennessee counties in 2000.

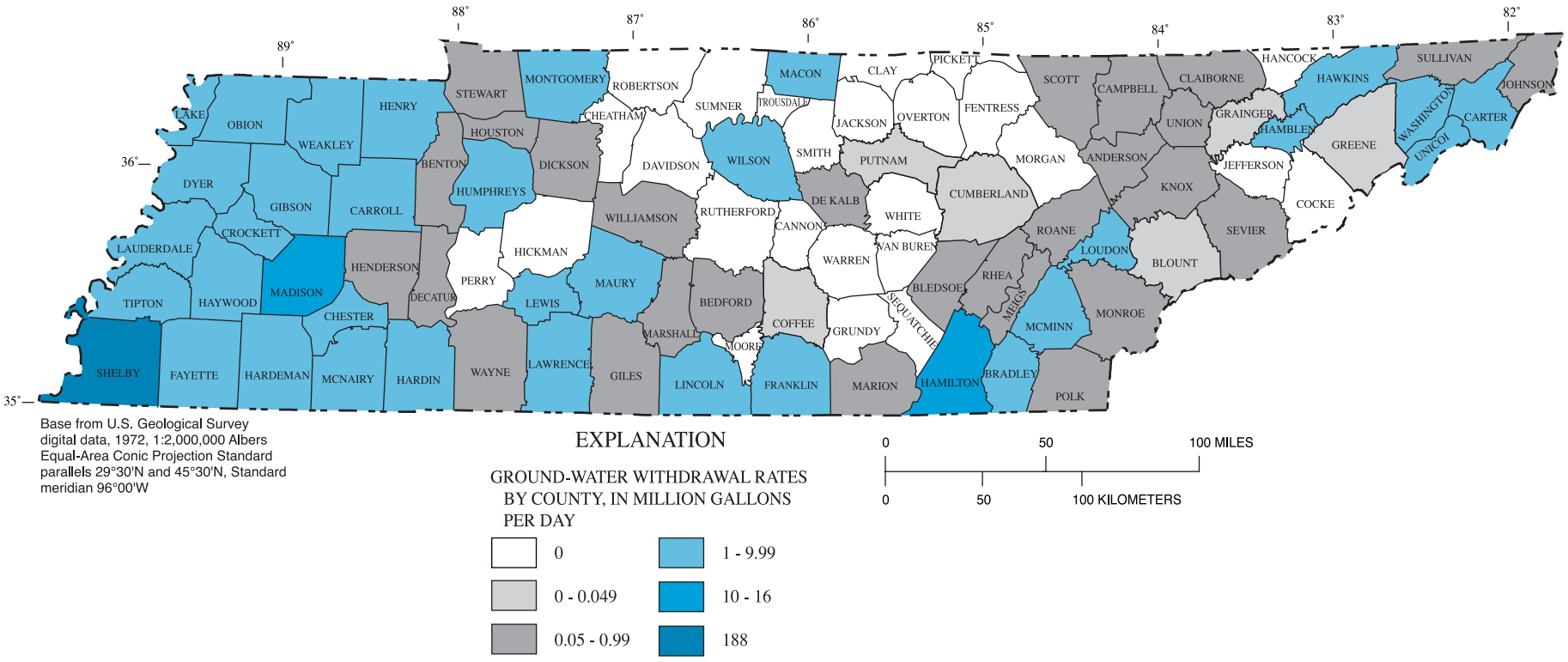


Figure 7. Ground-water withdrawal rates for Tennessee counties in 2000.

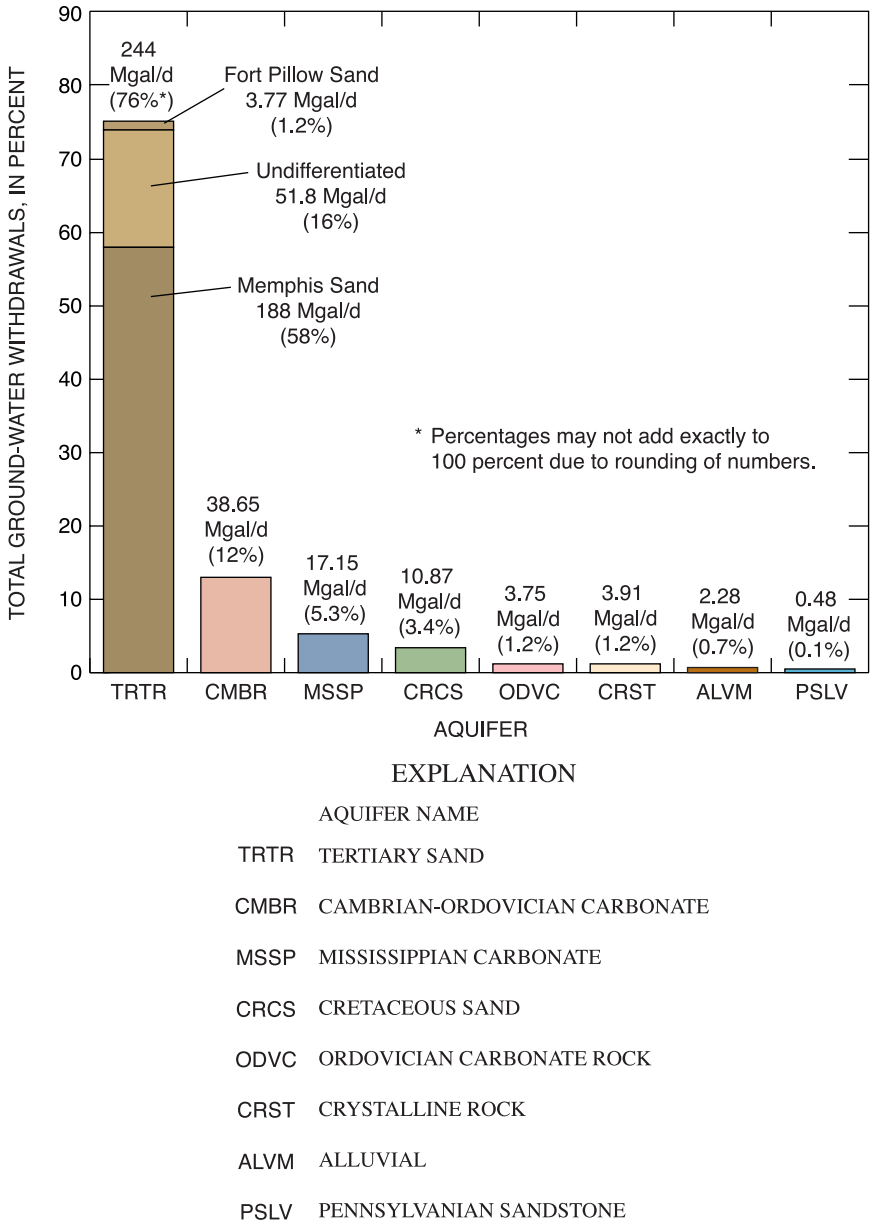
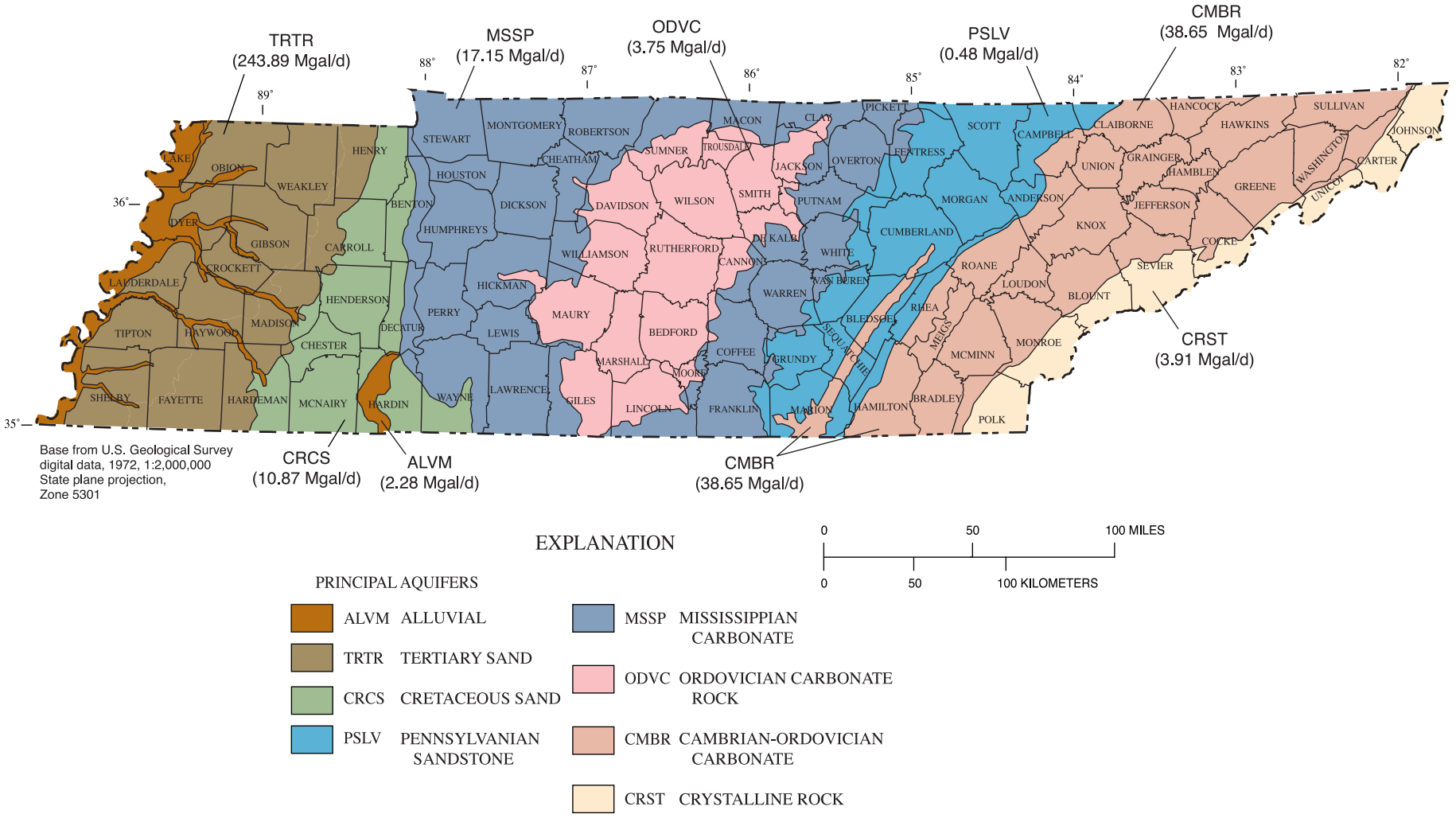


Figure 8. Ground-water withdrawals, in million gallons per day, from principal aquifers in Tennessee in 2000.



Note: All withdrawal-rate values are in million gallons per day (Mgal/d).

Figure 9. Principal aquifers and withdrawal rates in Tennessee in 2000.

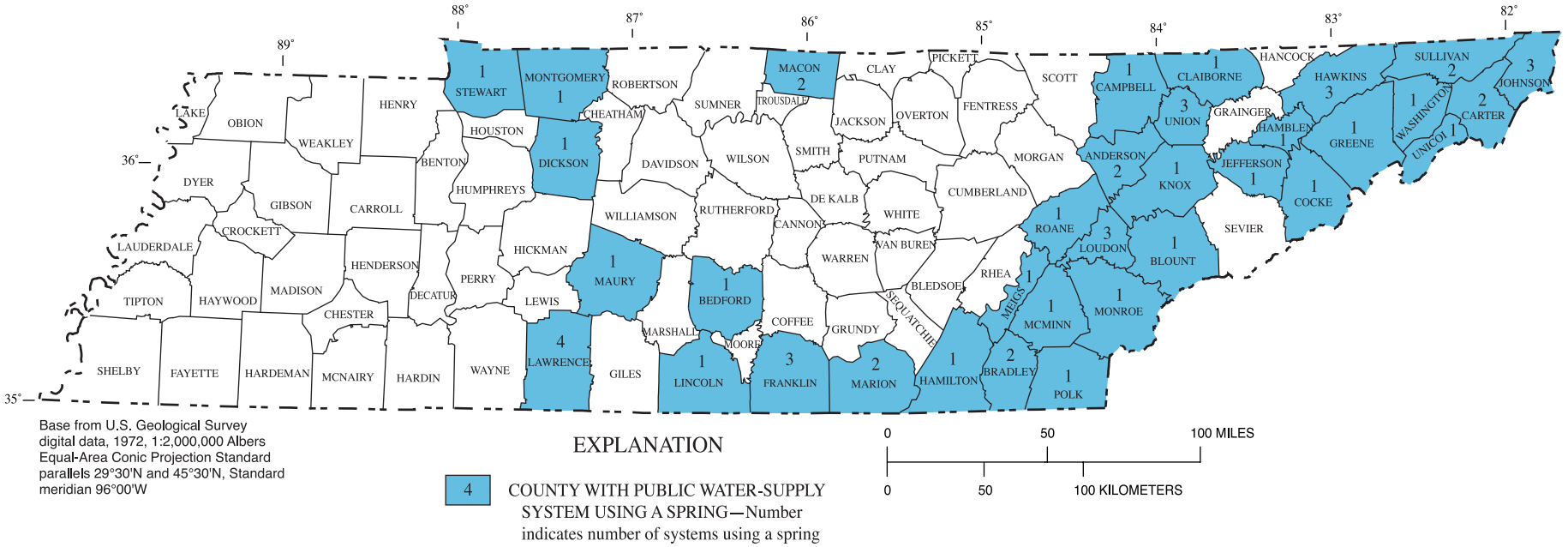


Figure 10. Tennessee counties with public water-supply systems using springs for water supply in 2000.

Table 4. Ground-water withdrawals by public water-supply systems in Tennessee using 1 million gallons per day or more in 2000

[- - no ground-water withdrawal reported by system; Aquifer names—TRTR, Tertiary sand; CRCS, Cretaceous sand; CMBR, Cambrian-Ordovician carbonate; CRST, Crystalline rock; ALVM, Alluvial; MSSP, Mississippian carbonate; ODVC, Ordovician carbonate rock]

Public water-supply system	Withdrawal rates, in million gallons per day			Change in withdrawals (1988-2000)	Aquifer
	1988	1995	2000		
Lower Mississippi Hydrologic Region					
Memphis Light, Gas and Water	141.00	148.00	166.73	25.73	TRTR
Jackson Water System	10.20	12.10	15.03	4.83	TRTR
Germantown Water Department	4.91	3.96	7.28	2.37	TRTR
Bartlett Water System/Bartlett-Ellendale	1.36/1.77	4.44	5.99	2.86	TRTR
Collierville Water Department	2.37	3.41	5.82	3.45	TRTR
Dyersburg Water Department	4.35	4.12	4.00	-0.35	TRTR
Union City Water Department	2.85	3.45	3.96	1.11	TRTR
Gibson Co. Municipal Water Districts	0.73	0.81	1.34	0.61	TRTR
Humboldt Utilities Water Department	1.84	2.28	2.37	0.53	TRTR
Selmer Water System	2.10	2.13	2.24	0.13	CRCS
Covington Water Department	1.40	1.43	2.23	0.83	TRTR
Ripley Water System	1.83	1.52	2.03	0.20	TRTR
Brownsville Water Department	1.71	2.05	1.77	0.05	TRTR
Poplar Grove Utility District	0.21	1.00	1.76	1.55	TRTR
Martin Water Department	1.51	1.40	1.50	-0.01	TRTR
Milan Water Department	1.34	1.31	1.33	-0.01	TRTR
County Wide Utility District	0.96	1.13	1.01	0.05	TRTR
Bolivar Water System	1.37	1.17	1.28	-0.09	CRCS
McKenzie Water Department	0.72	1.19	1.22	0.49	TRTR
Henderson Water Department	0.86	1.02	1.15	0.29	CRCS
Millington Water Department	1.10	1.17	1.10	0.0	TRTR
Munford Water Department	0.38	0.72	1.05	0.67	TRTR
Naval Support Activity Memphis	1.91	1.56	0.93	-0.98	TRTR
Subtotal withdrawal 1 Mgal/d or more	188.78	201.37	233.12	44.34	
Tennessee Hydrologic Region					
Hixson Utility District	5.61	6.19	6.70	1.09	CMBR
Elizabethton Water Department	5.26	5.35	5.39	0.13	CMBR
Johnson City Water Department	3.18	3.93	3.72	0.54	CRST
Jefferson City Water and Sewer Comm.	1.51	2.34	2.70	1.19	CMBR
Athens Utilities Board	1.76	1.12	2.60	0.84	CMBR
Paris Board of Public Utilities	2.17	2.41	2.57	0.40	TRTR
Savannah Public Utilities Department	1.73	1.60	2.27	0.54	ALVM
Erwin Utilities	1.28	2.08	2.21	0.93	CRST
Lincoln County Board of Public Utilities #1	0.74	1.42	1.68	0.94	MSSP
Savannah Valley Utility District	0.80	0.90	1.66	0.86	CMBR

Table 4. Ground-water withdrawals by public water-supply systems in Tennessee using 1 million gallons per day or more in 2000—Continued

Public water-supply system	Withdrawal rates, in million gallons per day			Change in withdrawals (1988-2000)	Aquifer
	1988	1995	2000		
Tennessee Hydrologic Region—Continued					
Hohenwald Water System	0.90	1.18	1.48	0.58	MSSP
Ocoee Utility District	0.56	1.47	1.33	0.77	CMBR
Lawrenceburg Water System	1.07	1.32	1.27	0.20	MSSP
Cleveland Utilities	1.25	1.47	1.23	-0.02	CMBR
First Utility District of Carter County	0.76	1.06	1.12	0.36	ODVC
Mount Pleasant Water System #1	0.93	1.06	1.03	0.1	ODVC
Mountain City Water Department	1.10	0.45	0.83	-0.27	CMBR
Eastside Utility District	3.77	--	0.00	-3.77	CMBR
Sweetwater Utility Board	1.10	0.47	0.00	-1.10	CMBR
Subtotal withdrawal 1 Mgal/d or more	35.67	35.82	39.79	4.12	
Ohio (Cumberland River) Hydrologic Region					
Fort Campbell Water System	4.98	4.69	4.42	-0.56	MSSP
Lafayette Water System	0.64	0.81	1.48	0.84	MSSP
Gladeville Utility District #1	--	0.97	1.06	1.06	ODVC
Subtotal withdrawals 1 Mgal/d or more	5.62	6.47	6.96	1.34	
Total Statewide	230.07	243.66	279.87	49.80	

SUMMARY

In 2000, public water-supply systems provided approximately 890 Mgal/d of non-purchased surface-water and ground-water supplies to about 88 percent of the population in Tennessee. Gross per capita water use in the State was about 136 gal/d.

Tennessee's public water supplies came from 144 systems that withdrew about 569 Mgal/d of surface water and 256 systems that withdrew about 321 Mgal/d of ground water, with 20 of these systems withdrawing from both sources. A separate category of public water sources came from purchased water supplies, in which systems purchased about 84 Mgal/d of their water from other systems. The largest combined surface-water withdrawals (about 173 Mgal/d) were reported in Middle Tennessee where more than 824,000 customers in Nashville and the surrounding area were supplied by water from the Cumberland River. The single largest ground-water withdrawal (about 167 Mgal/d) by one water system was in West Tennessee where Memphis Light, Gas and Water served more than 644,000 customers in 2000.

The sources of water used for public water supplies in Tennessee are directly related to the diverse physiographic and hydrologic regions across the State. Surface water is used primarily by water systems in Middle and East Tennessee and, in 2000, about 42 Mgal/d of ground water were withdrawn from natural springs in these two regions of the State. In West Tennessee, where ground water is the primary source for public water-supply systems, about 75 percent of the State's potable ground water was produced from the Tertiary sand aquifers.

Historical data available for public water use in Tennessee between 1955 and 2000 indicate surface-water and ground-water withdrawals have increased by about 250 percent. Surface water generally has provided from 60 to 64 percent of the total public water supplies in Tennessee, and ground water has provided the remaining 36 to 40 percent. Within the last 5 to 10 years, surface-water withdrawals have increased more than ground-water withdrawals. Since 1988, the number of public water-supply systems distributing water supplies for the State has declined; however, the number of systems distributing only ground-water supplies has increased during the same time period.

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