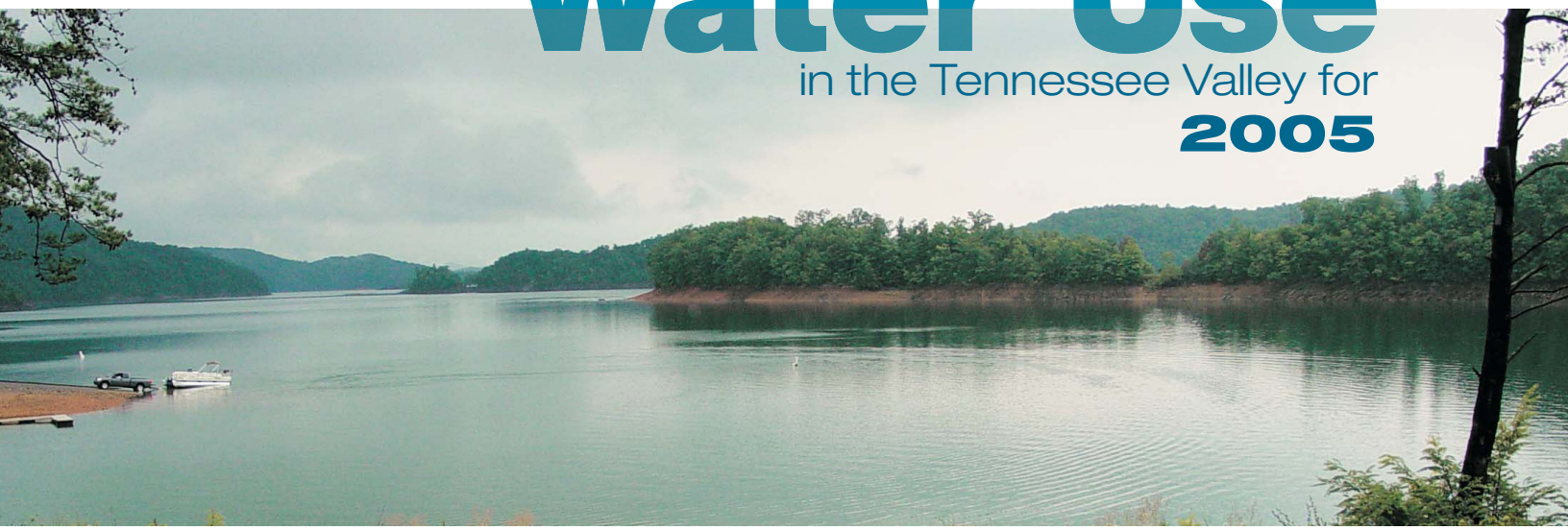
Water Use

in the Tennessee Valley for
2005



and Projected Use in
2030

TVA

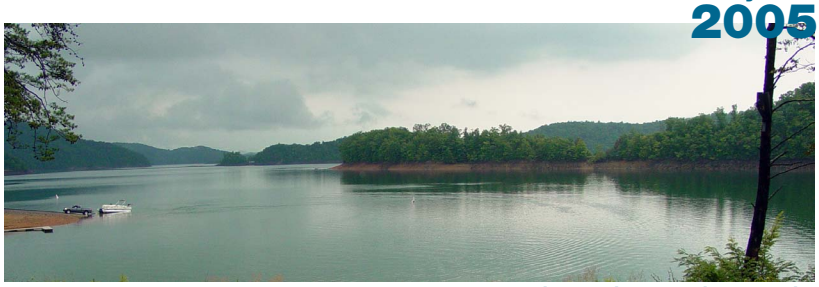
TENNESSEE VALLEY AUTHORITY

Prepared by
River Operations

in cooperation with
U.S. Geological Survey

Water Use

in the Tennessee Valley for
2005



and Projected Use in
2030

Charles E. Bohac
Michael J. McCall

November 2008

TVA

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Executive Summary

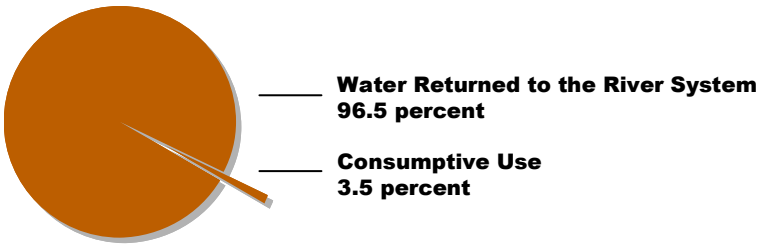
Water Use in 2005

In 2004, the U.S. Geological Survey (USGS) in cooperation with the Tennessee Valley Authority (TVA) published a report on water use in the Tennessee River watershed based on 2000 water-use data. These data were used by TVA in the development of a new reservoir operating policy and to identify potential areas of water supply concerns throughout the watershed. Because of the importance of water-supply planning, TVA in cooperation with the USGS prepared this report on water use in the watershed based on 2005 data.

Offstream water use in the Tennessee River watershed is estimated for 2005. Water use is categorized as thermoelectric power, industrial, public supply, and irrigation. Water use is summarized by category. These categories are source of water (surface water or groundwater) and location of withdrawal (state, county, hydrologic unit code, and reservoir catchment area). Water returns to the watershed are used to estimate consumptive use. A projection of water use for 2030 is also provided.

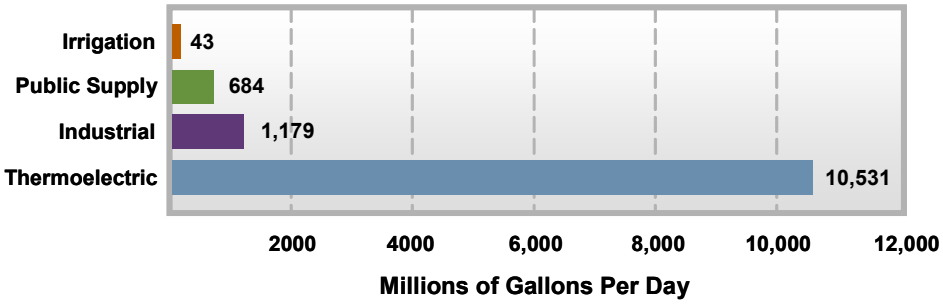
Total water withdrawals during 2005 were estimated to average 12,437 millions of gallons per day (mgd) of freshwater for offstream uses. The return flow was estimated as 12,005 mgd or 96.5 percent of the water withdrawn. Consumptive use accounts for the other 3.5 percent of total withdrawals or 432 mgd. Figure ES–1 illustrates both the water returned to the river system and the consumptive water use.

Figure ES–1: Total Water Withdrawal in 2005



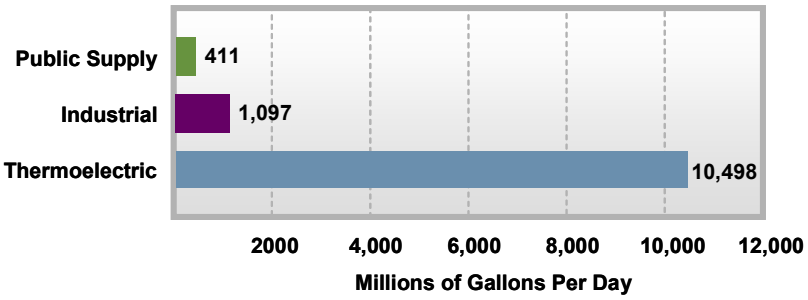
Out of the 12,437 mgd of water withdrawn from the Tennessee River system, thermoelectric power withdrawals were an estimated 10,531 mgd (84.7 percent of total withdrawals); industrial, 1,179 mgd (9.5 percent of total withdrawals); public supply, 684 mgd (5.5 percent of total withdrawals); and for irrigation purposes, 43 mgd (less than 1 percent of total withdrawals). These estimates are shown in Figure ES–2.

Figure ES–2: Water Withdrawals in 2005



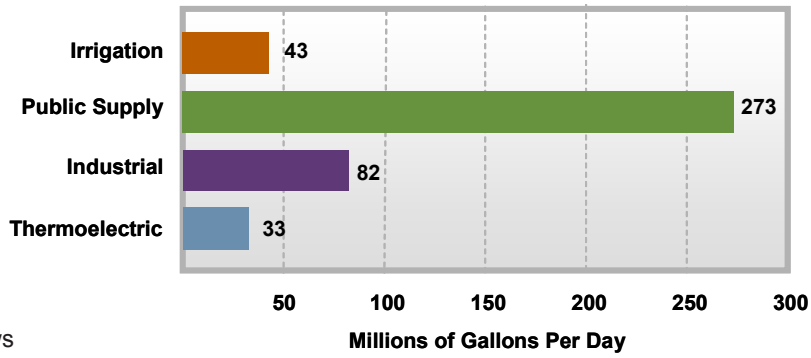
As shown in Figure ES–3, water returns to the river system were estimated as thermoelectric power, 10,498 mgd; industrial, 1,097 mgd; and public supply 411 mgd. No return data for irrigation exist. Therefore, irrigation return is assumed to be zero.

Figure ES–3: Water Returns to the River System in 2005



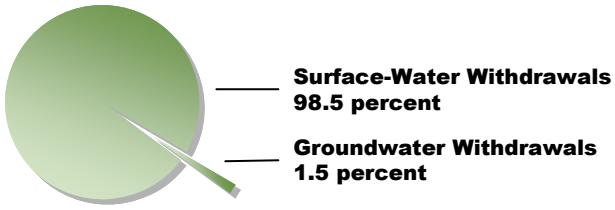
Water that evaporates, transpires, is incorporated into products or crops, or is consumed by humans or livestock is consumptive use. The consumptive use for each category was estimated as thermoelectric power, 33 mgd; industrial, 82 mgd; public supply, 273 mgd; and irrigation, 43 mgd and is shown in Figure ES–4.

Figure ES–4: Consumptive Use in 2005



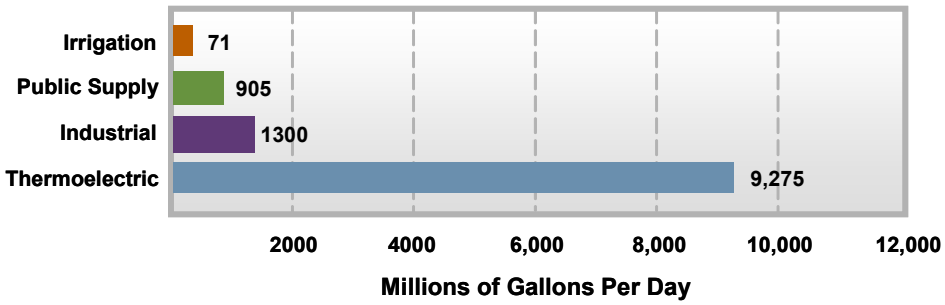
Surface water is obtained from a river or reservoir, and groundwater is obtained from wells. Figure ES–5 shows the surface-water withdrawals were 98.5 percent of total withdrawal, while groundwater withdrawals were 1.5 percent of total withdrawal.

Figure ES–5: Surface-Water and Groundwater Withdrawals in 2005



By 2030, water withdrawals are projected to decline about 7 percent to 11,551 mgd. By category, water withdrawals are projected to increase as follows: industrial 10 percent or to 1,300 mgd, public supply 32 percent or to 905 mgd, and irrigation 65 percent or to 71 mgd. Thermoelectric water withdrawal is expected to decline by 12 percent to 9,275 mgd reflecting a change in cooling technology for power plants. These are shown in Figure ES–6.

Figure ES–6: Projected Water Withdrawals in 2030



1 Introduction

Background

The Tennessee River system is the fifth largest river system in the United States. The Tennessee River watershed drains 40,910 square miles, including portions of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia as shown in Figure 1–1.

Figure 1–1: The Tennessee River Watershed

In 2004, the U.S. Geological Survey (USGS) and the Tennessee Valley Authority (TVA) prepared a water-use estimate for the Tennessee River watershed based on data collected in 2000 (Hutson and others, 2004). Utilizing these data, water-use estimates were projected to 2030 to aid in the water-supply analyses associated with TVA's Reservoir Operations Study (ROS). The ROS was a study conducted by TVA to examine alternative reservoir operations policies in an effort to increase overall public value of the reservoir system. The ROS developed a new operating policy that was implemented by TVA in 2004 (Tennessee Valley Authority, 2004). The 2000 water-use data were also used by TVA in 2004 to identify areas with potential concerns regarding water supply (Bohac and Koroa, 2004).

Purpose and Scope

The purpose of this report is to present water-use estimates for the Tennessee River watershed based on 2005 data with water-use projections to 2030. Water-use estimates will focus on four categories of offstream water use: thermoelectric power, industrial, public supply, and irrigation.

Hydrologic Setting

The Tennessee River system is regulated by a series of 49 dams and reservoirs managed by TVA. TVA operates the Tennessee River system to provide year-round navigation, flood-damage reduction, power generation, improved water quality, water supply, recreation, and economic growth.

Average yearly rainfall over the Tennessee River watershed is approximately 52 inches. Subsequent average runoff of 22 inches per year usually provides enough water to meet the offstream water-use demands on the Tennessee River system. However, periodic droughts may severely limit the ability of the Tennessee River system to meet all of these competing demands, particularly in unregulated portions (streams or rivers without dams) of the Tennessee River system.

Recognizing that annual hydrology will impact the trends in offstream water-use demands, it is important to consider the variability in hydrology since 2000 for this report. From 2001 through 2004 the watershed rainfall was within 10 percent of normal rainfall. In 2000 and 2005, the watershed received 74 percent and 77 percent of normal rainfall respectively.

Data Sources and Analysis Methods

Similar to the water-use estimate prepared in 2000, the data for this report are stored in the TVA Water-Use Data System. Each record in the database is labeled as a withdrawal or return flow water-use transaction. Each water-use transaction for a site in the database is assigned to a Water-Use Tabulation Area (WUTA), Reservoir Catchment Area (RCA), Hydrologic Unit Code (HUC), state, and county. The RCA as defined by Hutson and others (2004), is a natural drainage area truncated by a dam. The WUTA groups RCAs to account for the complete site-specific, water-use transactions between adjoining RCAs and is used to determine consumptive use on a large scale.

The database contains industrial, public-supply, and irrigation water-use data for 2005 collected by the seven Tennessee Valley states and provided to the USGS for its National Water-Use Information Program. Thermoelectric data were obtained from internal TVA sources, particularly those data, submitted to the U. S. Department of Energy for EIA-767 (Steam-Electric Plant Operation and Design Report); interviews with other electrical companies; the U. S. Department of Energy, Energy Information Administration electricity database (U.S. Department of Energy, 2005); and the Nuclear Energy Institute (2005).

The U.S. Environmental Protection Agency, National Pollutant Discharge Elimination System Program, Permit Compliance System (U. S. Environmental Protection Agency, 2005) provided return-flow data for municipalities, industry (including mining), and thermoelectric plants.

The USGS provided estimates of population data by HUC based on the geographic information system analysis of U. S. Bureau of the Census data for 2005.

Future water use was projected using economic-based projection factors provided by Woods and Poole Economics, Inc. (Woods and Poole, 2004).

The Appendix of this report summarizes the source and type of withdrawal data for Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia.

Water-use numerical data presented in this report are the daily quantities averaged over the year. Although irrigation data are applied seasonally at a rate higher than annual average daily quantities, the application rates were averaged over the year to make them compatible with the other data.

In Section 2 of this report, entries for Tables 2–1 through 2–24 contain two decimal places and totals are shown as integers. All numbers were rounded independently. Therefore, the sums of independently rounded numbers may not equal the totals (expressed as integers) in the report.

2

Water Use

Introduction

Water use for 2005 is organized in three ways.

The first presentation, and illustrated by Table 2–1, is a summary based on Water-Use Tabulation Area (WUTA) and Reservoir Catchment Area (RCA). Figure 2–1 shows the Tennessee River watershed divided into RCAs. The Water-Use Tabulation Area (WUTA) groups RCAs to account for the complete site-specific water-use transactions between adjoining RCAs and is used to determine consumptive use at a large scale. Table 2–1 shows the WUTAs in bold type with the RCAs comprising WUTA listed below.

The second spatial summary is by hydrologic unit code (HUC), and the third spatial summary is by state and county. Figure 2–2 shows the HUCs, and Figure 2–3 shows the counties comprising the Tennessee River watershed.

Withdrawals are either from surface water or groundwater. Return flow is comprised of discharges from industrial and publicly owned wastewater treatment plants. The difference between withdrawal and return is the net water demand at the RCA level. As in the case of Hutson and others (2004), the net water demand is accumulated at the downstream boundary of the WUTA to calculate a consumptive use. Cumulative consumptive use was calculated at key junctures of the WUTAs (Fort Loudoun, Watts Bar-Chickamauga, Nickajack, Guntersville, Wheeler-Wilson, Pickwick, and Kentucky) in the river system and indicates a sum of consumptive use in the watershed to that juncture. The consumptive use accumulated at Kentucky Dam is the total consumptive use for the watershed.

Information is presented by source of water, category of use, and type of transaction. Water sources are surface water and groundwater. Use categories are public supply, industrial (including mining), thermoelectric, and irrigation. Transactions are either withdrawals or returns. Returns are water discharges from thermoelectric power plants, industries, and municipal wastewater treatment plants.

Hutson and others (2004) define net water demand as the quantitative difference between water withdrawals and return flow. Consumptive use is that part of the water withdrawn that is evaporated, transported, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate environment. In this report, 100 percent of the water used for irrigation is considered to be consumptive use.

Offstream Water Use

Total Offstream Water Use

Total offstream water use for 2005 by WUTA area is shown in Table 2–1.

Total withdrawal was 12,437 mgd of which 98.5 percent or 12,247 mgd came from surface water. Groundwater supplied the remaining 1.5 percent or 190 mgd. Return flow totaled 12,005 mgd or 96.5 percent of total withdrawal. Total consumptive use was 432 mgd or 3.5 percent of total withdrawal and is shown in Figure 2–4.

Figure 2–5 shows the cumulative consumptive use at major WUTA junctures and net water demand for reservoir catchment areas.

Table 2–2 and Figure 2–6 show total offstream water use by HUC. The Wheeler HUC (06030002) had the largest withdrawal of 2,258 mgd or 18 percent of total withdrawal followed by the Middle Tennessee-Chickamauga HUC (06020001) at 1,669 mgd or 13 percent of the total withdrawal.

The Watts Bar-Chickamauga WUTA had the largest withdrawal of 3,147 mgd (Table 2–1) or 25 percent of the total withdrawal followed by Wheeler-Wilson at 2,323 mgd which is 19 percent of total withdrawal.

As shown in Table 2–3, Tennessee had the largest state withdrawal of 6,747 mgd or 54 percent of the total withdrawal, while Alabama had the next largest total withdrawal of 5,180 mgd or 42 percent of the total withdrawal. Tennessee comprises about 50 percent of the Tennessee River watershed, while Alabama comprises about 22 percent of the watershed. The largest county withdrawal is Limestone County, Alabama, which has a total withdrawal of 2,012 mgd.

For 2005, the total watershed intensity of water use by area was 0.304 mgd per square miles. Table 2–2 and Figure 2–7 show the intensity of per capita water use by HUC.

Water Use Summarized by Category

Table 2–4 presents total water use by category and WUTA.

Thermoelectric water use was the category with the largest total withdrawal of 10,531 mgd or 85 percent of total withdrawal. Total industrial withdrawal was 1,179 mgd or 9.5 percent of total withdrawal, total public-supply withdrawal was 684 mgd or 5.5 percent of total withdrawal, and total irrigation withdrawal was 43 mgd which was less than 1 percent of total withdrawal.

Of total return flow of 12,005 mgd, thermoelectric returns were 87 percent of the total, industrial returns were 9 percent of total returns, and public-supply returns were 3 percent of total returns.

Total water use by HUC is shown in Table 2–5.

The HUC with the largest thermoelectric water withdrawal (1,991 mgd) is Wheeler (06030002). Wheeler also has the largest public-supply withdrawal (105 mgd) and irrigation withdrawal (13 mgd). The largest industrial water withdrawal (617 mgd) is from South Fork Holston River (06010102).

Table 2–6 shows total water use by state and county.

The largest thermoelectric water withdrawal (1,990 mgd) was in Limestone County, Alabama. Limestone County also had the highest irrigation withdrawal of 8 mgd. Sullivan County, Tennessee, had the largest industrial water withdrawal of 617 mgd, and Knox County, Tennessee, had the largest public-supply withdrawal of 63 mgd. However, Madison County, Alabama, was very close with 62.5 mgd.

Water Use Summarized by Source

Tables 2–7 through 2–12 summarize surface-water and groundwater withdrawals by category, by HUC, and by state and county. Total withdrawal was 12,247 mgd for surface-water and 190 mgd for groundwater.

Surface water supplied all of the thermoelectric withdrawal, 97 percent or 1,149 mgd of the total industrial withdrawal, 78 percent or 534 mgd of the total public-supply withdrawal, 74 percent or 32 mgd of the total irrigation withdrawal, and 98.4 percent of total water withdrawal.

Tennessee withdrew 6,656 mgd of surface water which is 54 percent of total surface-water withdrawal. Alabama withdrew 5,135 mgd or 42 percent of total surface-water withdrawal. Limestone County, Alabama, had the largest total surface-water withdrawal of 2,006 mgd, almost all of which was for thermoelectric use. Hamilton County, Tennessee, had the next highest surface-water withdrawal of 1,595 mgd, which was also mostly for thermoelectric use. Industry used more surface water in Sullivan County, Tennessee, (617 mgd) than in any other county, while public-supply use was highest in Knox County, Tennessee, (62 mgd). Surface-water withdrawal for irrigation was highest in Limestone County, Alabama, with 6 mgd.

Tennessee withdrew 90 mgd of groundwater which is 47 percent of total groundwater withdrawal. Alabama withdrew 44 mgd or 22 percent of total groundwater. Madison County, Alabama, had the largest total groundwater withdrawal of 25 mgd, most of which was used for public supply. Hamilton County, Tennessee, had the next highest total withdrawal at 16 mgd. Hamilton County used more groundwater for industry (7 mgd) than any other county. Limestone County, Alabama, had the highest groundwater use for irrigation (2 mgd).

Water Use Described by Category

Thermoelectric

Table 2–13 shows thermoelectric use by WUTA. Total thermoelectric use was 10,531 mgd. Although thermoelectric use was 85 percent of total use, almost all (99.7 percent) was returned as shown in Figure 2–8.

The largest WUTA withdrawal was 3,007 mgd from the Watts Bar-Chickamauga WUTA. The largest withdrawal was Browns Ferry Nuclear Plant in Limestone County, Alabama, and its location is shown in Figure 2–9.

Table 2–14 and Figure 2–10 display use by HUC. Six HUCs had withdrawals ranging from about 1,200 mgd to almost 2,000 mgd. All of these HUCs include segments of the main stem of the Tennessee River.

As shown in Table 2–15, Tennessee's total thermoelectric withdrawal was 5,491 mgd which was 52 percent of total thermoelectric water withdrawal. Alabama's total thermoelectric withdrawal was 4,762 mgd which was 45 percent of total thermoelectric withdrawal. Tennessee's thermoelectric withdrawal was used to generate 56,498 million kilowatt hours of electricity or 57 percent of total power generated. Alabama's withdrawal was used to generate 36,747 million kilowatt hours of electricity or 37 percent of total power generated.

Industrial

Table 2–16 shows that industrial water withdrawal was 1,179 mgd or 9.5 percent of total withdrawal. Industrial return flow was 1,097 mgd and total consumptive use was 82 mgd or 7 percent of total industrial use as shown in Figure 2–11. Figure 2–11 also shows surface water supplied 97 percent of industrial water use (1,149 mgd).

Table 2–17 and Figure 2–12 show industrial use by HUC. Table 2–18 and Figure 2–13 show industrial use by state and county.

The Tennessee industrial withdrawal was 860 mgd, or 73 percent, of the total industrial withdrawal of 1,179 mgd. Nearly 72 percent of Tennessee's industrial withdrawal was from Sullivan County. Alabama had the next largest industrial withdrawal of 214 mgd or 18 percent of total industrial withdrawal.

Public Supply

Total water withdrawal for public supply was 684 mgd as shown in Table 2–19 which was 5.5 percent of total water use. Total return flow was 411 mgd. Consumptive use was 273 mgd or 40 percent of total public-supply withdrawal as shown in Figure 2–14. Surface water supplied 534 mgd or 78 percent of total public-supply use and is shown in Figure 2–14.

Table 2–20 and Figure 2–15 summarize public-supply use by HUC, and Table 2–21 and Figure 2–16 summarize by state and county.

Irrigation

Table 2–22 shows irrigation water withdrawals by WUTA. Surface water supplied about 75 percent of the total withdrawal and is shown in Figure 2–17.

Table 2–23 and Figure 2–18 show irrigation by HUC and Table 2–24 shows irrigation by state and county.

Alabama's irrigation use was the largest at 22 mgd or 51 percent of the irrigation total of 43 mgd. Tennessee's total was the next highest at 17 mgd or 40 percent of the irrigation total.

Table 2–1: Total Offstream Water Use by Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Total Return Flow	Net Water Demand Consumptive Use
	Surface	Ground	Total Water		
Cherokee					
Watauga	15.25	11.00	25.25	1.63	24.62
South Holston	16.48	6.97	23.45	5.40	18.05
Boone	0.10	0.14	0.24	23.00	-22.75
Ft Patrick Henry	632.89		632.89		632.89
Cherokee	711.63	13.64	725.27	1,288.41	-563.14
WUTA total	*1,376.35*	*31.76*	*1,408.11*	*1,318.44*	*89.67*
Cumulative	*1,376.35*	*31.76*	*1,408.11*	*1,318.44*	*89.67*
Douglas					
Douglas	388.75	22.82	411.57	358.95	52.62
WUTA total	*388.75*	*22.82*	*411.57*	*358.95*	*52.62*
Cumulative	*1,765.11*	*54.57*	*1,819.68*	*1,677.39*	*142.29*
Fort Loudoun					
Fort Loudoun	75.63	2.03	77.66	76.57	1.09
WUTA total	*75.63*	*2.03*	*77.66*	*76.57*	*1.09*
Cumulative	*1,840.73*	*56.60*	*1,897.33*	*1,753.96*	*143.38*
Fontana-Tellico					
Fontana	32.00	4.80	36.79	31.74	5.05
Santeetlah	0.42	0.26	0.68		0.68
Tellico	3.00	0.27	3.27	1.63	1.64
WUTA total	*35.41*	*5.33*	*40.74*	*33.36*	*7.38*
Cumulative	*1,876.14*	*61.93*	*1,938.07*	*1,787.32*	*150.75*
Norris					
Norris	35.15	3.01	38.16	22.84	15.33
Melton Hill	590.90	2.16	593.06	580.34	12.72
WUTA total	*626.06*	*5.17*	*631.23*	*603.18*	*28.05*
Cumulative	*2,502.20*	*67.10*	*2,569.30*	*2,390.50*	*178.80*
Hiwassee-Ocoee					
Chatuge	2.00	0.85	2.85	0.2	2.65
Nottely	0.92	0.72	1.65	0.34	1.31
Hiwassee	0.88	1.11	2.00	1.54	0.46
Apalachia	3.21		3.21	0.01	3.20
Blue Ridge	5.45	0.23	5.68	0.47	5.21
Ocoee	0.02	1.15	1.17	3.59	-2.42
WUTA total	*12.48*	*4.07*	*16.55*	*6.15*	*10.40*
Cumulative	*2,514.68*	*71.17*	*2,585.85*	*2,396.66*	*189.20*
Watts Bar-Chickamauga					
Watts Bar	1,443.17	0.99	1,444.16	1,303.49	140.66
Chickamauga	1,677.82	25.44	1,703.26	1,803.52	-100.26
WUTA total	*3,120.99*	*26.42*	*3,147.41*	*3,107.01*	*40.40*
Cumulative	*5,635.67*	*97.60*	*5,733.26*	*5,503.67*	*229.60*
Nickajack					
Nickajack	47.18	7.67	54.85	57.89	-3.04
WUTA total	*47.18*	*7.67*	*54.85*	*57.89*	*-3.04*
Cumulative	*5,682.85*	*105.26*	*5,788.12*	*5,561.56*	*226.56*

Table 2–1: Total Offstream Water Use by Water-Use Tabulation Area in 2005 (Continued) (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Total Return Flow	Net Water Demand Consumptive Use
	Surface	Ground	Total Water		
Guntersville					
Guntersville	1,523.67	6.84	1,530.51	1,500.71	29.80
WUTA total	*1,523.67*	*6.84*	*1,530.51*	*1,500.71*	*29.80*
Cumulative	*7,206.52*	*112.11*	*7,318.62*	*7,062.27*	*256.36*
Tims Ford					
Tims Ford	29.56	4.09	33.66	25.84	7.82
WUTA total	*29.56*	*4.09*	*33.66*	*25.84*	*7.82*
Cumulative	*7,236.08*	*116.20*	*7,352.28*	*7,088.11*	*264.18*
Wheeler-Wilson					
Wheeler	2,239.60	37.22	2,276.82	2,202.38	74.45
Wilson	41.73	4.77	46.49	8.86	37.64
WUTA total	*2,281.33*	*41.99*	*2,323.32*	*2,211.24*	*112.08*
Cumulative	*9,517.41*	*158.19*	*9,675.60*	*9,299.34*	*376.26*
Pickwick					
Pickwick	1,335.00	4.27	1,339.27	1,360.03	-20.75
Cedar Creek	3.88	0.32	4.20		4.20
Upper Bear Creek	3.17		3.17		3.17
WUTA total	*1,342.05*	*4.59*	*1,346.64*	*1,360.03*	*-13.38*
Cumulative	*10,859.46*	*162.78*	*11,022.24*	*10,659.37*	*362.87*
Normandy					
Normandy	25.52	2.17	27.69	2.31	25.38
WUTA total	*25.52*	*2.17*	*27.69*	*2.31*	*25.38*
Cumulative	*10,884.98*	*164.95*	*11,049.93*	*10,661.68*	*388.26*
Kentucky					
Kentucky	1,361.73	25.19	1,386.92	1,343.51	43.41
WUTA total	*1,361.73*	*25.19*	*1,386.92*	*1,343.51*	*43.41*
Cumulative	***12,247***	**190**	***12,437***	***12,005***	***432***

Note: Figures may not add to totals because of independent rounding.

Figure 2–1: Tennessee River Watershed Divided into Reservoir Catchment Areas

Figure 2–2: The 8-Digit Hydrologic Unit Codes of the Tennessee River Watershed

Figure 2–3: States and Counties Within the Tennessee River Watershed

Figure 2–4: Source and Disposition of Total Water Use in the Tennessee River Watershed in 2005

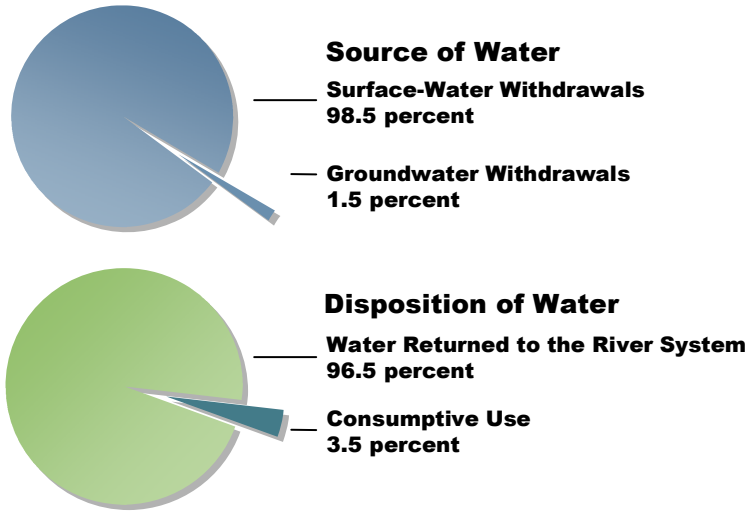


Figure 2–5: Cumulative Consumptive Use at Major Water-Use Tabulation Area Junctures and Net Water Demand for Reservoir Catchment Areas in the Tennessee Watershed in 2005.

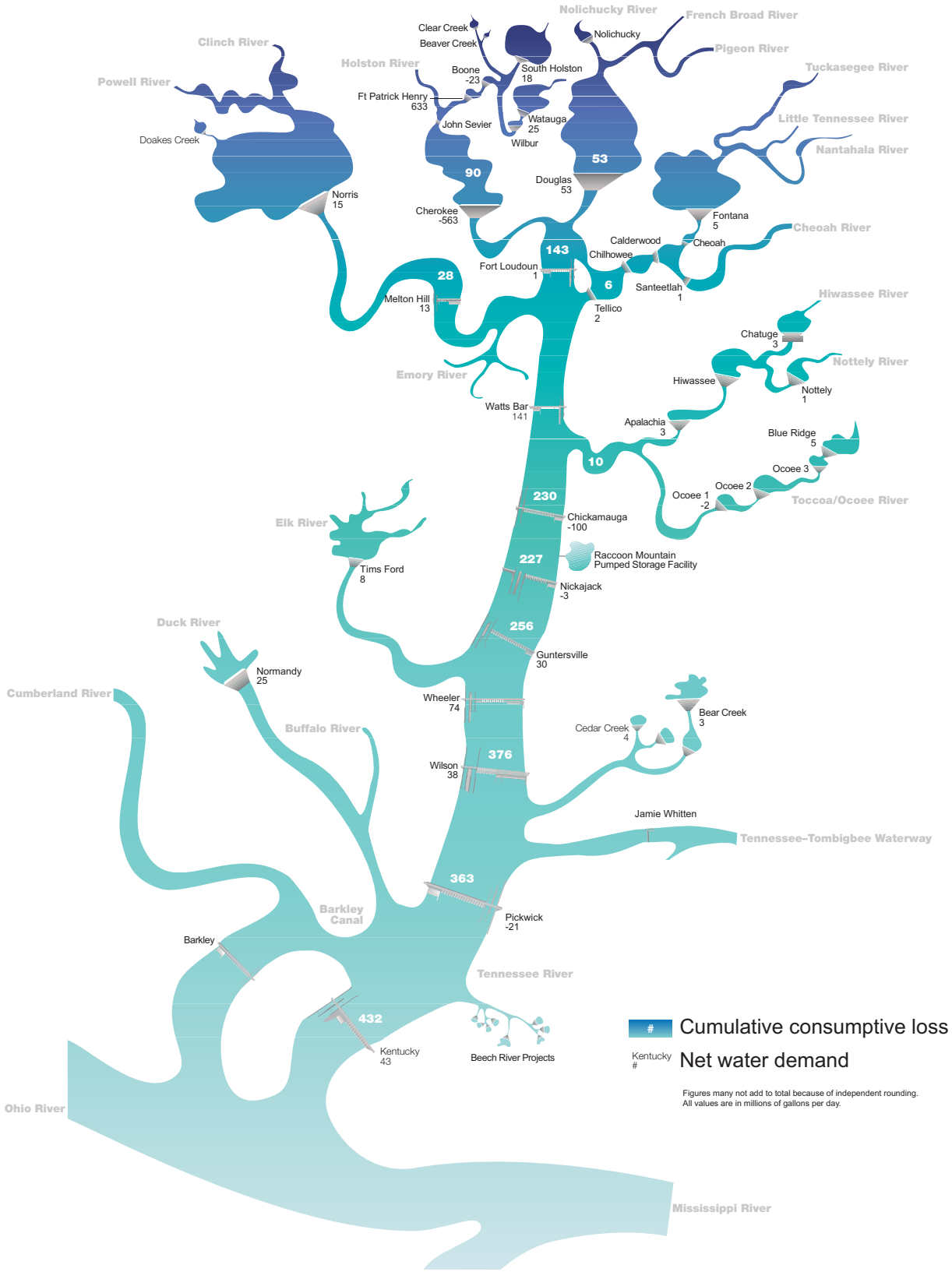


Table 2–2: Total Offstream Water Use by Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Population	Gross Per Capita Use Gal/day	Withdrawals			Total Return	Net Water Demand
			Surface	Ground	Total		
6010101	32,019	121.32	2.00	1.88	3.88	3.00	0.88
6010102	239,233	2,744.05	649.43	7.03	656.47	599.55	56.92
6010103	169,980	155.13	15.29	11.08	26.37	14.17	12.20
6010104	188,081	3,835.77	709.68	11.75	721.43	711.61	9.82
6010105	359,330	865.36	305.24	5.71	310.95	297.74	13.21
6010106	75,670	529.47	39.10	0.97	40.06	35.49	4.57
6010107	118,297	123.69	12.46	2.18	14.63	7.96	6.67
6010108	169,756	275.67	32.01	14.79	46.80	25.31	21.48
6010201	448,905	511.26	227.41	2.09	229.51	75.00	154.50
6010202	39,672	565.71	20.23	2.21	22.44	20.24	2.21
6010203	45,801	295.32	11.77	1.76	13.53	11.50	2.02
6010204	52,807	70.35	3.20	0.51	3.71	1.63	2.09
6010205	143,464	225.24	30.05	2.26	32.31	18.32	13.99
6010206	66,155	88.15	5.08	0.75	5.83	4.06	1.77
6010207	188,551	3,151.34	591.81	2.38	594.19	1,865.84	-1271.66
6010208	73,246	17,620.26	1,290.61	0.00	1,290.61	2.56	1,288.05
6020001	483,878	3,449.14	1,639.56	29.40	1,668.96	1,772.85	-103.89
6020002	215,477	459.16	91.17	7.77	98.94	90.62	8.32
6020003	27,701	247.26	5.46	1.38	6.85	4.10	2.75
6020004	31,227	174.83	3.63	1.83	5.46	1.00	4.46
6030001	149,347	10,217.02	1,521.56	4.32	1,525.88	1,499.54	26.34
6030002	534,430	4,224.25	2,221.89	35.68	2,257.56	2,197.07	60.50
6030003	74,852	476.91	31.05	4.65	35.70	29.35	6.35
6030004	47,188	382.37	17.02	1.02	18.04	1.97	16.07
6030005	198,716	6,964.97	1,376.77	7.28	1,384.05	1,364.79	19.26
6030006	40,206	243.11	7.69	2.08	9.77	4.09	5.68
6040001	79,069	416.90	28.80	4.16	32.96	27.73	5.23
6040002	108,119	290.86	29.28	2.17	31.45	13.20	18.25
6040003	125,387	66.96	8.17	0.22	8.40	8.66	-0.27
6040004	22,998	138.22	1.31	1.87	3.18	2.05	1.13
6040005	67,578	19,263.60	1,295.54	6.25	1,301.80	1,294.18	7.62
6040006	87,762	400.14	22.43	12.68	35.12		35.12
Total	**4,704,902**	**2,643**	**12,247**	**190**	**12,437**	**12,005**	**432**

Note: Figures may not add to totals because of independent rounding.

Figure 2–6: Total Water Withdrawals by Source and by Hydrologic Unit Code in the Tennessee River Watershed in 2005

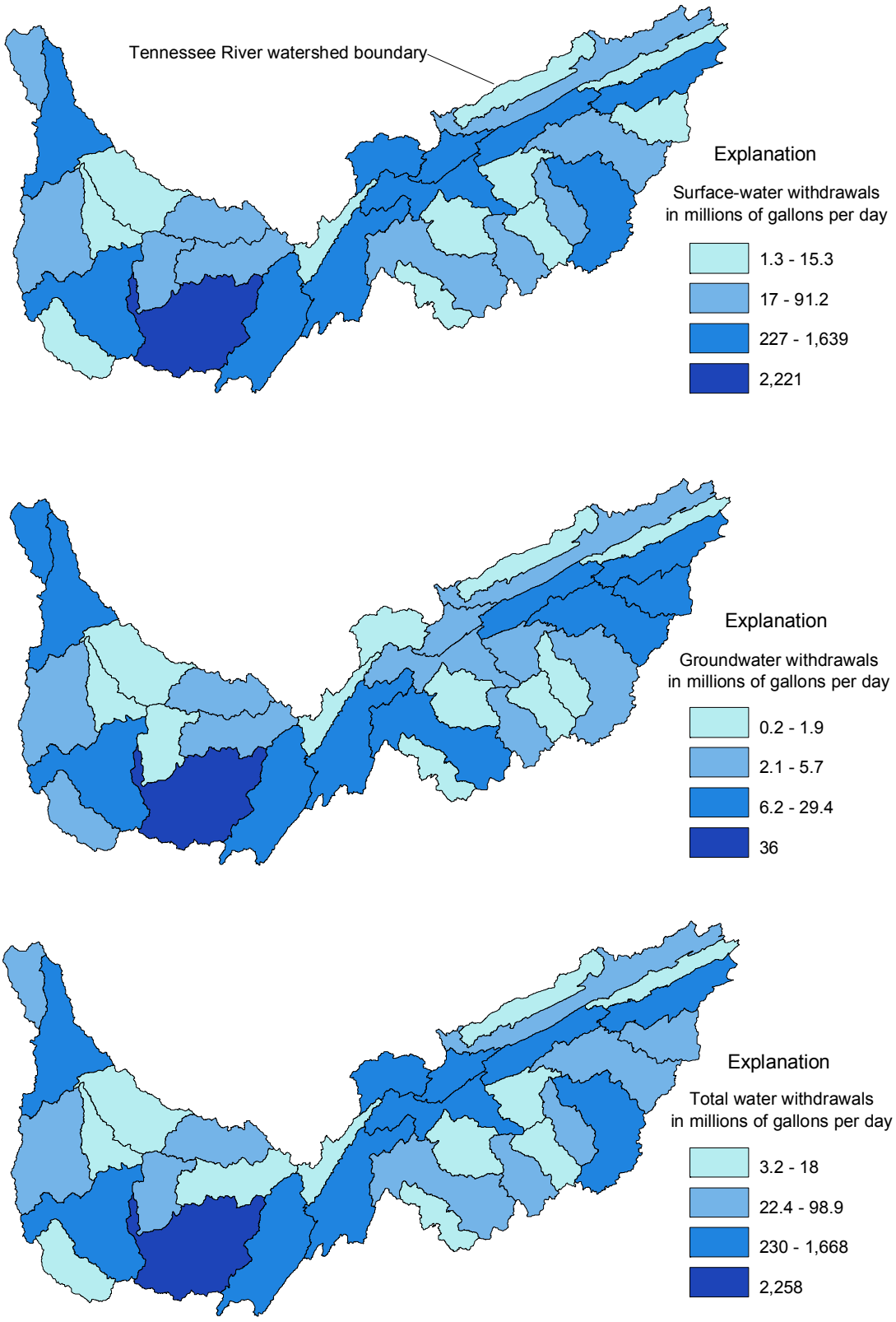


Table 2–3: Total Offstream Water Use by County in 2005 (Millions of Gallons per Day)

State/County	Withdrawals			Total Return	Net Water Demand
	Surface	Ground	Total		
Alabama					
Blount	0.01	0.01	0.02		0.02
Colbert	1,359.74	2.57	1,362.32	1,350.67	11.65
Cullman	0.00	0.06	0.06		0.06
Dekalb	1.27	1.21	2.47		2.47
Etowah	0.01	0.00	0.01		0.01
Franklin	4.08	1.07	5.16	3.71	1.45
Jackson	1,495.82	0.67	1,496.49	1,489.64	6.84
Lauderdale	13.60	2.14	15.74	9.68	6.06
Lawrence	65.29	0.31	65.60	53.50	12.10
Limestone	2,005.75	6.62	2,012.37	1,993.62	18.75
Madison	42.15	25.31	67.46	37.21	30.25
Marion	4.49	0.00	4.49	0.12	4.37
Marshall	21.44	3.03	24.47	10.46	14.01
Morgan	121.71	1.41	123.12	112.68	10.44
State Total	5,135.35	44.42	5,179.77	5,061.28	118.49
Georgia					
Catoosa	1.35	4.39	5.73	0.56	5.18
Dade	2.37	0.15	2.52	0.32	2.20
Fannin	1.62	0.15	1.77	0.47	1.31
Rabun	1.59	0.56	2.15	1.89	0.26
Towns	1.08	0.26	1.34	0.36	0.98
Union	0.92	0.72	1.65	0.34	1.31
Walker	0.79	6.06	6.84	1.67	5.17
State Total	9.71	12.29	22.00	5.60	16.40
Kentucky					
Calloway	0.27	4.52	4.79	0.00	4.79
Graves	0.11	0.06	0.17		0.17
Livingston	4.26	1.80	6.05		6.05
Lyon	0.00	0.02	0.02	0.01	0.01
McCracken	0.00	0.74	0.74		0.74
Marshall	17.77	5.82	23.60	0.26	23.34
State Total	22.42	12.95	35.37	0.27	35.10
Mississippi					
Tishomingo		2.36	2.36	1.43	0.93
State Total		2.36	2.36	1.43	0.93
North Carolina					
Avery	0.93	1.13	2.06	1.62	0.43
Buncombe	285.67	4.11	289.78	286.09	3.69
Cherokee	1.52	1.02	2.54	1.33	1.20
Clay		0.59	0.59	0.06	0.53
Graham	17.46	0.28	17.74	17.39	0.35
Haywood	39.00	0.97	39.97	32.93	7.04
Henderson	7.49	2.34	9.83	3.74	6.09
Jackson	1.29	1.16	2.45	1.22	1.23
Macon	1.61	1.64	3.24	1.33	1.91
Madison	0.23	1.07	1.29	0.40	0.89
Mitchell	5.73	0.82	6.55	3.73	2.82
Swain	10.48	0.60	11.08	10.31	0.77
Transylvania	7.75	1.20	8.95	7.51	1.44
Watauga	3.05	1.03	4.08	0.29	3.79
Yancey	0.54	0.89	1.44	0.47	0.97
State Total	382.75	18.84	401.59	368.42	33.17
Tennessee					
Anderson	578.48	0.52	579.00	573.91	5.10
Bedford	9.22	0.87	10.09	8.62	1.48
Benton	3.49	0.19	3.68	1.07	2.61
Bledsoe	0.44	0.49	0.93	0.15	0.78
Blount	12.55	0.47	13.02	14.83	-1.80
Bradley	14.15	2.55	16.70	12.59	4.10
Campbell	2.33	0.63	2.96	1.58	1.37
Carroll	0.97	0.70	1.67	0.20	1.47
Carter	0.19	8.93	9.12	2.56	6.57
Claiborne	2.74	0.10	2.83	0.53	2.30

Note: Figures may not add to totals because of independent rounding.

Table 2–3: Total Offstream Water Use by County in 2005 (Continued)
(Millions of Gallons per Day)

State/County	Withdrawals			Total Return	Net Water Demand
	Surface	Ground	Total		
Tennessee (continued)					
Cocke	4.25	0.09	4.33	2.56	1.77
Coffee	30.36	0.94	31.31	26.56	4.75
Cumberland	5.51	0.00	5.51	1.98	3.53
Decatur	1.03	0.21	1.24	0.53	0.70
Dickson	0.01		0.01		0.01
Dickson	4.91		4.91		4.91
Fentress	0.00		0.00		0.00
Franklin	3.40	2.88	6.28	1.38	4.90
Giles	3.81	0.36	4.17	1.77	2.40
Grainger	0.38	4.58	4.96	4.66	0.30
Greene	10.82	0.06	10.88	6.12	4.77
Grundy	1.11		1.11	0.37	0.74
Hamblen	19.56	0.53	20.09	12.49	7.60
Hamilton	1,594.65	16.40	1,611.05	1,594.51	16.53
Hancock	0.25	0.00	0.25	0.17	0.09
Hardin	24.83	2.43	27.26	24.78	2.48
Hawkins	697.43	1.26	698.70	695.42	3.28
Henderson	3.03	0.39	3.41	1.55	1.86
Henry	0.40	3.34	3.75	2.28	1.46
Hickman	2.42	2.42	0.49	1.93	
Houston		0.20	0.20		0.20
Humphreys	1,290.68	1.51	1,292.19	1,290.74	1.45
Jefferson	1.11	7.46	8.58	3.96	4.61
Johnson	0.43	1.64	2.07	0.82	1.25
Knox	63.06	1.38	64.44	59.45	4.99
Lawrence	2.99	2.34	5.33	2.45	2.88
Lewis	0.01	1.56	1.57	0.72	0.85
Lincoln	2.74	2.31	5.05	1.37	3.67
Loudon	15.80	0.37	16.17	12.46	3.70
McMinn	73.47	2.64	76.10	75.93	0.17
McNairy	0.11	0.91	1.02	0.49	0.53
Marion	2.33	1.39	3.71	0.81	2.90
Marshall	2.62	0.16	2.78	2.36	0.42
Maury	12.06	1.11	13.17	7.98	5.19
Meigs	0.14	0.70	0.85	0.26	0.59
Monroe	3.90	0.79	4.69	2.44	2.25
Moore	0.90	0.36	1.25	1.97	-0.72
Morgan	1.36		1.36	0.58	0.78
Perry	0.62		0.62	0.61	0.01
Polk	3.86	1.23	5.09	3.63	1.46
Rhea	191.70	0.96	192.66	176.11	16.54
Roane	1,287.09	1.03	1,288.12	1,282.04	6.09
Sequatchie	0.76		0.76	0.49	0.27
Sevier	8.86	0.35	9.21	7.55	1.65
Stewart	0.02	0.04	0.06	0.06	
Sullivan	640.74	0.45	641.19	592.19	49.00
Unicoi	0.05	9.21	9.26	5.22	4.03
Union	0.01	0.35	0.36	0.31	0.05
Washington	15.25	0.56	15.81	11.72	4.08
Wayne	1.04	0.30	1.34	0.89	0.46
Williamson	0.07	0.17	0.24		0.24
State Total	6,656.45	90.41	6,746.86	6,539.22	207.63
Virginia					
Lee	1.40	0.58	1.98	0.89	1.09
Russell	19.24	1.15	20.39	4.85	15.54
Scott	1.10	0.01	1.11	3.45	-2.33
Smyth	2.14	4.09	6.23	3.04	3.20
Tazewell	3.20	0.09	3.29	5.55	-2.26
Washington	7.80	2.74	10.55	3.53	7.01
Wise	5.15	0.21	5.36	7.66	-2.31
State Total	40.04	8.88	48.91	28.97	19.94
Watershed Total	**12,247**	**190**	**12,437**	**12,005**	**432**

Note: Figures may not add to totals because of independent rounding.

Figure 2–7: Intensity of Per Capita Use Withdrawals by Hydrologic Unit Code in the Tennessee River Watershed in 2005

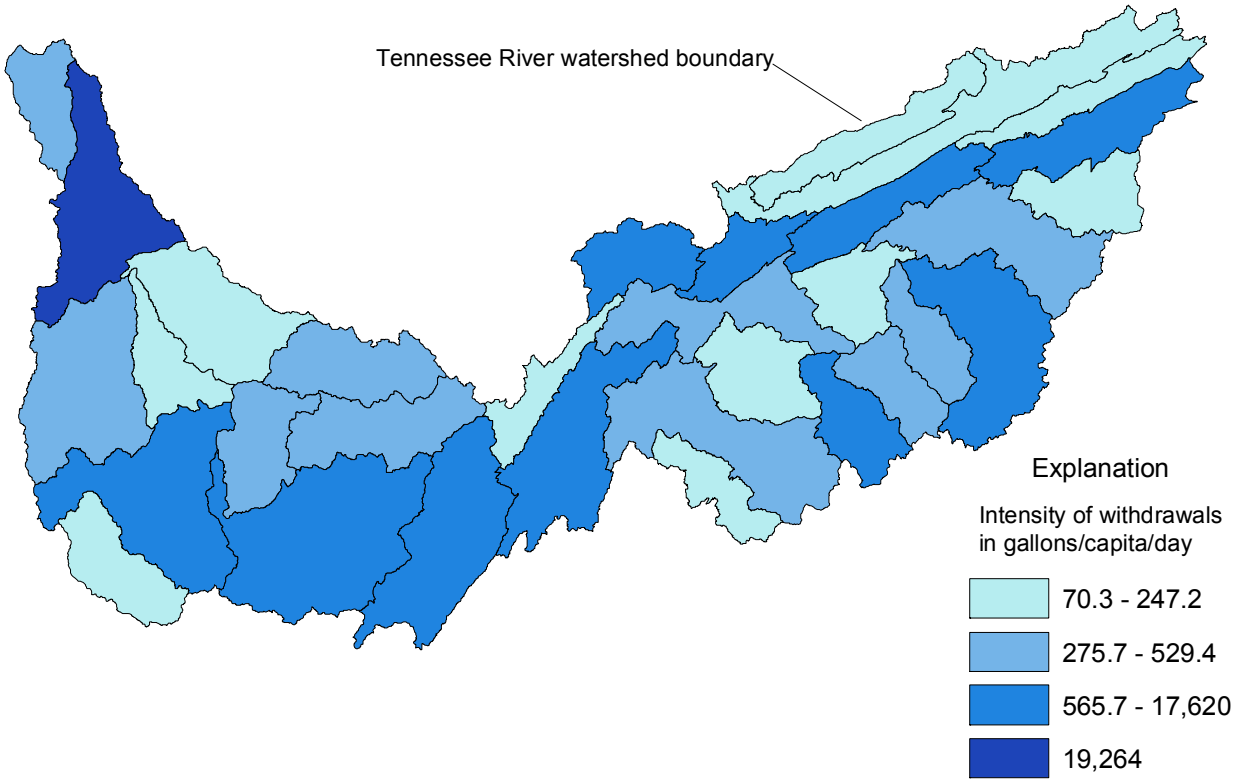


Table 2–4: Total Water Use by Category and Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Reservoir Catchment Area	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
Cherokee									
Watauga			0.10	0.00	25.69	1.62	0.46	26.25	1.63
South Holston				0.84	23.02	4.56	0.43	23.45	5.40
Boone			0.10			23.00	0.14	0.24	23.00
Ft Patrick Henry			616.68		16.21			632.89	0.00
Cherokee	693.70	692.44	7.33	578.72	21.45	17.25	2.80	725.27	1,288.41
Subtotal	*693.70*	*692.44*	*624.21*	*579.56*	*86.37*	*46.43*	*3.83*	*1,408.11*	*1,318.44*
Cumulative	*693.70*	*692.44*	*624.21*	*579.56*	*86.37*	*46.43*	*3.83*	*1,408.11*	*1,318.44*
Douglas									
Douglas	262.66	262.65	63.13	53.21	83.64	43.09	2.14	411.57	358.95
Subtotal	*262.66*	*262.65*	*63.13*	*53.21*	*83.64*	*43.09*	*2.14*	*411.57*	*358.95*
Cumulative	*956.36*	*955.09*	*687.33*	*632.77*	*170.01*	*89.53*	*5.97*	*1,819.68*	*1,677.39*
Fort Loudoun									
Fort Loudoun			7.37	12.82	69.67	63.76	0.62	77.66	76.57
Subtotal			*7.37*	*12.82*	*69.67*	*63.76*	*0.62*	*77.66*	*76.57*
Cumulative	*956.36*	*955.09*	*694.70*	*645.59*	*239.68*	*153.28*	*6.59*	*1,897.33*	*1,753.96*
Fontana-Tellico									
Fontana			27.18	27.39	9.54	4.35	0.07	36.79	31.74
Santeetlah					0.68			0.68	0.00
Tellico			0.01	0.11	2.77	1.52	0.48	3.27	1.63
Subtotal			*27.20*	*27.49*	*12.99*	*5.87*	*0.55*	*40.74*	*33.36*
Cumulative	*956.36*	*955.09*	*721.90*	*673.08*	*252.67*	*159.15*	*7.15*	*1,938.07*	*1,787.32*
Norris									
Norris	15.16	3.20	3.75	4.05	18.92	15.59	0.33	38.16	22.84
Melton Hill	563.20	563.17	1.57	4.35	27.39	12.83	0.90	593.06	580.34
Subtotal	*578.36*	*566.36*	*5.32*	*8.40*	*46.32*	*28.42*	*1.23*	*631.23*	*603.18*
Cumulative	*1,534.72*	*1,521.45*	*727.22*	*681.48*	*298.99*	*187.57*	*8.38*	*2,569.30*	*2,390.50*
Hiwassee-Ocoee									
Chatuge					2.67	0.2	0.18	2.85	0.2
Nottely					1.65	0.34		1.65	0.34
Hiwassee					1.62	1.54	0.37	2.00	1.54
Apalachia					3.21	0.01		3.21	0.01
Blue Ridge			3.62	0.01	2.01	0.46	0.05	5.68	0.47
Ocoee				3.30	1.15	0.30	0.02	1.17	3.59
Subtotal			*3.62*	*3.31*	*12.31*	*2.85*	*0.62*	*16.55*	*6.15*
Cumulative	*1,534.72*	*1,521.45*	*730.84*	*684.78*	*311.30*	*190.42*	*9.00*	*2,585.85*	*2,396.66*
Watts Bar-Chickamauga									
Watts Bar	1,430.90	1,279.23	0.02	5.30	12.87	18.96	0.37	1,444.16	1,303.49
Chickamauga	1,576.60	1,713.03	75.09	74.94	49.03	15.54	2.54	1,703.26	1,803.52
Subtotal	*3,007.50*	*2,992.27*	*75.11*	*80.24*	*61.90*	*34.51*	*2.91*	*3,147.41*	*3,107.01*
Cumulative	*4,542.22*	*4,513.72*	*805.95*	*765.02*	*373.20*	*224.93*	*11.90*	*5,733.26*	*5,503.67*

Note: Figures may not add to totals because of independent rounding.

Table 2–4: Total Water Use by Category and Water-Use Tabulation Area in 2005 (Continued)
(Millions of Gallons per Day)

Water-Use Tabulation Reservoir Catchment Area	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
Nickajack									
Nickajack			12.12	11.08	42.41	46.81	0.32	54.85	57.89
Subtotal			*12.12*	*11.08*	*42.41*	*46.81*	*0.32*	*54.85*	*57.89*
Cumulative	*4,542.22*	*4,513.72*	*818.07*	*776.11*	*415.60*	*271.74*	*12.23*	*5,788.12*	*5,561.56*
Guntersville									
Guntersville	1,476.30	1,476.29	8.81	8.12	43.01	16.30	2.39	1,530.51	1,500.71
Subtotal	*1,476.30*	*1,476.29*	*8.81*	*8.12*	*43.01*	*16.30*	*2.39*	*1,530.51*	*1,500.71*
Cumulative	*6,018.52*	*5,990.01*	*826.88*	*784.22*	*458.61*	*288.04*	*14.61*	*7,318.62*	*7,062.27*
Tims Ford									
Tims Ford			25.50	21.14	5.81	4.70	2.35	33.66	25.84
Subtotal			*25.50*	*21.14*	*5.81*	*4.70*	*2.35*	*33.66*	*25.84*
Cumulative	*6,018.52*	*5,990.01*	*852.38*	*805.36*	*464.42*	*292.74*	*16.97*	*7,352.28*	*7,088.11*
Wheeler-Wilson									
Wheeler	1,991.44	1,987.94	148.33	145.56	120.83	68.88	16.23	2,276.82	2,202.38
Wilson			19.29	2.70	24.21	6.15	3.00	46.49	8.86
Subtotal	*1,991.44*	*1,987.94*	*167.61*	*148.26*	*145.04*	*75.03*	*19.23*	*2,323.32*	*2,211.24*
Cumulative	*8,009.96*	*7,977.95*	*1,019.99*	*953.62*	*609.46*	*367.77*	*36.20*	*9,675.60*	*9,299.34*
Pickwick									
Pickwick	1,294.14	1,292.83	37.20	50.88	5.90	16.31	2.03	1,339.27	1,360.03
Cedar Creek					4.20			4.20	0.00
Upper Bear Creek					3.17			3.17	0.00
Subtotal	*1,294.14*	*1,292.83*	*37.20*	*50.88*	*13.27*	*16.31*	*2.03*	*1,346.64*	*1,360.03*
Cumulative	*9,304.10*	*9,270.78*	*1,057.19*	*1,004.50*	*622.72*	*384.08*	*38.23*	*11,022.24*	*10,659.37*
Normandy									
Normandy	0.00				26.53	2.31	1.16	27.69	2.31
Subtotal	*0.00*				*26.53*	*2.31*	*1.16*	*27.69*	*2.31*
Cumulative	*9,304.10*	*9,270.78*	*1,057.19*	*1,004.50*	*649.25*	*386.39*	*39.39*	*11,049.93*	*10,661.68*
Kentucky									
Kentucky	1,226.90	1,226.83	121.44	92.27	34.57	24.41	4.01	1,386.92	1,343.51
Subtotal	*1,226.90*	*1,226.83*	*121.44*	*92.27*	*34.57*	*24.41*	*4.01*	*1,386.92*	*1,343.51*
Cumulative	*10,531*	*10,498*	*1,179*	*1,097*	*684*	*411*	*43*	*12,437*	*12,005*

Note: Figures may not add to totals because of independent rounding.

Table 2–5: Total Water Use by Category and Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
6010101				2.01	2.28	0.99	1.61	3.88	3.00
6010102			616.68	575.84	39.23	23.71	0.56	656.47	599.55
6010103			0.20	0.00	25.69	14.17	0.48	26.37	14.17
6010104	693.70	692.44	7.38	8.22	19.17	10.95	1.18	721.43	711.61
6010105	262.66	262.65	6.88	5.81	41.28	29.28	0.14	310.95	297.74
6010106			33.17	28.66	6.80	6.84	0.10	40.06	35.49
6010107			1.31		12.95	7.96	0.37	14.63	7.96
6010108			21.77	18.74	23.44	6.57	1.59	46.80	25.31
6010201	150.90		7.34	11.26	70.17	63.75	1.09	229.51	75.00
6010202			18.60	18.82	3.77	1.42	0.07	22.44	20.24
6010203			8.58	8.57	4.95	2.93	0.00	13.53	11.50
6010204			0.01	0.11	3.45	1.52	0.25	3.71	1.63
6010205	15.16	3.20	3.52	3.33	13.38	11.80	0.25	32.31	18.32
6010206			0.23	0.69	5.55	3.37	0.06	5.83	4.06
6010207	563.20	1,842.40	1.57	4.72	28.52	18.72	0.90	594.19	1,865.84
6010208	1,280.00			0.00	10.52	2.56	0.09	1,290.61	2.56
6020001	1,576.60	1,713.03	13.25	11.08	76.31	48.73	2.81	1,668.96	1,772.85
6020002			73.96	74.94	24.41	15.68	0.57	98.94	90.62
6020003			3.62	3.31	3.16	0.79	0.07	6.85	4.10
6020004				0.00	5.16	1.00	0.30	5.46	1.00
6030001	1,476.30	1,476.29	8.81	8.12	38.41	15.13	2.36	1,525.88	1,499.54
6030002	1,991.44	1,987.94	147.83	143.83	105.20	65.30	13.10	2,257.56	2,197.07
6030003			25.50	22.79	7.69	6.55	2.51	35.70	29.35
6030004			0.50	0.07	13.79	1.90	3.75	18.04	1.97
6030005	1,294.14	1,292.83	56.48	53.58	29.53	18.38	3.89	1,384.05	1,364.79
6030006			0.00	0.00	8.60	4.09	1.17	9.77	4.09
6040001			23.70	23.49	8.32	4.24	0.94	32.96	27.73
6040002			3.70	4.89	26.53	8.31	1.22	31.45	13.20
6040003			0.50	1.76	7.47	6.90	0.43	8.40	8.66
6040004			0.10		2.83	2.05	0.25	3.18	2.05
6040005	1,226.90	1,226.83	66.13	62.13	7.95	5.22	0.82	1,301.80	1,294.18
6040006			27.31		7.34		0.47	35.12	0.00
Total	**10,531**	**10,498**	**1,179**	**1,097**	**684**	**411**	**43**	**12,437**	**12,005**

Note: Figures may not add to totals because of independent rounding.

Table 2–6: Total Water Use by Category and County in 2005 (Millions of Gallons per Day)

State and County	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
Alabama									
Blount							0.02	0.02	0.00
Colbert	1,294.14	1,292.83	56.48	53.39	9.35	4.44	2.34	1,362.32	1,350.67
Cullman							0.06	0.06	0.00
Dekalb					1.17		1.30	2.47	0.00
Etowah							0.01	0.01	0.00
Franklin					4.69	3.71	0.47	5.16	3.71
Jackson	1,476.30	1,476.29	8.78	8.12	10.71	5.24	0.70	1,496.49	1,489.64
Lauderdale					14.58	9.68	1.16	15.74	9.68
Lawrence			57.18	52.20	6.91	1.30	1.50	65.60	53.50
Limestone	1,990.24	1,987.54	0.50	0.06	13.37	6.02	8.26	2,012.37	1,993.62
Madison				0.93	62.54	36.27	4.92	67.46	37.21
Marion					4.49	0.12	0.00	4.49	0.12
Marshall			0.04	0.15	23.94	10.30	0.49	24.47	10.46
Morgan	1.20	0.40	90.64	90.48	30.42	21.79	0.86	123.12	112.68
State Total	**4,761.88**	**4,757.07**	**213.62**	**205.34**	**182.19**	**98.88**	**22.08**	**5,179.77**	**5,061.28**
Georgia									
Catoosa				0.01	4.68	0.55	1.05	5.73	0.56
Dade				0.01	2.35	0.31	0.17	2.52	0.32
Fannin				0.01	1.72	0.46	0.05	1.77	0.47
Rabun			1.60	1.82	0.48	0.07	0.07	2.15	1.89
Towns					1.17	0.36	0.18	1.34	0.36
Union					1.65	0.34		1.65	0.34
Walker			1.13	0.15	5.44	1.52	0.28	6.84	1.67
State Total			**2.73**	**2.00**	**17.48**	**3.60**	**1.80**	**22.00**	**5.60**
Kentucky									
Calloway			1.08		3.43	0.00	0.28	4.79	0.00
Graves					0.05		0.12	0.17	0.00
Livingston			6.05				0.00	6.05	0.00
Lyon					0.02	0.01	0.00	0.02	0.01
McCracken					0.73		0.01	0.74	0.00
Marshall			20.18		3.39	0.26	0.03	23.60	0.26
State Total			**27.31**		**7.62**	**0.27**	**0.44**	**35.37**	**0.27**
Mississippi									
Tishomingo			0.00	0.04	2.35	1.39		2.36	1.43
State Total			**0.00**	**0.04**	**2.35**	**1.39**		**2.36**	**1.43**
North Carolina									
Avery			0.93	0.85	1.13	0.78		2.06	1.62
Buncombe	262.66	262.65	0.13	0.10	27.00	23.34	289.78	286.09	
Cherokee					2.54	1.33		2.54	1.33
Clay					0.59	0.06		0.59	0.06
Graham			17.01	17.10	0.73	0.29		17.74	17.39
Haywood			33.17	28.52	6.80	4.40		39.97	32.93
Henderson			0.04	0.04	9.78	3.70		9.83	3.74
Jackson					2.45	1.22		2.45	1.22
Macon					3.24	1.33		3.24	1.33
Madison					1.29	0.40		1.29	0.40
Mitchell			4.82	3.37	1.73	0.36		6.55	3.73
Swain			8.58	8.57	2.50	1.74		11.08	10.31
Transylvania			6.71	5.68	2.24	1.83		8.95	7.51
Watauga			0.00	0.00	4.08	0.28		4.08	0.29
Yancey			0.00	0.00	1.43	0.47		1.44	0.47
State Total	**262.66**	**262.65**	**71.40**	**64.23**	**67.52**	**41.54**		**401.59**	**368.42**

Note: Figures may not add to totals because of independent rounding.

Table 2–6: Total Water Use by Category and County in 2005 (Continued) (Millions of Gallons per Day)

State and County	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
Tennessee									
Anderson	563.20	563.17	1.57	4.72	13.49	6.02	0.75	579.00	573.91
Bedford			3.70	4.74	6.35	3.88	0.04	10.09	8.62
Benton			2.13		1.45	1.07	0.10	3.68	1.07
Bledsoe					0.55	0.15	0.38	0.93	0.15
Blount			0.00	5.61	12.25	9.21	0.77	13.02	14.83
Bradley			3.93	3.67	12.72	8.92	0.05	16.70	12.59
Campbell					2.89	1.58	0.06	2.96	1.58
Carroll			1.27		0.35	0.20	0.05	1.67	0.20
Carter			0.08		8.85	2.56	0.19	9.12	2.56
Claiborne					2.79	0.53	0.05	2.83	0.53
Cocke			0.09	0.13	3.96	2.43	0.28	4.33	2.56
Coffee			24.72	21.27	5.09	5.29	1.50	31.31	26.56
Cumberland				0.00	5.43	1.98	0.08	5.51	1.98
Decatur			0.00	0.01	1.18	0.53	0.05	1.24	0.53
Dickson							0.01	0.01	0.00
Dickson					4.91			4.91	0.00
Fentress							0.00	0.00	0.00
Franklin					5.25	1.38	1.03	6.28	1.38
Giles				0.07	3.10	1.70	1.07	4.17	1.77
Grainger			4.32	4.55	0.13	0.11	0.51	4.96	4.66
Greene			1.75	2.48	8.46	3.64	0.68	10.88	6.12
Grundy					0.90	0.37	0.20	1.11	0.37
Hamblen			10.60	8.24	9.03	4.25	0.46	20.09	12.49
Hamilton	1,539.30	1,539.17	12.12	10.91	59.02	44.43	0.61	1,611.05	1,594.51
Hancock					0.23	0.17	0.03	0.25	0.17
Hardin			23.70	23.48	3.03	1.30	0.54	27.26	24.78
Hawkins	693.70	692.44	0.34	0.56	4.27	2.41	0.38	698.70	695.42
Henderson					3.31	1.55	0.11	3.41	1.55
Henry					3.11	2.28	0.64	3.75	2.28
Hickman				0.09	2.39	0.41	0.03	2.42	0.49
Houston					0.20			0.20	0.00
Humphreys	1,226.90	1,226.83	62.73	62.13	2.52	1.78	0.04	1,292.19	1,290.74
Jefferson			3.90	2.66	4.40	1.30	0.27	8.58	3.96
Johnson			0.06		1.98	0.82	0.03	2.07	0.82
Knox			0.90	1.38	63.08	58.07	0.46	64.44	59.45
Lawrence				0.16	4.45	2.29	0.88	5.33	2.45
Lewis			0.05		1.51	0.72	0.01	1.57	0.72
Lincoln					3.64	1.37	1.41	5.05	1.37
Loudon			6.49	4.80	9.61	7.66	0.07	16.17	12.46
McMinn			70.03	71.27	5.75	4.66	0.32	76.10	75.93
McNairy					0.81	0.49	0.21	1.02	0.49
Marion			0.00	0.00	3.66	0.81	0.05	3.71	0.81
Marshall				0.03	2.66	2.34	0.12	2.78	2.36
Maury			0.50	1.67	12.42	6.31	0.25	13.17	7.98
Meigs					0.70	0.26	0.14	0.85	0.26
Monroe				0.12	4.66	2.32	0.03	4.69	2.44
Moore			0.70	1.66	0.56	0.31		1.25	1.97
Morgan					1.35	0.58	0.01	1.36	0.58
Perry					0.61	0.61	0.01	0.62	0.61
Polk			3.62	3.30	1.44	0.33	0.04	5.09	3.63
Rhea	188.20	173.87			3.92	2.24	0.53	192.66	176.11
Roane	1,280.00	1,279.23			8.08	2.80	0.04	1,288.12	1,282.04
Sequatchie					0.75	0.49	0.01	0.76	0.49
Sevier			0.06		8.97	7.55	0.18	9.21	7.55

Note: Figures may not add to totals because of independent rounding.

Table 2–6: Total Water Use by Category and County in 2005 (Continued) (Millions of Gallons per Day)

State and County	Thermoelectric		Industrial		Public Supply		Irrigation	Totals	
	Withdrawal	Return	Withdrawal	Return	Withdrawal	Return	Withdrawal	Withdrawal	Return
Tennessee									
Stewart					0.04		0.02	0.06	0.00
Sullivan			616.70	575.00	24.11	17.19	0.38	641.19	592.19
Unicoi			3.71	3.80	5.52	1.43	0.03	9.26	5.22
Union					0.35	0.31	0.01	0.36	0.31
Washington				0.00	14.80	11.72	1.01	15.81	11.72
Wayne			0.05		1.16	0.89	0.13	1.34	0.89
Williamson					0.15		0.09	0.24	0.00
State Total	**5,491.30**	**5,474.71**	**859.81**	**818.50**	**378.32**	**246.01**	**17.43**	**6,746.86**	**6,539.22**
Virginia									
Lee			0.23	0.05	1.75	0.84		1.98	0.89
Russell	15.16	3.20	3.47	0.45	1.75	1.20	0.01	20.39	4.85
Scott				2.42	1.11	1.03		1.11	3.45
Smyth				0.45	4.64	2.59	1.60	6.23	3.04
Tazewell			0.06	2.03	3.23	3.52		3.29	5.55
Washington				0.53	10.49	3.00	0.06	10.55	3.53
Wise			0.00	0.74	5.36	6.93		5.36	7.66
State Total	**15.16**	**3.20**	**3.75**	**6.67**	**28.33**	**19.11**	**1.66**	**48.91**	**28.97**
Watershed Total	**10,531**	**10,498**	**1,179**	**1,097**	**684**	**411**	**43**	**12,437**	**12,005**

Note: Figures may not add to totals because of independent rounding.

Table 2–7: Surface-Water Withdrawals by Category and Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Cherokee					
Watauga		0.10	14.84	0.31	15.25
South Holston			16.27	0.20	16.48
Boone		0.02		0.08	0.10
Fort Patrick Henry		616.68	16.21		632.89
Cherokee	693.70	1.05	14.24	2.65	711.63
WUTA Total	*693.70*	*617.85*	*61.56*	*3.24*	*1,376.35*
Cumulative	**693.70**	**617.85**	**61.56**	**3.24**	**1,376.35**
Douglas					
Douglas	262.66	58.16	66.51	1.43	388.75
WUTA Total	*262.66*	*58.16*	*66.51*	*1.43*	*388.75*
Cumulative	***956.36***	***676.01***	***128.07***	***4.67***	***1,765.11***
Fort Loudoun					
Fort Loudoun		6.69	68.69	0.24	75.63
WUTA Total		*6.69*	*68.69*	*0.24*	*75.63*
Cumulative	**956.36**	**682.70**	**196.76**	**4.91**	**1,840.73**
Fontana-Tellico					
Fontana		27.07	4.86	0.07	32.00
Santeetlah			0.42		0.42
Tellico		0.01	2.61	0.37	3.00
WUTA Total		*27.08*	*7.89*	*0.44*	*35.41*
Cumulative	**956.36**	**709.78**	**204.65**	**5.35**	**1,876.14**
Norris					
Norris	15.16	3.50	16.21	0.29	35.15
Melton Hill	563.20	1.45	25.49	0.77	590.90
WUTA Total	**578.36**	**4.94**	**41.69**	**1.06**	**626.06**
Cumulative	**1,534.72**	**714.73**	**246.34**	**6.41**	**2,502.20**
Hiwassee-Ocoee					
Chatuge			1.87	0.13	2.00
Nottely			0.92		0.92
Hiwassee			0.60	0.28	0.88
Apalachia			3.21		3.21
Blue Ridge		3.57	1.86	0.02	5.45
Ocoee				0.02	0.02
WUTA Total		**3.57**	**8.46**	**0.45**	**12.48**
Cumulative	**1,534.72**	**718.30**	**254.80**	**6.86**	**2,514.68**
Watts Bar-Chickamauga					
Watts Bar	1,430.90		11.93	0.34	1,443.17
Chickamauga	1,576.60	74.47	25.00	1.76	1,677.82
WUTA Total	**3,007.50**	**74.47**	**36.93**	**2.09**	**3,120.99**
Cumulative	**4,542.22**	**792.77**	**291.73**	**8.95**	**5,635.67**
Nickajack					
Nickajack		5.40	41.57	0.21	47.18
WUTA Total		**5.40**	**41.57**	**0.21**	**47.18**
Cumulative	**4,542.22**	**798.16**	**333.30**	**9.16**	**5,682.85**
Guntersville					
Guntersville	1,476.30	8.78	36.82	1.77	1,514.36
WUTA Total	**1,476.30**	**8.78**	**36.82**	**1.77**	**1,523.67**
Cumulative	**6,018.52**	**806.94**	**370.12**	**10.93**	**7,206.52**

Table 2–7: Surface-Water Withdrawals by Water Use Category and Water-Use Tabulation Area in 2005 (Continued) (Millions of Gallons per Day)

Water-Use Tabulation Reservoir Catchment Area	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Tims Ford					
Tims Ford		24.19	3.42	1.95	29.56
WUTA Total		**24.19**	**3.42**	**1.95**	**29.56**
Cumulative	**6,018.52**	**831.13**	**373.54**	**12.88**	**7,236.08**
Wheeler-Wilson					
Wheeler	1,991.44	147.03	89.10	12.04	2,239.60
Wilson		18.42	21.45	1.86	41.73
WUTA Total	**1,991.44**	**165.45**	**110.55**	**13.90**	**2,281.33**
Cumulative	**8,009.96**	**996.59**	**484.09**	**26.78**	**9,517.41**
Pickwick					
Pickwick	1,294.14	37.20	2.51	1.15	1,335.00
Cedar Creek			3.88		3.88
Upper Bear Creek			3.17		3.17
WUTA Total	**1,294.14**	**37.20**	**9.56**	**1.15**	**1,342.05**
Cumulative	**9,304.10**	**1,033.78**	**493.65**	**27.93**	**10,859.46**
Normandy					
Normandy		0.00	24.46	1.06	25.52
WUTA Total		**0.00**	**24.46**	**1.06**	**25.52**
Cumulative	**9,304.10**	**1,033.78**	**518.11**	**28.99**	**10,884.98**
Kentucky					
Kentucky	1,226.90	115.60	15.81	3.42	1,361.73
WUTA Total	**1,226.90**	**115.60**	**15.81**	**3.42**	**1,361.73**
Cumulative	**10,531**	**1,149**	**534**	**32**	**12,247**

Note: Figures may not add to totals because of independent rounding.

Table 2–8: Surface-Water Withdrawals by Category and Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
6010101			0.40	1.61	2.00
6010102		616.68	32.49	0.27	649.43
6010103		0.12	14.84	0.32	15.29
6010104	693.70	1.10	13.84	1.04	709.68
6010105	262.66	6.88	35.56	0.14	305.24
6010106		33.17	5.83	0.10	39.10
6010107			12.16	0.30	12.46
6010108		18.11	12.95	0.95	32.01
6010201	150.90	6.64	69.19	0.68	227.41
6010202		18.49	1.67	0.07	20.23
6010203		8.58	3.19	0.00	11.77
6010204		0.01	3.03	0.16	3.20
6010205	15.16	3.50	11.18	0.22	30.05
6010206		0.00	5.03	0.05	5.08
6010207	563.20	1.45	26.39	0.77	591.81
6010208	1,280.00		10.52	0.09	1,290.61
6020001	1,576.60	5.91	55.14	1.91	1,639.56
6020002		73.96	16.78	0.43	91.17
6020003		3.57	1.86	0.03	5.46
6020004			3.34	0.30	3.63
6030001	1,476.30	8.78	34.74	1.75	1,521.56
6030002	1,991.44	146.53	74.26	9.65	2,221.89
6030003		24.19	4.75	2.11	31.05
6030004		0.50	13.51	3.01	17.02
6030005	1,294.14	55.61	24.63	2.39	1,376.77
6030006			7.05	0.64	7.69
6040001		23.70	4.35	0.75	28.80
6040002		3.70	24.46	1.11	29.28
6040003		0.50	7.30	0.38	8.17
6040004			1.09	0.23	1.31
6040005	1,226.90	65.70	2.41	0.53	1,295.54
6040006		22.00		0.44	22.43
Watershed Total	**10,531**	**1,149**	**534**	**32**	**12,247**

Note: Figures may not add to totals because of independent rounding.

Table 2–9: Surface-Water Withdrawals by Category and County in 2005 (Millions of Gallons per Day)

State and County	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Alabama					
Blount				0.01	0.01
Colbert	1,294.14	55.61	8.59	1.40	1,359.74
Cullman				0.00	0.00
Dekalb			0.47	0.80	1.27
Etowah				0.01	0.01
Franklin			3.88	0.21	4.08
Jackson	1,476.30	8.78	10.08	0.66	1,495.82
Lauderdale			13.18	0.42	13.60
Lawrence		57.18	6.91	1.19	65.29
Limestone	1,990.24	0.50	8.85	6.16	2,005.75
Madison			38.85	3.30	42.15
Marion			4.49		4.49
Marshall			20.96	0.49	21.44
Morgan	1.20	89.35	30.42	0.74	121.71
State Total	**4,761.88**	**211.42**	**146.67**	**15.39**	**5,135.35**
Georgia					
Catoosa			0.56	0.79	1.35
Dade			2.35	0.02	2.37
Fannin			1.61	0.02	1.62
Rabun		1.49	0.03	0.07	1.59
Towns			0.96	0.13	1.08
Union			0.92		0.92
Walker		0.51		0.28	0.79
State Total		**2.00**	**6.42**	**1.29**	**9.71**
Kentucky					
Calloway				0.27	0.27
Graves				0.11	0.11
Livingston		4.25		0.00	4.26
Lyon				0.00	0.00
McCracken				0.00	0.00
Marshall		17.75		0.03	17.77
State Total		**22.00**		**0.42**	**22.42**
North Carolina					
Avery		0.93			0.93
Buncombe	262.66	0.13	22.89		285.67
Cherokee			1.52		1.52
Graham		17.01	0.45		17.46
Haywood		33.17	5.83		39.00
Henderson		0.04	7.45		7.49
Jackson			1.29		1.29
Macon			1.61		1.61
Madison			0.23		0.23
Mitchell		4.82	0.91		5.73
Swain		8.58	1.90		10.48
Transylvania		6.71	1.04		7.75
Watauga		0.00	3.05		3.05
Yancey		0.00	0.54		0.54
State Total	**262.66**	**71.40**	**48.69**		**382.75**

Table 2–9: Surface-Water Withdrawals by Category and County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Tennessee					
Anderson	563.20	1.45	13.21	0.63	578.48
Bedford		3.70	5.52	0.00	9.22
Benton		2.06	1.33	0.10	3.49
Bledsoe			0.06	0.38	0.44
Blount			12.25	0.30	12.55
Bradley		3.93	10.18	0.04	14.15
Campbell			2.26	0.06	2.33
Carroll		0.97			0.97
Carter				0.19	0.19
Claiborne			2.69	0.05	2.74
Cocke			3.96	0.28	4.25
Coffee		23.85	5.08	1.43	30.36
Cumberland			5.43	0.08	5.51
Decatur		0.00	0.98	0.05	1.03
Dickson				0.01	0.01
Dickson			4.91		4.91
Fentress				0.00	0.00
Franklin			2.86	0.54	3.40
Giles			2.74	1.07	3.81
Grainger				0.38	0.38
Greene		1.75	8.46	0.62	10.82
Grundy			0.90	0.20	1.11
Hamblen		10.60	8.67	0.29	19.56
Hamilton	1,539.30	5.40	49.73	0.22	1,594.65
Hancock			0.23	0.02	0.25
Hardin		23.70	0.67	0.47	24.83
Hawkins	693.70	0.34	3.01	0.38	697.43
Henderson			2.92	0.11	3.03
Henry			0.00	0.40	0.40
Hickman			2.39	0.03	2.42
Humphreys	1,226.90	62.66	1.07	0.04	1,290.68
Jefferson		0.71	0.27	0.13	1.11
Johnson		0.05	0.36	0.02	0.43
Knox		0.23	62.40	0.43	63.06
Lawrence			2.20	0.80	2.99
Lewis				0.01	0.01
Lincoln			1.33	1.41	2.74
Loudon		6.47	9.26	0.07	15.80
McMinn		70.03	3.21	0.23	73.47
McNairy				0.11	0.11
Marion			2.29	0.03	2.33
Marshall			2.51	0.12	2.62
Maury		0.50	11.36	0.20	12.06
Meigs				0.14	0.14
Monroe			3.87	0.03	3.90
Moore		0.34	0.56		0.90
Morgan			1.35	0.01	1.36
Perry			0.61	0.01	0.62
Polk		3.57	0.25	0.03	3.86
Rhea	188.20		3.01	0.48	191.70

Table 2–9: Surface-Water Withdrawals by Category and County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Thermoelectric	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Tennessee (continued)					
Roane	1,280.00		7.06	0.03	1,287.09
Sequatchie			0.75	0.01	0.76
Sevier			8.70	0.16	8.86
Stewart				0.02	0.02
Sullivan		616.70	23.82	0.21	640.74
Unicoi		0.04		0.01	0.05
Union				0.01	0.01
Washington			14.80	0.45	15.25
Wayne			0.93	0.11	1.04
Williamson				0.07	0.07
State Total	**5,491.30**	**839.06**	**312.38**	**13.71**	**6,656.45**
Virginia					
Lee			1.40		1.40
Russell	15.16	3.47	0.61	0.01	19.24
Scott			1.10		1.10
Smyth			0.54	1.60	2.14
Tazewell		0.03	3.17		3.20
Washington			7.80		7.80
Wise		0.00	5.15		5.15
State Total	**15.16**	**3.50**	**19.77**	**1.60**	**40.04**
Watershed Total	**10,531**	**1,149**	**534**	**32**	**12,247**

Note: Figures may not add to totals because of independent rounding.

Table 2–10: Groundwater Withdrawals by Category and Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Reservoir Catchment Area	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Cherokee				
Watauga	0.00	10.85	0.15	11.00
South Holston		6.75	0.23	6.97
Boone	0.08	0.00	0.07	0.14
Ft Patrick Henry				0.00
Cherokee	6.28	7.21	0.15	13.64
WUTA total	*6.36*	*24.81*	*0.59*	*31.76*
Cumulative	*6.36*	*24.81*	*0.59*	*31.76*
Douglas				
Douglas	4.97	17.13	0.71	22.82
WUTA total	*4.97*	*17.13*	*0.71*	*22.82*
Cumulative	*11.33*	*41.94*	*1.30*	*54.57*
Fort Loudoun				
Fort Loudoun	0.68	0.98	0.38	2.03
WUTA total	*0.68*	*0.98*	*0.38*	*2.03*
Cumulative	*12.00*	*42.92*	*1.68*	*56.60*
Fontana-Tellico				
Fontana	0.11	4.68		4.80
Santeetlah		0.26		0.26
Tellico		0.16	0.11	0.27
WUTA total	*0.11*	*5.10*	*0.11*	*5.33*
Cumulative	*12.12*	*48.02*	*1.79*	*61.93*
Norris				
Norris	0.25	2.72	0.04	3.01
Melton Hill	0.12	1.91	0.13	2.16
WUTA total	*0.38*	*4.62*	*0.17*	*5.17*
Cumulative	*12.49*	*52.65*	*1.96*	*67.10*
Hiwassee-Ocoee				
Chatuge		0.80	0.05	0.85
Nottely		0.72		0.72
Hiwassee		1.02	0.09	1.11
Apalachia				0.00
Blue Ridge	0.05	0.15	0.03	0.23
Ocoee		1.15	0.00	1.15
WUTA total	*0.05*	*3.85*	*0.18*	*4.07*
Cumulative	*12.54*	*56.50*	*2.14*	*71.17*
Watts Bar-Chickamauga				
Watts Bar	0.02	0.93	0.03	0.99
Chickamauga	0.62	24.03	0.78	25.44
WUTA total	*0.64*	*24.97*	*0.81*	*26.42*
Cumulative	*13.18*	*81.47*	*2.95*	*97.60*
Nickajack				
Nickajack	6.72	0.83	0.11	7.67
WUTA total	*6.72*	*0.83*	*0.11*	*7.67*
Cumulative	*19.90*	*82.30*	*3.06*	*105.26*

Table 2–10: Groundwater Withdrawals by Category and Water-Use Tabulation Area in 2005 (Continued) (Millions of Gallons per Day)

Water-Use Tabulation Reservoir Catchment Area	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Guntersville				
Guntersville	0.04	6.19	0.62	6.84
WUTA total	*0.04*	*6.19*	*0.62*	*6.84*
Cumulative	*19.94*	*88.48*	*3.68*	*112.11*
Tims Ford				
Tims Ford	1.30	2.39	0.40	4.09
WUTA total	*1.30*	*2.39*	*0.40*	*4.09*
Cumulative	*21.24*	*90.87*	*4.08*	*116.20*
Wheeler-Wilson				
Wheeler	1.29	31.73	4.19	37.22
Wilson	0.87	2.76	1.14	4.77
WUTA total	*2.16*	*34.49*	*5.33*	*41.99*
Cumulative	*23.40*	*125.37*	*9.42*	*158.19*
Pickwick				
Pickwick	0.00	3.38	0.89	4.27
Cedar Creek		0.32		0.32
Upper Bear Creek				0.00
WUTA total	*0.00*	*3.70*	*0.89*	*4.59*
Cumulative	*23.41*	*129.07*	*10.31*	*162.78*
Normandy				
Normandy		2.07	0.10	2.17
WUTA total	*0.00*	*2.07*	*0.10*	*2.17*
Cumulative	*23.41*	*131.14*	*10.41*	*164.95*
Kentucky				
Kentucky	5.85	18.75	0.59	25.19
WUTA total	*5.85*	*18.75*	*0.59*	*25.19*
Cumulative	30	*150*	*11*	*190*

Note: Figures may not add to totals because of independent rounding.

Table 2–11: Groundwater Withdrawals by Category and Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Industrial	Public Supply	Irrigation	Total Water Withdrawals
6010108	3.67	10.48	0.64	14.79
6010101		1.88	0.00	1.88
6010206	0.23	0.52	0.00	0.75
6010205	0.02	2.20	0.04	2.26
6010204		0.42	0.09	0.51
6010203		1.76		1.76
6010208			0.00	0.00
6010201	0.70	0.98	0.42	2.09
6020001	7.34	21.17	0.89	29.40
6010107	1.31	0.79	0.08	2.18
6010106		0.97	0.00	0.97
6010105		5.71		5.71
6010104	6.28	5.33	0.15	11.75
6010103	0.08	10.85	0.15	11.08
6010102		6.75	0.29	7.03
6010202	0.11	2.10	0.00	2.21
6030004		0.28	0.74	1.02
6040005	0.43	5.54	0.28	6.25
6040004	0.10	1.75	0.02	1.87
6040003		0.17	0.05	0.22
6040002		2.07	0.10	2.17
6040001		3.96	0.20	4.16
6010207	0.12	2.12	0.13	2.38
6030005	0.87	4.91	1.51	7.28
6040006	5.31	7.34	0.03	12.68
6030003	1.30	2.94	0.40	4.65
6030002	1.29	30.93	3.45	35.68
6030001	0.04	3.67	0.61	4.32
6020004		1.82	0.01	1.83
6020003	0.05	1.31	0.03	1.38
6020002		7.63	0.14	7.77
6030006	0.00	1.56	0.53	2.08
Watershed Total	**30**	**150**	**11**	**190**

Note: Figures may not add to totals because of independent rounding.

Table 2–12: Groundwater Withdrawals by Category and County in 2005 (Millions of Gallons per Day)

State and County	Industrial	Public Supply	Irrigation	Total Withdrawals
Alabama				
Blount			0.01	0.01
Colbert	0.87	0.76	0.94	2.57
Cullman			0.06	0.06
Dekalb		0.70	0.50	1.21
Etowah			0.00	0.00
Franklin		0.82	0.26	1.07
Jackson		0.63	0.04	0.67
Lauderdale		1.40	0.74	2.14
Lawrence			0.31	0.31
Limestone		4.52	2.11	6.62
Madison		23.70	1.61	25.31
Marion			0.00	0.00
Marshall	0.04	2.98		3.02
Morgan	1.29		0.12	1.41
State Total	**2.20**	**35.52**	**6.69**	**44.40**
Georgia				
Catoosa		4.13	0.26	4.39
Dade			0.15	0.15
Fannin		0.12	0.03	0.15
Rabun	0.11	0.45		0.56
Towns		0.21	0.05	0.26
Union		0.72		0.72
Walker	0.62	5.44		6.06
State Total	**0.73**	**11.06**	**0.50**	**12.29**
Kentucky				
Calloway	1.08	3.43	0.01	4.52
Graves		0.05	0.01	0.06
Livingston	1.80			1.80
Lyon		0.02		0.02
McCracken	0.73	0.01		0.74
Marshall	2.44	3.39		5.82
State Total	**5.31**	**7.62**	**0.02**	**12.95**
Mississippi				
Tishomingo	0.00	2.35		2.36
State Total	**0.00**	**2.35**		**2.36**
North Carolina				
Avery		1.13		1.13
Buncombe		4.11		4.11
Cherokee		1.02		1.02
Clay		0.59		0.59
Graham		0.28		0.28
Haywood		0.97		0.97
Henderson		2.34		2.34
Jackson		1.16		1.16
Macon		1.64		1.64
Madison		1.07		1.07

Note: Figures may not add to totals because of independent rounding.

Table 2–12: Groundwater Withdrawals by Category and County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Industrial	Public Supply	Irrigation	Total Withdrawals
North Carolina (continued)				
Mitchell		0.82		0.82
Swain		0.60		0.60
Transylvania		1.20		1.20
Watauga		1.03		1.03
Yancey		0.89		0.89
State Total	**0.00**	**18.84**		**18.84**
Tennessee				
Anderson	0.12	0.28	0.12	0.52
Bedford		0.84	0.04	0.87
Benton	0.07	0.11		0.19
Bledsoe		0.49		0.49
Blount	0.00	0.00	0.47	0.47
Bradley		2.54	0.01	2.55
Campbell		0.63		0.63
Carroll	0.30	0.35	0.05	0.70
Carter	0.08	8.85		8.93
Claiborne		0.10		0.10
Cocke	0.09			0.09
Coffee	0.86	0.01	0.07	0.94
Cumberland			0.00	0.00
Decatur		0.20	0.01	0.21
Franklin		2.39	0.49	2.88
Giles		0.36		0.36
Grainger	4.32	0.13	0.13	4.58
Greene	0.00		0.06	0.06
Hamblen		0.36	0.17	0.53
Hamilton	6.72	9.29	0.38	16.40
Hancock		0.00	0.00	0.00
Hardin		2.36	0.07	2.43
Hawkins		1.26		1.26
Henderson		0.39		0.39
Henry		3.10	0.24	3.34
Houston		0.20		0.20
Humphreys	0.06	1.45		1.51
Jefferson	3.20	4.13	0.13	7.46
Johnson	0.00	1.62	0.02	1.64
Knox	0.67	0.67	0.04	1.38
Lawrence		2.25	0.09	2.34
Lewis	0.05	1.51		1.56
Lincoln		2.31		2.31
Loudon	0.02	0.35		0.37
McMinn		2.54	0.10	2.64
McNairy		0.81	0.11	0.91
Marion	0.00	1.37	0.01	1.39
Marshall		0.16		0.16
Maury		1.07	0.05	1.11
Meigs		0.70		0.70
Monroe		0.79		0.79
Moore	0.36			0.36

Table 2–12: Groundwater Withdrawals by Category and County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Industrial	Public Supply	Irrigation	Total Water Withdrawals
Tennessee (continued)				
Polk	0.05	1.19	0.00	1.23
Rhea		0.91	0.05	0.96
Roane		1.03	0.01	1.03
Sevier	0.06	0.27	0.02	0.35
Stewart		0.04		0.04
Sullivan		0.29	0.17	0.45
Unicoi	3.66	5.52	0.02	9.21
Union		0.35		0.35
Washington		0.00	0.56	0.56
Wayne	0.05	0.22	0.02	0.30
Williamson		0.15	0.01	0.17
State Total	**20.75**	**65.94**	**3.72**	**90.41**
Virginia				
Lee	0.23	0.35		0.58
Russell			1.15	1.15
Scott			0.01	0.01
Smyth			4.09	4.09
Tazewell	0.02	0.06		0.09
Washington		2.68	0.06	2.74
Wise		0.21		0.21
State Total	**0.25**	**8.56**	**0.06**	**8.88**
Watershed total	**30**	**150**	**11**	**190**

Note: Figures may not add to totals because of independent rounding.

Table 2–13: Thermoelectric Power Water Use by Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchmet Area	Surface-Water Withdrawals	Return Flow	Net Water Demand	Power Generated (Million Kilowatt Hours)
Cherokee				
Cherokee	693.70	692.44	1.26	4,958
WUTA total	*693.70*	*692.44*	*1.26*	4,958
Cumulative	*693.70*	*692.44*	*1.26*	4,958
Douglas				
Douglas	262.66	262.65	0.01	2,339
WUTA total	*262.66*	*262.65*	*0.01*	2,339
Cumulative	*956.36*	*955.09*	*1.27*	7,297
Norris				
Norris	15.16	3.20	11.97	3,931
Melton Hill	563.20	563.17	0.03	6,571
WUTA total	*578.36*	*566.36*	*12.00*	10,502
Cumulative	*1,534.72*	*1,521.45*	*13.27*	17,799
Watts Bar-Chickamauga				
Watts Bar	1,430.90	1,279.23	151.67	18,267
Chickamauga	1,576.60	1,713.03	-136.43	19,068
WUTA total	*3,007.50*	*2,992.27*	*15.23*	37,335
Cumulative	*4,542.22*	*4,513.72*	*28.50*	55,134
Guntersville				
Guntersville	1,476.30	1,476.29	0.01	9,835
WUTA total	*1,476.30*	*1,476.29*	*0.01*	9,835
Cumulative	*6,018.52*	*5,990.01*	*28.51*	64,969
Wheeler-Wilson				
Wheeler	1,991.44	1,987.94	3.49	19,169
WUTA total	*1,991.44*	*1,987.94*	*3.49*	19,169
Cumulative	*8,009.96*	*7,977.95*	*32.00*	84,138
Pickwick				
Pickwick	1,294.14	1,292.83	1.31	7,743
WUTA total	*1,294.14*	*1,292.83*	*1.31*	7,743
Cumulative	*9,304.10*	*9,270.78*	*33.31*	91,881
Kentucky				
Kentucky	1,226.90	1,226.83	0.07	7,634
WUTA total	*1,226.90*	*1,226.83*	*0.07*	7,634
Cumulative	*10,531*	*10,498*	*33*	99,515

Note: Figures may not add to totals because of independent rounding.

Figure 2–8: Disposition of Water Used by Thermoelectric Power Plants in the Tennessee River Watershed

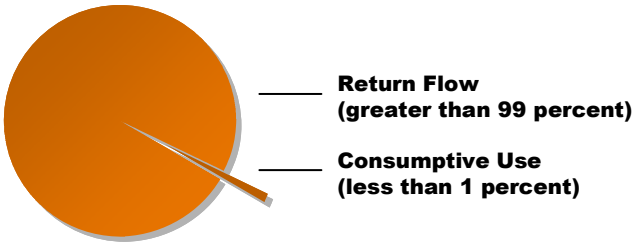


Figure 2–9: Location of Coal and Nuclear Thermoelectric Power Plants in the Tennnessee River Watershed

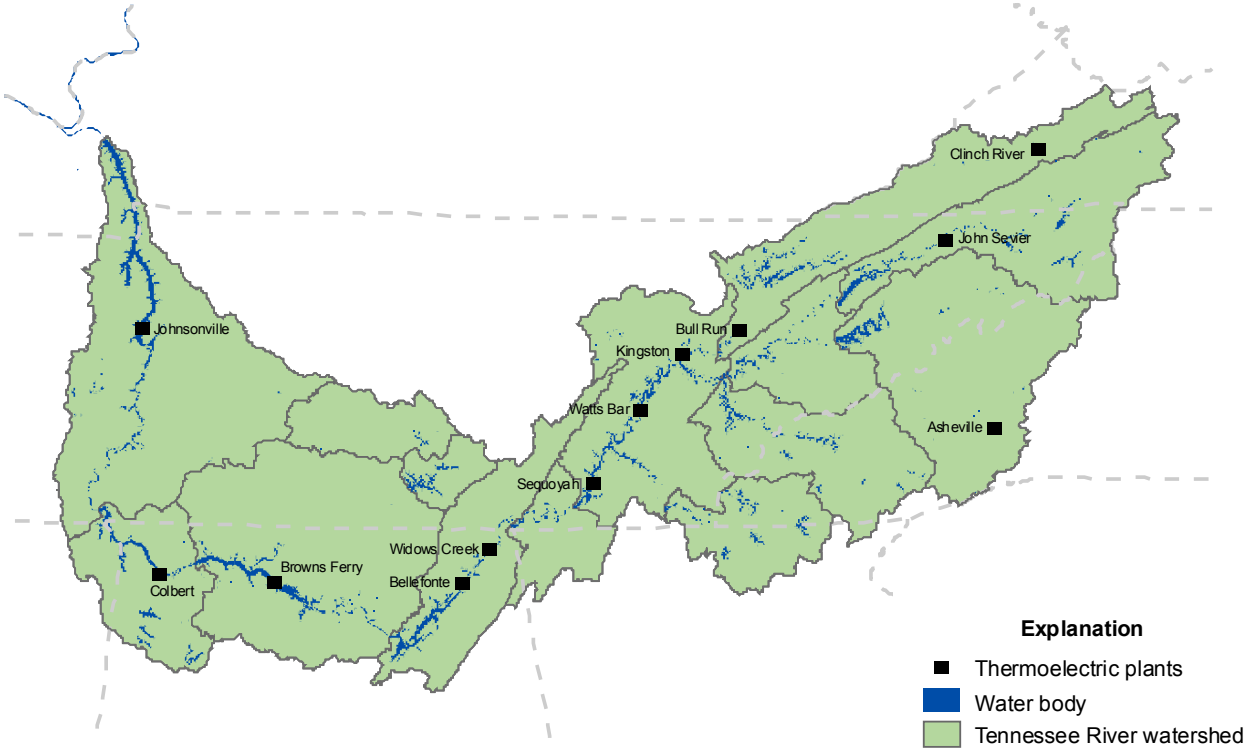


Table 2–14: Thermoelectric Power Water Use by Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Surface-Water Withdrawals	Return Flow	Net Water Demand	Power Generated (Million Kilowatt Hours)
6010104	693.70	692.44	1.26	4,958
6010105	262.66	262.65	0.01	2,339
6010201	150.90		150.90	8,803
6010205	15.16	3.20	11.97	3,931
6010207	563.20	1,842.40	-1,279.20	6,571
6010208	1,280.00		1,280.00	9,464
6020001	1,576.60	1,713.03	-136.43	19,068
6030001	1,476.30	1,476.29	0.01	9,835
6030002	1,991.44	1,987.94	3.49	19,169
6030005	1,294.14	1,292.83	1.31	7,743
6040005	1,226.90	1,226.83	0.07	7,634
Watershed Total	**10,531**	**10,498**	**33**	**99,515**

Note: Figures may not add to totals because of independent rounding.

Table 2–15: Thermoelectric Power Water Use by County in 2005 (Millions of Gallons per Day)

State and County	Surface-Water Withdrawals	Return Flow	Net Water Demand	Power Generated (Million Kilowatt Hours)
Alabama				
Colbert	1,294.14	1,292.83	1.31	7,743
Jackson	1,476.30	1,476.29	0.01	9,835
Limestone	1,990.24	1,987.54	2.70	17,955
Morgan	1.20	0.40	0.80	1,214
State Total	4,761.88	4,757.07	4.81	36,747
North Carolina				
Buncombe	262.66	262.65	0.01	2,339
State Total	262.66	262.65	0.01	2,339
Tennessee				
Anderson	563.20	563.17	0.03	6,571
Hamilton	1,539.30	1,539.17	0.13	19,068
Hawkins	693.70	692.44	1.26	4,958
Humphreys	1,226.90	1,226.83	0.07	7,634
Rhea	188.20	173.87	14.33	8,803
Roane	1,280.00	1,279.23	0.77	9,464
State Total	5,491.30	5,474.71	16.59	56,498
Virginia				
Russell	15.16	3.20	11.97	3,931
State Total	15.16	3.20	11.97	3,931
Watershed Total	**10,531**	**10,498**	**33**	**99,515**

Note: Figures may not add to totals because of independent rounding.

Table 2–16: Industrial Water Use by Source and Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Cherokee					
Watauga	0.00	0.10	0.10	0.00	0.10
South Holston			0.00	0.84	-0.84
Boone	0.08	0.02	0.10		0.10
Fort Patrick Henry		616.68	616.68		616.68
Cherokee	6.28	1.05	7.33	578.72	-571.39
WUTA total	***6.36***	***617.85***	***624.21***	***579.56***	***44.65***
Cumulative	*6.36*	*617.85*	*624.21*	*579.56*	*44.65*
Douglas					
Douglas	4.97	58.16	63.13	53.21	9.92
WUTA total	***4.97***	***58.16***	***63.13***	***53.21***	***9.92***
Cumulative	*11.33*	*676.01*	*687.33*	*632.77*	*54.56*
Fort Loudoun					
Fort Loudoun	0.68	6.69	7.37	12.82	-5.45
WUTA total	***0.68***	***6.69***	***7.37***	***12.82***	***-5.45***
Cumulative	*12.00*	*682.70*	*694.70*	*645.59*	*49.12*
Fontana-Tellico					
Fontana	0.11	27.07	27.18	27.39	-0.20
Santeetlah			0.00		0.00
Tellico		0.01	0.01	0.11	-0.09
WUTA total	***0.11***	***27.08***	***27.20***	***27.49***	***-0.30***
Cumulative	*12.12*	*709.78*	*721.90*	*673.08*	*48.82*
Norris					
Norris	0.25	3.50	3.75	4.05	-0.30
Melton Hill	0.12	1.45	1.57	4.35	-2.78
WUTA total	***0.38***	***4.94***	***5.32***	***8.40***	***-3.08***
Cumulative	*12.49*	*714.73*	*727.22*	*681.48*	*45.74*
Hiwassee-Ocoee					
Chatuge			0.00		0.00
Nottely			0.00		0.00
Hiwassee			0.00		0.00
Apalachia			0.00		0.00
Blue Ridge	0.05	3.57	3.62	0.01	3.61
Ocoee			0.00	3.30	-3.30
WUTA total	***0.05***	***3.57***	***3.62***	***3.31***	***0.31***
Cumulative	*12.54*	*718.30*	*730.84*	*684.78*	*46.06*
Watts Bar-Chickamauga					
Watts Bar	0.02		0.02	5.30	-5.27
Chickamauga	0.62	74.47	75.09	74.94	0.14
WUTA total	***0.64***	***74.47***	***75.11***	***80.24***	***-5.13***
Cumulative	*13.18*	*792.77*	*805.95*	*765.02*	*40.92*

Table 2–16: Industrial Water Use by Source and Water-Use Tabulation Area in 2005 (Continued)
(Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Nickajack					
Nickajack	6.72	5.40	12.12	11.08	1.04
WUTA total	***6.72***	***5.40***	***12.12***	***11.08***	***1.04***
Cumulative	*19.90*	*798.16*	*818.07*	*776.11*	*41.96*
Guntersville					
Guntersville	0.04	8.78	8.81	8.12	0.70
WUTA total	***0.04***	***8.78***	***8.81***	***8.12***	***0.70***
Cumulative	*19.94*	*806.94*	*826.88*	*784.22*	*42.66*
Tims Ford					
Tims Ford	1.30	24.19	25.50	21.14	4.36
WUTA total	***1.30***	***24.19***	***25.50***	***21.14***	***4.36***
Cumulative	*21.24*	*831.13*	*852.38*	*805.36*	*47.02*
Wheeler-Wilson					
Wheeler	1.29	147.03	148.33	145.56	2.77
Wilson	0.87	18.42	19.29	2.70	16.58
WUTA total	***2.16***	***165.45***	***167.61***	***148.26***	***19.35***
Cumulative	*23.40*	*996.59*	*1,019.99*	*953.62*	*66.37*
Pickwick					
Pickwick	0.00	37.20	37.20	50.88	-13.68
Cedar Creek			0.00		0.00
Upper Bear Creek			0.00		0.00
WUTA total	***0.00***	***37.20***	***37.20***	***50.88***	***-13.68***
Cumulative	*23.41*	*1,033.78*	*1,057.19*	*1,004.50*	*52.68*
Normandy					
Normandy		0.00	0.00		0.00
WUTA total		***0.00***	***0.00***		***0.00***
Cumulative	*23.41*	*1,033.78*	*1,057.19*	*1,004.50*	*52.69*
Kentucky					
Kentucky	5.85	115.60	121.44	92.27	29.17
WUTA total	***5.85***	***115.60***	***121.44***	***92.27***	***29.17***
Cumulative	*30*	*1,149*	*1,179*	*1,097*	*82*

Note: Figures may not add to totals because of independent rounding.

Figure 2–10: Thermoelectric Power Water Withdrawals by Hydrologic Unit Code in the Tennessee River Watershed in 2005

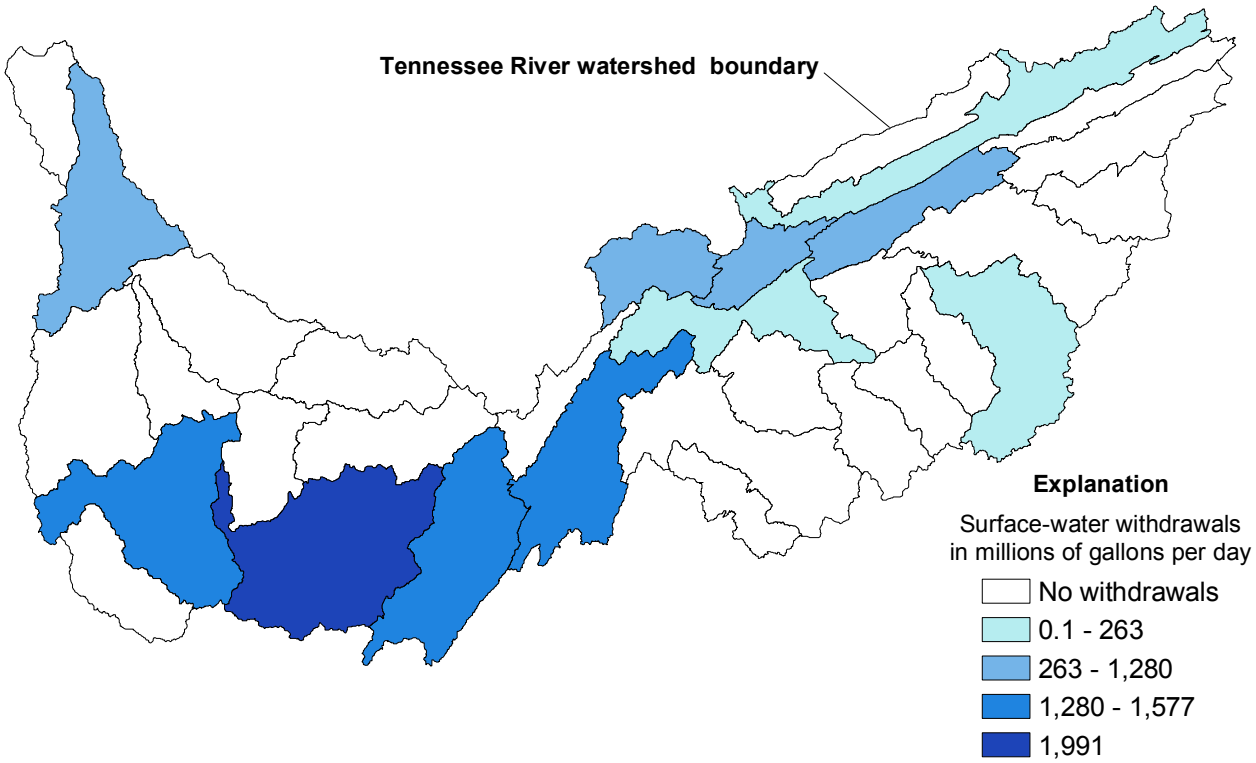


Table 2–17: Industrial Water Use by Source and Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
6010101			0.00	2.01	-2.01
6010102		616.68	616.68	575.84	40.84
6010103	0.08	0.12	0.20	0.00	0.20
6010104	6.28	1.10	7.38	8.22	-0.84
6010105		6.88	6.88	5.81	1.07
6010106		33.17	33.17	28.66	4.51
6010107	1.31		1.31		1.31
6010108	3.67	18.11	21.77	18.74	3.03
6010201	0.70	6.64	7.34	11.26	-3.92
6010202	0.11	18.49	18.60	18.82	-0.21
6010203		8.58	8.58	8.57	0.01
6010204		0.01	0.01	0.11	-0.09
6010205	0.02	3.50	3.52	3.33	0.19
6010206	0.23	0.00	0.23	0.69	-0.46
6010207	0.12	1.45	1.57	4.72	-3.15
6010208			0.00	0.00	0.00
6020001	7.34	5.91	13.25	11.08	2.16
6020002		73.96	73.96	74.94	-0.99
6020003	0.05	3.57	3.62	3.31	0.31
6020004			0.00	0.00	0.00
6030001	0.04	8.78	8.81	8.12	0.70
6030002	1.29	146.53	147.83	143.83	4.00
6030003	1.30	24.19	25.50	22.79	2.70
6030004		0.50	0.50	0.07	0.43
6030005	0.87	55.61	56.48	53.58	2.90
6030006	0.00		0.00	0.00	0.00
6040001		23.70	23.70	23.49	0.22
6040002		3.70	3.70	4.89	-1.19
6040003		0.50	0.50	1.76	-1.26
6040004	0.10		0.10		0.10
6040005	0.43	65.70	66.13	62.13	4.00
6040006	5.31	22.00	27.31		27.31
Watershed Total	**30**	**1,149**	**1,179**	**1,097**	**82**

Note: Figures may not add to totals because of independent rounding.

Table 2–18: Industrial Water Use by Source and County in 2005 (Millions of Gallons per Day)

State and County	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Alabama					
Colbert	0.87	55.61	56.48	53.39	3.09
Jackson		8.78	8.78	8.12	0.66
Lawrence		57.18	57.18	52.20	4.98
Limestone		0.50	0.50	0.06	0.44
Madison			0.00	0.93	-0.93
Marshall	0.04		0.04	0.15	-0.12
Morgan	1.29	89.35	90.64	90.48	0.16
State Total	**2.20**	**211.42**	**213.62**	**205.34**	**8.28**
Georgia					
Catoosa			0.00	0.01	-0.01
Dade			0.00	0.01	-0.01
Fannin			0.00	0.01	-0.01
Rabun	0.11	1.49	1.60	1.82	-0.21
Walker	0.62	0.51	1.13	0.15	0.97
State Total	**0.73**	**2.00**	**2.73**	**2.00**	**0.73**
Kentucky					
Calloway	1.08		1.08		1.08
Livingston	1.80	4.25	6.05		6.05
Marshall	2.44	17.75	20.18		20.18
State Total	**5.31**	**22.00**	**27.31**		**27.31**
Mississippi					
Tishomingo	0.00		0.00	0.04	-0.03
State Total	**0.00**		**0.00**	**0.04**	**-0.03**
North Carolina					
Avery		0.93	0.93	0.85	0.08
Buncombe		0.13	0.13	0.10	0.03
Graham		17.01	17.01	17.10	-0.09
Haywood		33.17	33.17	28.52	4.65
Henderson		0.04	0.04	0.04	0.01
Mitchell		4.82	4.82	3.37	1.46
Swain		8.58	8.58	8.57	0.01
Transylvania		6.71	6.71	5.68	1.03
Watauga		0.00	0.00	0.00	0.00
Yancey		0.00	0.00	0.00	0.00
State Total		**71.40**	**71.40**	**64.23**	**7.17**
Tennessee					
Anderson	0.12	1.45	1.57	4.72	-3.15
Bedford		3.70	3.70	4.74	-1.04
Benton	0.07	2.06	2.13		2.13
Blount	0.00		0.00	5.61	-5.61
Bradley		3.93	3.93	3.67	0.25
Carroll	0.30	0.97	1.27		1.27

Note: Figures may not add to totals because of independent rounding.

Table 2–18: Industrial Water Use by Source and County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Tennessee (continued)					
Carter	0.08		0.08		0.08
Cocke	0.09		0.09	0.13	-0.05
Coffee	0.86	23.85	24.72	21.27	3.45
Cumberland			0.00	0.00	0.00
Decatur		0.00	0.00	0.01	0.00
Giles			0.00	0.07	-0.07
Grainger	4.32		4.32	4.55	-0.23
Greene	0.00	1.75	1.75	2.48	-0.73
Hamblen		10.60	10.60	8.24	2.36
Hamilton	6.72	5.40	12.12	10.91	1.21
Hardin		23.70	23.70	23.48	0.22
Hawkins		0.34	0.34	0.56	-0.22
Hickman			0.00	0.09	-0.09
Humphreys	0.06	62.66	62.73	62.13	0.60
Jefferson	3.20	0.71	3.90	2.66	1.24
Johnson	0.00	0.05	0.06		0.06
Knox	0.67	0.23	0.90	1.38	-0.48
Lawrence			0.00	0.16	-0.16
Lewis	0.05		0.05		0.05
Loudon	0.02	6.47	6.49	4.80	1.69
McMinn		70.03	70.03	71.27	-1.24
Marion	0.00		0.00	0.00	0.00
Marshall			0.00	0.03	-0.03
Maury		0.50	0.50	1.67	-1.18
Monroe			0.00	0.12	-0.12
Moore	0.36	0.34	0.70	1.66	-0.96
Polk	0.05	3.57	3.62	3.30	0.32
Sevier	0.06		0.06		0.06
Sullivan		616.70	616.70	575.00	41.70
Unicoi	3.66	0.04	3.71	3.80	-0.09
Washington			0.00	0.00	0.00
Wayne	0.05		0.05		0.05
State Total	**20.75**	**839.06**	**859.81**	**818.50**	**41.31**
Virginia					
Lee	0.23		0.23	0.05	0.18
Russell		3.47	3.47	0.45	3.02
Scott			0.00	2.42	-2.42
Smyth			0.00	0.45	-0.45
Tazewell	0.02	0.03	0.06	2.03	-1.98
Washington			0.00	0.53	-0.53
Wise		0.00	0.00	0.74	-0.74
State Total	**0.25**	**3.50**	**3.75**	**6.67**	**-2.92**
Watershed total	**30**	**1,149**	**1,179**	**1,097**	**82**

Note: Figures may not add to totals because of independent rounding.

Figure 2–11: Source and Disposition of Industrial Water Withdrawals in 2005

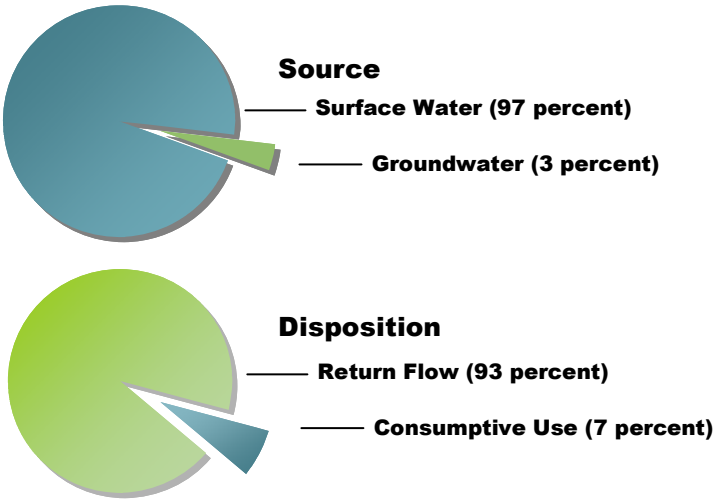


Figure 2–12: Industrial Water Withdrawals by Source and by Hydrologic Unit Code in the Tennessee River Watershed in 2005

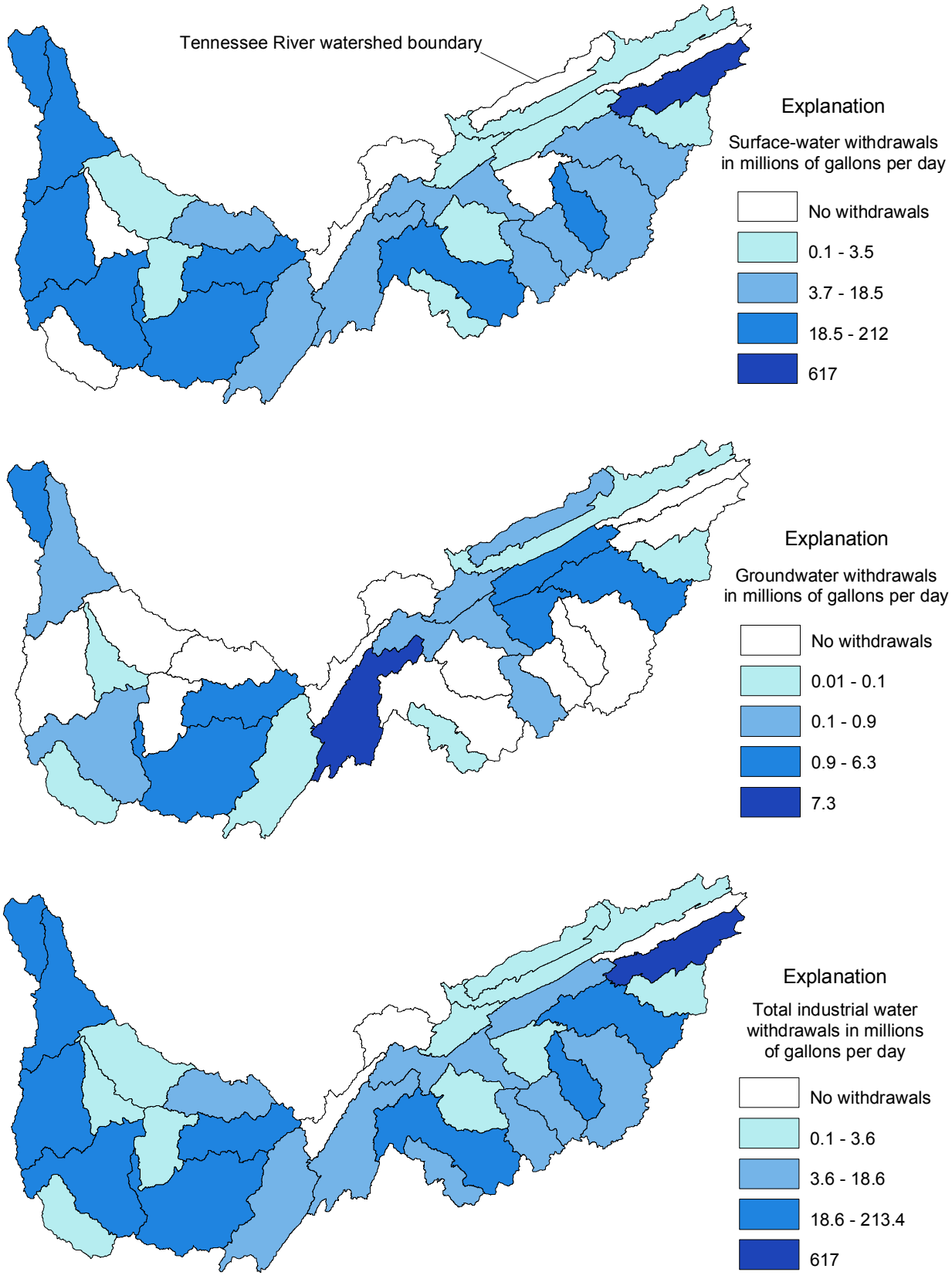


Figure 2–13: Industrial Water Withdrawals by State and County in the Tennessee River Watershed in 2005

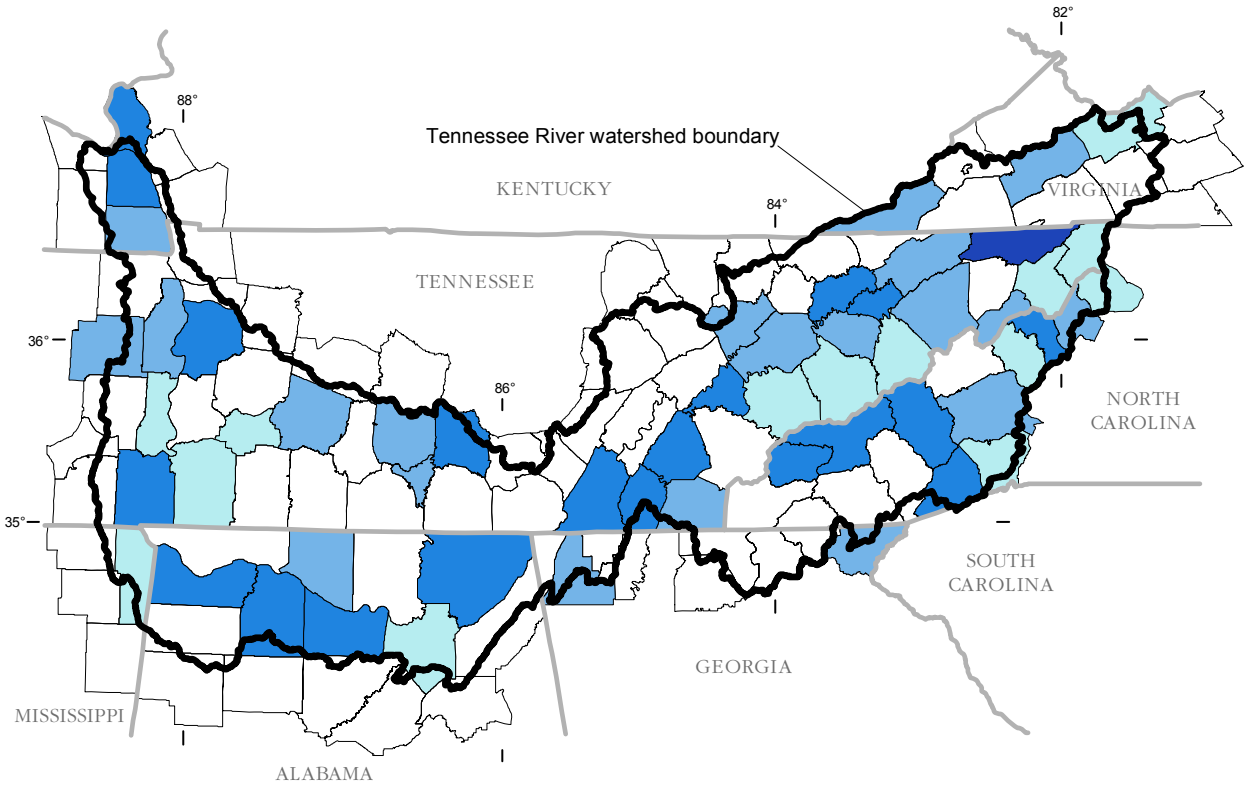


Table 2–19: Public-Supply Water Use by Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Return	Net Water Demand
	Ground	Surface	Total		
Cherokee					
Watauga	10.85	14.84	25.69	1.62	24.07
South Holston	6.75	16.27	23.02	4.56	18.46
Boone	0.00		0.00	23.00	-23.00
Ft Patrick Henry		16.21	16.21		16.21
Cherokee	7.21	14.24	21.45	17.25	4.20
WUTA total	***24.81***	***61.56***	***86.37***	***46.43***	***39.94***
Cumulative	*24.81*	*61.56*	*86.37*	*46.43*	*39.94*
Douglas					
Douglas	17.13	66.51	83.64	43.09	40.54
WUTA total	***17.13***	***66.51***	***83.64***	***43.09***	***40.54***
Cumulative	*41.94*	*128.07*	*170.01*	*89.53*	*80.48*
Fort Loudoun					
Fort Loudoun	0.98	68.69	69.67	63.76	5.91
WUTA total	***0.98***	***68.69***	***69.67***	***63.76***	***5.91***
Cumulative	*42.92*	*196.76*	*239.68*	*153.28*	*86.39*
Fontana-Tellico					
Fontana	4.68	4.86	9.54	4.35	5.19
Santeetlah	0.26	0.42	0.68		0.68
Tellico	0.16	2.61	2.77	1.52	1.25
WUTA total	***5.10***	***7.89***	***12.99***	***5.87***	***7.12***
Cumulative	*48.02*	*204.65*	*252.67*	*159.15*	*93.52*
Norris					
Norris	2.72	16.21	18.92	15.59	3.33
Melton Hill	1.91	25.49	27.39	12.83	14.57
WUTA total	***4.62***	***41.69***	***46.32***	***28.42***	***17.90***
Cumulative	*52.65*	*246.34*	*298.99*	*187.57*	*111.41*
Hiwassee-Ocoee					
Chatuge	0.80	1.87	2.67	0.2	2.47
Nottely	0.72	0.92	1.65	0.34	1.31
Hiwassee	1.02	0.60	1.62	1.54	0.08
Apalachia		3.21	3.21	0.01	3.20
Blue Ridge	0.15	1.86	2.01	0.46	1.55
Ocoee	1.15		1.15	0.30	0.86
WUTA total	***3.85***	***8.46***	***12.31***	***2.85***	***9.46***
Cumulative	*56.50*	*254.80*	*311.30*	*190.42*	*120.88*
Watts Bar-Chickamauga					
Watts Bar	0.93	11.93	12.87	18.96	-6.10
Chickamauga	24.03	25.00	49.03	15.54	33.49
WUTA total	***24.97***	***36.93***	***61.90***	***34.51***	***27.39***
Cumulative	*81.47*	*291.73*	*373.20*	*224.93*	*148.27*

Table 2–19: Public-Supply Water Use by Water-Use Tabulation Area in 2005 (Continued) (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals			Return	Net Water Demand
	Ground	Surface	Total		
Nickajack					
Nickajack	0.83	41.57	42.41	46.81	-4.40
WUTA total	***0.83***	***41.57***	***42.41***	***46.81***	***-4.40***
Cumulative	*82.30*	*333.30*	*415.60*	*271.74*	*143.87*
Guntersville					
Guntersville	6.19	36.82	43.01	16.30	26.71
WUTA total	***6.19***	***36.82***	***43.01***	***16.30***	***26.71***
Cumulative	*88.48*	*370.12*	*458.61*	*288.04*	*170.57*
Tims Ford					
Tims Ford	2.39	3.42	5.81	4.70	1.11
WUTA total	***2.39***	***3.42***	***5.81***	***4.70***	***1.11***
Cumulative	*90.87*	*373.54*	*464.42*	*292.74*	*171.68*
Wheeler-Wilson					
Wheeler	31.73	89.10	120.83	68.88	51.96
Wilson	2.76	21.45	24.21	6.15	18.05
WUTA total	***34.49***	***110.55***	***145.04***	***75.03***	***70.01***
Cumulative	*125.37*	*484.09*	*609.46*	*367.77*	*241.69*
Pickwick					
Pickwick	3.38	2.51	5.90	16.31	-10.41
Cedar Creek	0.32	3.88	4.20		4.20
Upper Bear Creek		3.17	3.17		3.17
WUTA total	***3.70***	***9.56***	***13.27***	***16.31***	***-3.05***
Cumulative	*129.07*	*493.65*	*622.72*	*384.08*	*238.64*
Normandy					
Normandy	2.07	24.46	26.53	2.31	24.22
WUTA total	***2.07***	***24.46***	***26.53***	***2.31***	***24.22***
Cumulative	*131.14*	*518.11*	*649.25*	*386.39*	*262.86*
Kentucky					
Kentucky	18.75	15.81	34.57	24.41	10.16
WUTA total	***18.75***	***15.81***	***34.57***	***24.41***	***10.16***
Cumulative	*150*	*534*	*684*	*411*	*273*

Figure 2–14: Source and Disposition of Public-Supply Water Use in the Tennessee River Watershed in 2005

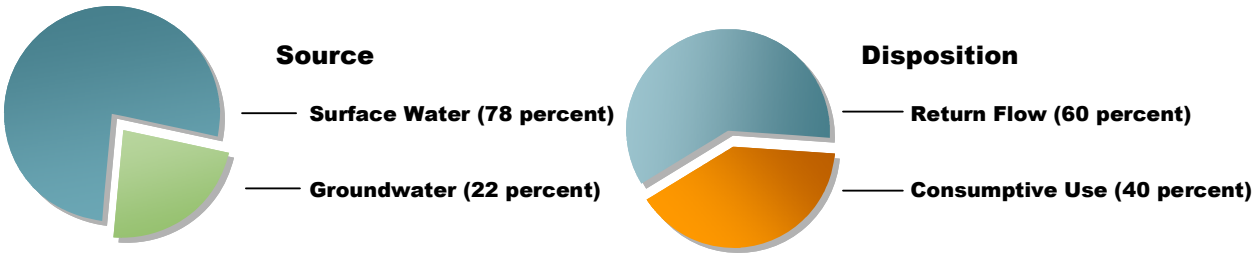


Table 2–20: Public-Supply Water Use by Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
6010101	1.88	0.40	2.28	0.99	1.29
6010102	6.75	32.49	39.23	23.71	15.52
6010103	10.85	14.84	25.69	14.17	11.52
6010104	5.33	13.84	19.17	10.95	8.22
6010105	5.71	35.56	41.28	29.28	12.00
6010106	0.97	5.83	6.80	6.84	-0.04
6010107	0.79	12.16	12.95	7.96	4.99
6010108	10.48	12.95	23.44	6.57	16.86
6010201	0.98	69.19	70.17	63.75	6.42
6010202	2.10	1.67	3.77	1.42	2.35
6010203	1.76	3.19	4.95	2.93	2.01
6010204	0.42	3.03	3.45	1.52	1.93
6010205	2.20	11.18	13.38	11.80	1.58
6010206	0.52	5.03	5.55	3.37	2.17
6010207	2.12	26.39	28.52	18.72	9.79
6010208		10.52	10.52	2.56	7.96
6020001	21.17	55.14	76.31	48.73	27.58
6020002	7.63	16.78	24.41	15.68	8.73
6020003	1.31	1.86	3.16	0.79	2.37
6020004	1.82	3.34	5.16	1.00	4.16
6030001	3.67	34.74	38.41	15.13	23.27
6030002	30.93	74.26	105.20	65.30	39.90
6030003	2.94	4.75	7.69	6.55	1.14
6030004	0.28	13.51	13.79	1.90	11.89
6030005	4.91	24.63	29.53	18.38	11.16
6030006	1.56	7.05	8.60	4.09	4.51
6040001	3.96	4.35	8.32	4.24	4.07
6040002	2.07	24.46	26.53	8.31	18.22
6040003	0.17	7.30	7.47	6.90	0.57
6040004	1.75	1.09	2.83	2.05	0.78
6040005	5.54	2.41	7.95	5.22	2.74
6040006	7.34		7.34		7.34
Watershed Total	**150**	**534**	**684**	**411**	**273**

Note: Figures may not add to totals because of independent rounding.

Figure 2–15: Public-Supply Withdrawals by Source and Hydrologic Unit Code in the Tennessee River Watershed in 2005

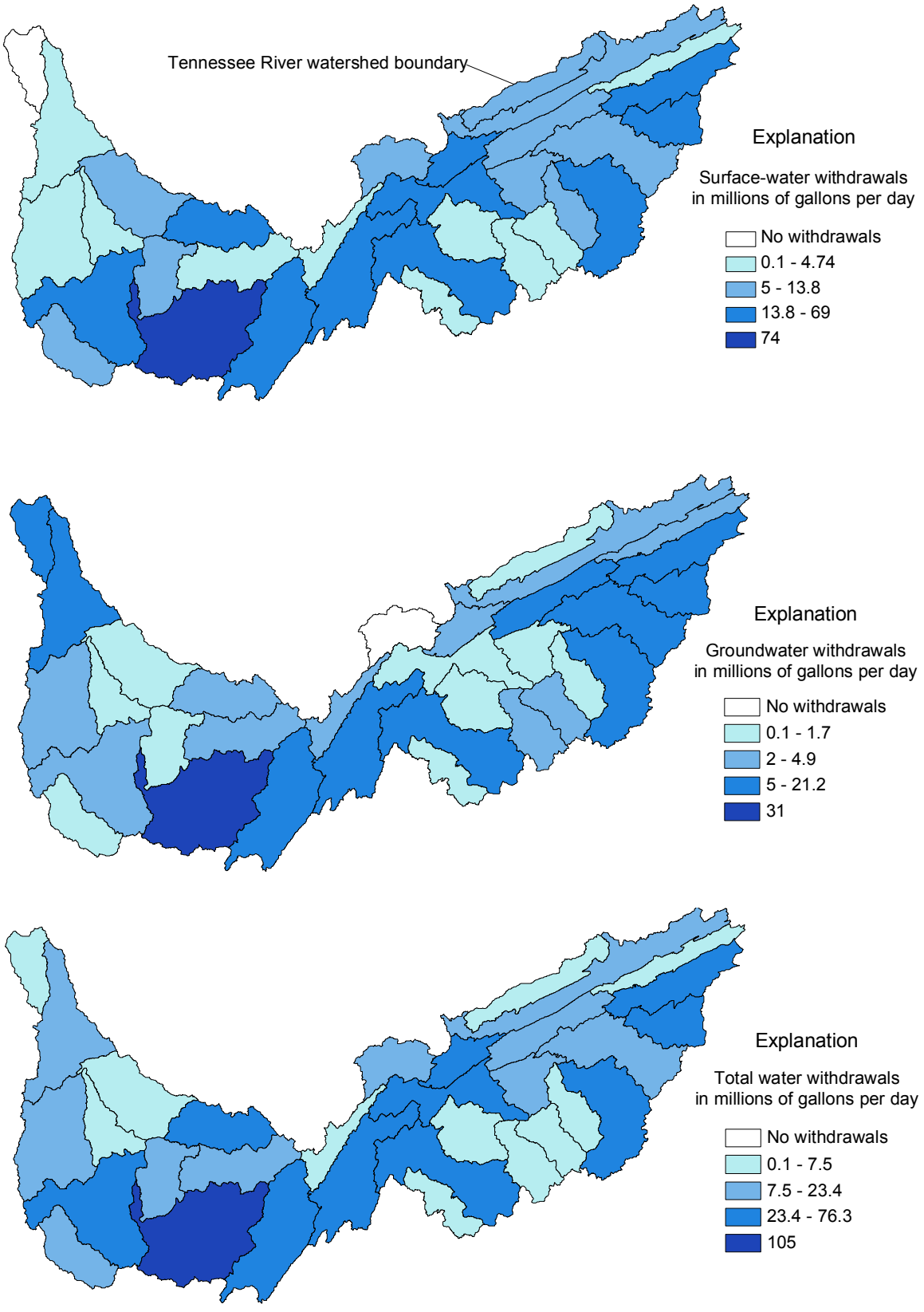


Table 2–21: Public-Supply Water Use by County in 2005 (Millions of Gallons per Day)

State and County	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Alabama					
Colbert	0.76	8.59	9.35	4.44	4.91
Dekalb	0.70	0.47	1.17		1.17
Franklin	0.82	3.88	4.69	3.71	0.98
Jackson	0.63	10.08	10.71	5.24	5.47
Lauderdale	1.40	13.18	14.58	9.68	4.90
Lawrence		6.91	6.91	1.30	5.62
Limestone	4.52	8.85	13.37	6.02	7.35
Madison	23.70	38.85	62.54	36.27	26.27
Marion		4.49	4.49	0.12	4.37
Marshall	2.98	20.96	23.94	10.30	13.64
Morgan		30.42	30.42	21.79	8.63
State total	**35.52**	**146.67**	**182.19**	**98.88**	**83.31**
Georgia					
Catoosa	4.13	0.56	4.68	0.55	4.13
Dade		2.35	2.35	0.31	2.04
Fannin	0.12	1.61	1.72	0.46	1.26
Rabun	0.45	0.03	0.48	0.07	0.41
Towns	0.21	0.96	1.17	0.36	0.81
Union	0.72	0.92	1.65	0.34	1.31
Walker	5.44		5.44	1.52	3.92
State total	**11.06**	**6.42**	**17.48**	**3.60**	**13.87**
Kentucky					
Calloway	3.43		3.43	0.00	3.43
Graves	0.05		0.05		0.05
Lyon	0.02		0.02	0.01	0.00
McCracken	0.73		0.73		0.73
Marshall	3.39		3.39	0.26	3.13
State total	**7.62**		**7.62**	**0.27**	**7.35**
Mississippi					
Tishomingo	2.35		2.35	1.39	0.96
State total	**2.35**		**2.35**	**1.39**	**0.96**
North Carolina					
Avery	1.13		1.13	0.78	0.35
Buncombe	4.11	22.89	27.00	23.34	3.66
Cherokee	1.02	1.52	2.54	1.33	1.20
Clay	0.59		0.59	0.06	0.53
Graham	0.28	0.45	0.73	0.29	0.44
Haywood	0.97	5.83	6.80	4.40	2.40
Henderson	2.34	7.45	9.78	3.70	6.08
Jackson	1.16	1.29	2.45	1.22	1.23
Macon	1.64	1.61	3.24	1.33	1.91

Note: Figures may not add to totals because of independent rounding.

Table 2–21: Public-Supply Water Use by County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
North Carolina (continued)					
Madison	1.07	0.23	1.29	0.40	0.89
Mitchell	0.82	0.91	1.73	0.36	1.36
Swain	0.60	1.90	2.50	1.74	0.75
Transylvania	1.20	1.04	2.24	1.83	0.41
Watauga	1.03	3.05	4.08	0.28	3.79
Yancey	0.89	0.54	1.43	0.47	0.97
State total	**18.84**	**48.69**	**67.52**	**41.54**	**25.98**
Tennessee					
Anderson	0.28	13.21	13.49	6.02	7.47
Bedford	0.84	5.52	6.35	3.88	2.47
Benton	0.11	1.33	1.45	1.07	0.38
Bledsoe	0.49	0.06	0.55	0.15	0.40
Blount	0.00	12.25	12.25	9.21	3.04
Bradley	2.54	10.18	12.72	8.92	3.80
Campbell	0.63	2.26	2.89	1.58	1.31
Carroll	0.35		0.35	0.20	0.15
Carter	8.85		8.85	2.56	6.30
Claiborne	0.10	2.69	2.79	0.53	2.25
Cocke		3.96	3.96	2.43	1.54
Coffee	0.01	5.08	5.09	5.29	-0.20
Cumberland		5.43	5.43	1.98	3.45
Decatur	0.20	0.98	1.18	0.53	0.65
Dickson		4.91	4.91		4.91
Franklin	2.39	2.86	5.25	1.38	3.87
Giles	0.36	2.74	3.10	1.70	1.40
Grainger	0.13		0.13	0.11	0.02
Greene		8.46	8.46	3.64	4.82
Grundy		0.90	0.90	0.37	0.53
Hamblen	0.36	8.67	9.03	4.25	4.78
Hamilton	9.29	49.73	59.02	44.43	14.58
Hancock	0.00	0.23	0.23	0.17	0.06
Hardin	2.36	0.67	3.03	1.30	1.72
Hawkins	1.26	3.01	4.27	2.41	1.86
Henderson	0.39	2.92	3.31	1.55	1.75
Henry	3.10	0.00	3.11	2.28	0.82
Hickman		2.39	2.39	0.41	1.98
Houston	0.20		0.20		0.20
Humphreys	1.45	1.07	2.52	1.78	0.75
Jefferson	4.13	0.27	4.40	1.30	3.10
Johnson	1.62	0.36	1.98	0.82	1.16
Knox	0.67	62.40	63.08	58.07	5.01
Lawrence	2.25	2.20	4.45	2.29	2.15
Lewis	1.51		1.51	0.72	0.79
Lincoln	2.31	1.33	3.64	1.37	2.26

Note: Figures may not add to totals because of independent rounding.

Table 2–21: Public-Supply Water Use by County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Withdrawals			Return	Net Water Demand
	Groundwater	Surface Water	Total		
Tennessee (continued)					
Loudon	0.35	9.26	9.61	7.66	1.94
McMinn	2.54	3.21	5.75	4.66	1.09
McNairy	0.81		0.81	0.49	0.32
Marion	1.37	2.29	3.66	0.81	2.85
Marshall	0.16	2.51	2.66	2.34	0.33
Maury	1.07	11.36	12.42	6.31	6.11
Meigs	0.70		0.70	0.26	0.44
Monroe	0.79	3.87	4.66	2.32	2.34
Moore		0.56	0.56	0.31	0.24
Morgan		1.35	1.35	0.58	0.77
Perry		0.61	0.61	0.61	0.00
Polk	1.19	0.25	1.44	0.33	1.11
Rhea	0.91	3.01	3.92	2.24	1.68
Roane	1.03	7.06	8.08	2.80	5.28
Sequatchie		0.75	0.75	0.49	0.26
Sevier	0.27	8.70	8.97	7.55	1.41
Stewart	0.04		0.04		0.04
Sullivan	0.29	23.82	24.11	17.19	6.91
Unicoi	5.52		5.52	1.43	4.09
Union	0.35		0.35	0.31	0.04
Washington	0.00	14.80	14.80	11.72	3.08
Wayne	0.22	0.93	1.16	0.89	0.27
Williamson	0.15		0.15		0.15
State total	**65.94**	**312.38**	**378.32**	**246.01**	**132.31**
Virginia					
Lee	0.35	1.40	1.75	0.84	0.91
Russell	1.15	0.61	1.75	1.20	0.55
Scott	0.01	1.10	1.11	1.03	0.09
Smyth	4.09	0.54	4.64	2.59	2.05
Tazewell	0.06	3.17	3.23	3.52	-0.28
Washington	2.68	7.80	10.49	3.00	7.48
Wise	0.21	5.15	5.36	6.93	-1.57
State total	**8.56**	**19.77**	**28.33**	**19.11**	**9.23**
Watershed Total	**150**	**534**	**684**	**411**	**273**

Note: Figures may not add to totals because of independent rounding.

Figure 2–16: Public-Supply Withdrawals by State and County in the Tennessee River Watershed in 2005

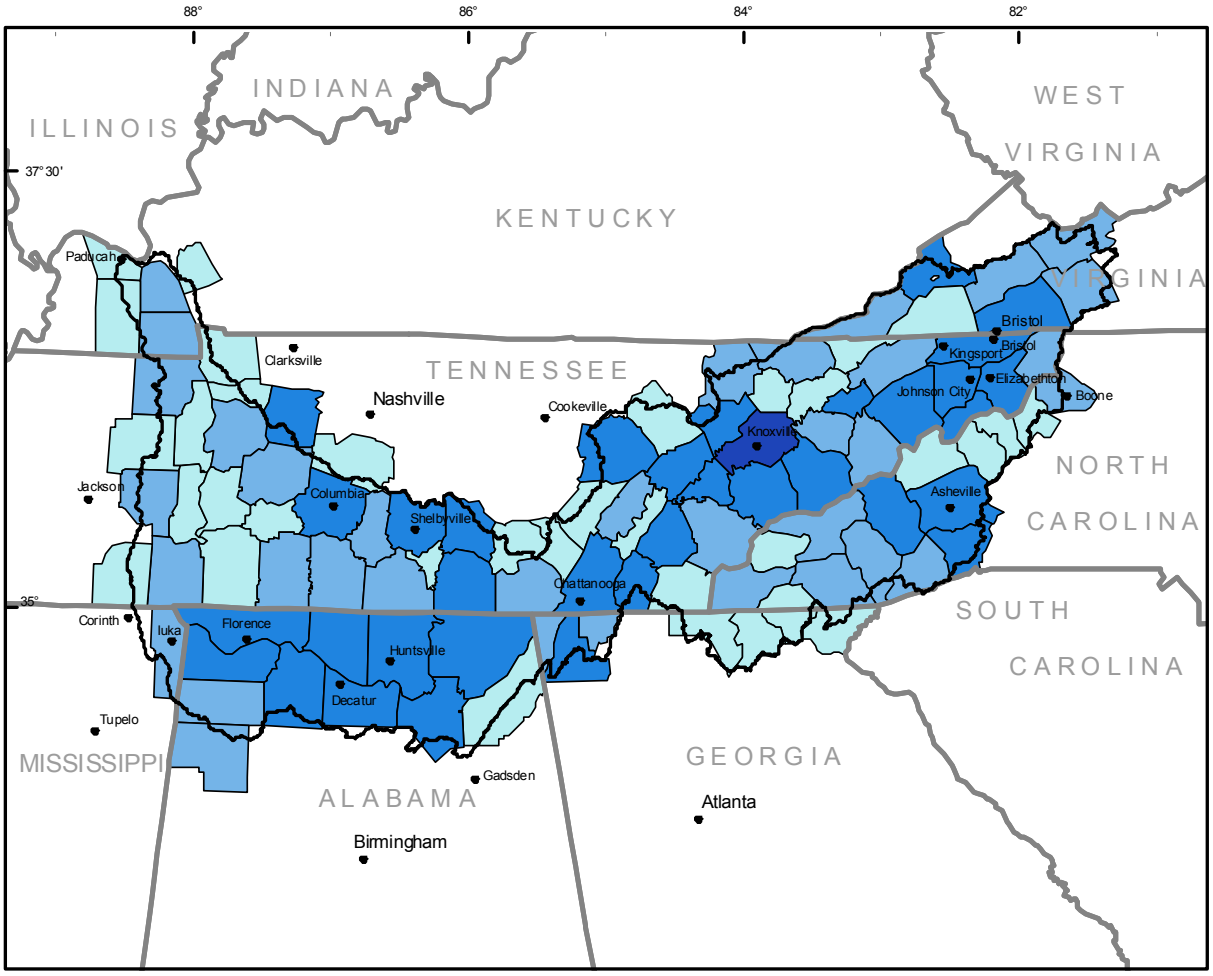


Figure 2–17: Source of Water Used for Irrigation in the Tennessee River Watershed in 2005

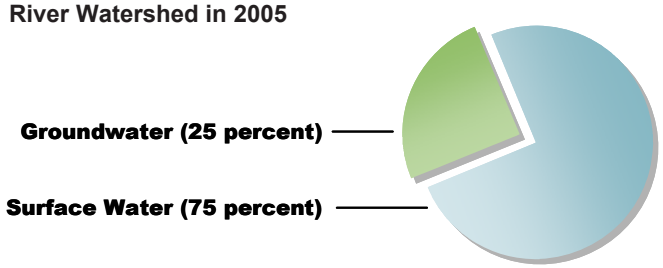


Table 2–22: Irrigation Water Withdrawals by Source and Water-Use Tabulation Area in 2005 (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals		
	Groundwater	Surface Water	Total
Cherokee			
Watauga	0.15	0.31	0.46
South Holston	0.23	0.20	0.43
Boone	0.07	0.08	0.14
Fort Patrick Henry			0.00
Cherokee	0.15	2.65	2.80
WUTA total	***0.59***	***3.24***	***3.83***
Cumulative	*0.59*	*3.24*	*3.83*
Douglas			
Douglas	0.71	1.43	2.14
WUTA total	***0.71***	***1.43***	***2.14***
Cumulative	*1.30*	*4.67*	*5.97*
Fort Loudoun			
Fort Loudoun	0.38	0.24	0.62
WUTA total	***0.38***	***0.24***	***0.62***
Cumulative	*1.68*	*4.91*	*6.59*
Fontana-Tellico			
Fontana		0.07	0.07
Santeetlah			0.00
Tellico	0.11	0.37	0.48
WUTA total	***0.11***	***0.44***	***0.55***
Cumulative	*1.79*	*5.35*	*7.15*
Norris			
Norris	0.04	0.29	0.33
Melton Hill	0.13	0.77	0.90
WUTA total	***0.17***	***1.06***	***1.23***
Cumulative	*1.96*	*6.41*	*8.38*
Hiwassee-Ocoee			
Chatuge	0.05	0.13	0.18
Nottely			0.00
Hiwassee	0.09	0.28	0.37
Apalachia			0.00
Blue Ridge	0.03	0.02	0.05
Ocoee	0.00	0.02	0.02
WUTA total	***0.18***	***0.45***	***0.62***
Cumulative	*2.14*	*6.86*	*9.00*
Watts Bar-Chickamauga			
Watts Bar	0.03	0.34	0.37
Chickamauga	0.78	1.76	2.54
WUTA total	***0.81***	***2.09***	***2.91***
Cumulative	*2.95*	*8.95*	*11.90*

Note: Figures may not add to totals because of independent rounding.

Table 2–22: Irrigation Water Withdrawals by Source and Water-Use Tabulation Area in 2005 (Continued) (Millions of Gallons per Day)

Water-Use Tabulation Area Reservoir Catchment Area	Withdrawals		Total
	Groundwater	Surface Water	
Nickajack			
Nickajack	0.11	0.21	0.32
WUTA total	***0.11***	***0.21***	***0.32***
Cumulative	*3.06*	*9.16*	*12.23*
Guntersville			
Guntersville	0.62	1.77	2.39
WUTA total	***0.62***	***1.77***	***2.39***
Cumulative	*3.68*	*10.93*	*14.61*
Tims Ford			
Tims Ford	0.40	1.95	2.35
WUTA total	***0.40***	***1.95***	***2.35***
Cumulative	*4.08*	*12.88*	*16.97*
Wheeler-Wilson			
Wheeler	4.19	12.04	16.23
Wilson	1.14	1.86	3.00
WUTA total	***5.33***	***13.90***	***19.23***
Cumulative	*9.42*	*26.78*	*36.20*
Pickwick			
Pickwick	0.89	1.15	2.03
Cedar Creek			0.00
Upper Bear Creek			0.00
WUTA total	***0.89***	***1.15***	***2.03***
Cumulative	*10.31*	*27.93*	*38.23*
Normandy			
Normandy	0.10	1.06	1.16
WUTA total	***0.10***	***1.06***	***1.16***
Cumulative	*10.41*	*28.99*	*39.39*
Kentucky			
Kentucky	0.59	3.42	4.01
WUTA total	***0.59***	***3.42***	***4.01***
Cumulative	*11*	*32*	*43*

Note: Figures may not add to totals because of independent rounding.

Figure 2–18: Irrigation Water Withdrawals by Source and Hydrologic Unit Code in the Tennessee Watershed in 2005

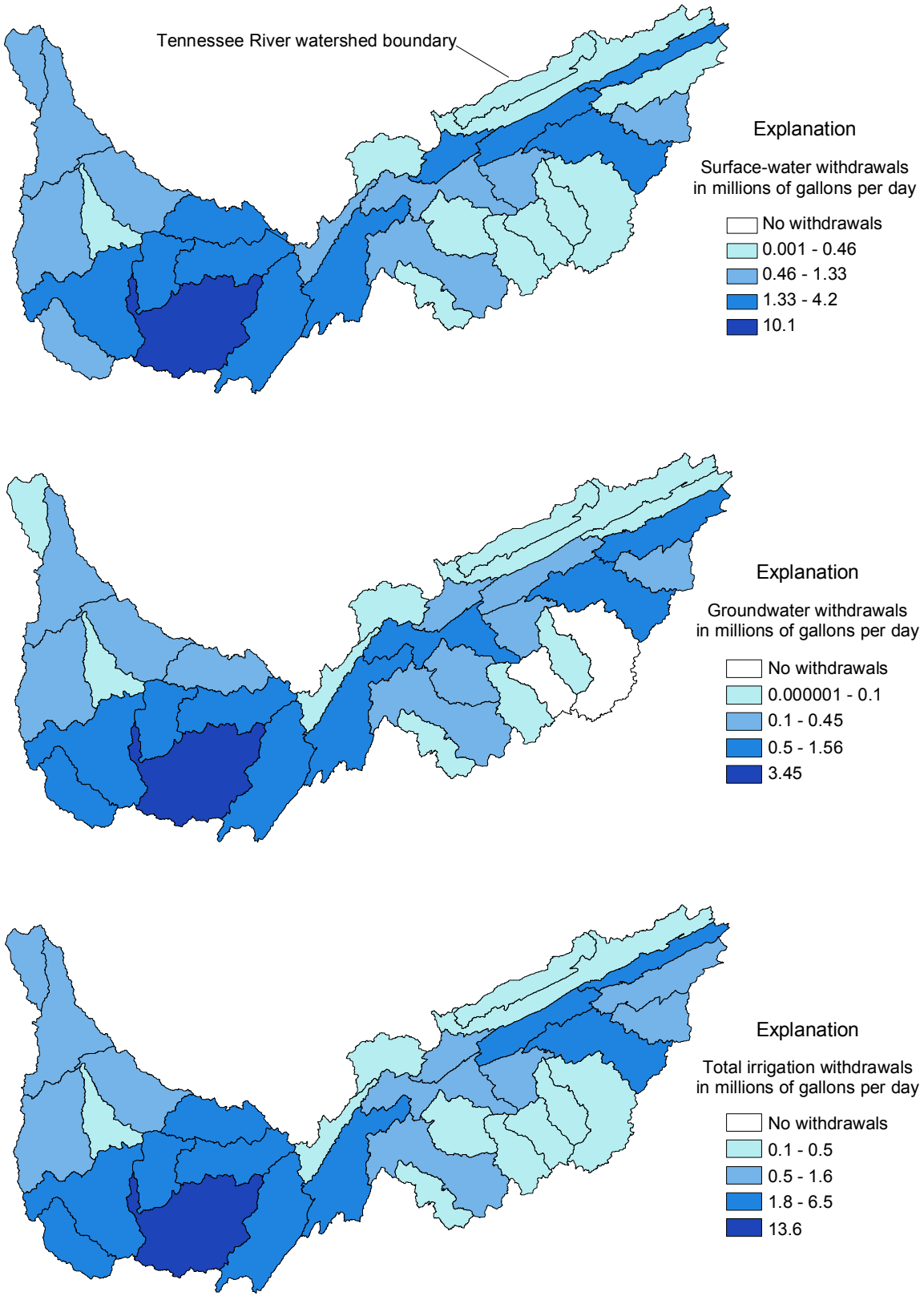


Table 2–23: Irrigation Water Withdrawals by Hydrologic Unit Code in 2005 (Millions of Gallons per Day)

Hydrologic Unit Code	Withdrawals		Total
	Groundwater	Surface Water	
6010101	0.00	1.61	1.61
6010102	0.29	0.27	0.56
6010103	0.15	0.32	0.48
6010104	0.15	1.04	1.18
6010105		0.14	0.14
6010106	0.00	0.10	0.10
6010107	0.08	0.30	0.37
6010108	0.64	0.95	1.59
6010201	0.42	0.68	1.09
6010202	0.00	0.07	0.07
6010203		0.00	0.00
6010204	0.09	0.16	0.25
6010205	0.04	0.22	0.25
6010206	0.00	0.05	0.06
6010207	0.13	0.77	0.90
6010208	0.00	0.09	0.09
6020001	0.89	1.91	2.81
6020002	0.14	0.43	0.57
6020003	0.03	0.03	0.07
6020004	0.01	0.30	0.30
6030001	0.61	1.75	2.36
6030002	3.45	9.65	13.10
6030003	0.40	2.11	2.51
6030004	0.74	3.01	3.75
6030005	1.51	2.39	3.89
6030006	0.53	0.64	1.17
6040001	0.20	0.75	0.94
6040002	0.10	1.11	1.22
6040003	0.05	0.38	0.43
6040004	0.02	0.23	0.25
6040005	0.28	0.53	0.82
6040006	0.03	0.44	0.47
Watershed Total	**11**	**32**	**43**

Note: Figures may not add to totals because of independent rounding.

Table 2–24: Irrigation Water Withdrawals by County in 2005 (Millions of Gallons per Day)

State and County	Withdrawals		Total
	Groundwater	Surface Water	
Alabama			
Blount	0.01	0.01	0.02
Colbert	0.94	1.40	2.34
Cullman	0.06	0.00	0.06
Dekalb	0.50	0.80	1.30
Etowah	0.00	0.01	0.01
Franklin	0.26	0.21	0.47
Jackson	0.04	0.66	0.70
Lauderdale	0.74	0.42	1.16
Lawrence	0.31	1.19	1.50
Limestone	2.11	6.16	8.26
Madison	1.61	3.30	4.92
Marion			0.00
Marshall		0.49	0.49
Morgan	0.12	0.74	0.86
State Total	**6.69**	**15.39**	**22.08**
Georgia			
Catoosa	0.26	0.79	1.05
Dade	0.15	0.02	0.17
Fannin	0.03	0.02	0.05
Rabun		0.07	0.07
Towns	0.05	0.13	0.18
Walker		0.28	0.28
State Total	**0.50**	**1.29**	**1.80**
Kentucky			
Calloway	0.01	0.27	0.28
Graves	0.01	0.11	0.12
Livingston		0.00	0.00
Lyon		0.00	0.00
McCracken	0.01	0.00	0.01
Marshall		0.03	0.03
State Total	**0.02**	**0.42**	**0.44**
Tennessee			
Anderson	0.12	0.63	0.75
Bedford	0.04	0.00	0.04
Benton		0.10	0.10
Bledsoe		0.38	0.38
Blount	0.47	0.30	0.77
Bradley	0.01	0.04	0.05
Campbell		0.06	0.06
Carroll	0.05		0.05
Carter		0.19	0.19
Claiborne		0.05	0.05
Cocke		0.28	0.28
Coffee	0.07	1.43	1.50

Note: Figures may not add to totals because of independent rounding.

Table 2–24: Irrigation Water Withdrawals by County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Withdrawals		Total
	Groundwater	Surface Water	
Tennessee (continued)			
Cumberland	0.00	0.08	0.08
Decatur	0.01	0.05	0.05
Dickson		0.01	0.01
Fentress		0.00	0.00
Franklin	0.49	0.54	1.03
Giles		1.07	1.07
Grainger	0.13	0.38	0.51
Greene	0.06	0.62	0.68
Grundy		0.20	0.20
Hamblen	0.17	0.29	0.46
Hamilton	0.38	0.22	0.61
Hancock	0.00	0.02	0.03
Hardin	0.07	0.47	0.54
Hawkins		0.38	0.38
Henderson		0.11	0.11
Henry	0.24	0.40	0.64
Hickman		0.03	0.03
Humphreys		0.04	0.04
Jefferson	0.13	0.13	0.27
Johnson	0.02	0.02	0.03
Knox	0.04	0.43	0.46
Lawrence	0.09	0.80	0.88
Lewis		0.01	0.01
Lincoln		1.41	1.41
Loudon		0.07	0.07
McMinn	0.10	0.23	0.32
McNairy	0.11	0.11	0.21
Marion	0.01	0.03	0.05
Marshall		0.12	0.12
Maury	0.05	0.20	0.25
Meigs		0.14	0.14
Monroe		0.03	0.03
Morgan		0.01	0.01
Perry		0.01	0.01
Polk	0.00	0.03	0.04
Rhea	0.05	0.48	0.53
Roane	0.01	0.03	0.04
Sequatchie		0.01	0.01
Sevier	0.02	0.16	0.18
Stewart		0.02	0.02
Sullivan	0.17	0.21	0.38
Unicoi	0.02	0.01	0.03
Union		0.01	0.01
Washington	0.56	0.45	1.01
Wayne	0.02	0.11	0.13
Williamson	0.01	0.07	0.09
State Total	**3.72**	**13.71**	**17.43**

Note: Figures may not add to totals because of independent rounding.

Table 2–24: Irrigation Water Withdrawals by County in 2005 (Continued)
(Millions of Gallons per Day)

State and County	Withdrawals		
	Groundwater	Surface Water	Total
Virginia			
Russell		0.01	0.01
Smyth		1.60	1.60
Washington	0.06		0.06
State Total	**0.06**	**1.60**	**1.66**
Watershed Total	**11**	**32**	**43**

Note: Figures may not add to totals because of independent rounding.

3

Comparison to Previous Updates, Inter-Basin Transfers, & Diversions

Comparison to Previous Updates

1995, 2000, and 2005

The Tennessee River watershed is the only watershed in the nation that has continuous trend data since 1995. Table 3–1 compares water use in 2005 to water use in 2000 and 1995.

The growth in total water withdrawals slowed substantially between 2000 and 2005 compared to total water withdrawals between 1995 and 2000. Total withdrawals grew by 22 percent from 1995 to 2000, but only by 1.9 percent from 2000 to 2005 (line 2 of Table 3–1).

The percent of total withdrawal supplied by surface water slightly increased from 1995 to 2005. The percentage of water supplied by groundwater continued to decline from 2.6 percent in 1995, to 1.8 percent in 2000, and to 1.5 percent in 2005 (line 6 of Table 3–1).

Total return flow not only increased from 11,562 mgd to 12,005 (line 7 of Table 3–1), but the percentage of total withdrawal that was returned also increased from 94.7 percent to 96.5 percent between 2000 and 2005 (line 8 of Table 3–1). Due to the increased percentage of water returned, consumptive use fell from 649 mgd in 2000 to 432 mgd in 2005 (line 9 of Table 3–1). Consumptive use fell from 5.3 percent of total withdrawal in 2000 to 3.5 percent of total withdrawal in 2005 (line 10 of Table 3–1).

Thermoelectric water withdrawal increased by 2.5 percent from 2000 to 2005 (line 13 of Table 3–1). The increase was much less than the increase between 1995 and 2000 during the period when new power plants became operational. Thermoelectric net water demand was 33 mgd in 2005 which was almost the same as in 2000 (line 16 of Table 3–1). Net water demand for thermoelectric use increased as a percentage of total net water demand between 2000 and 2005 (line 18 of Table 3–1). This occurred because net water demand for thermoelectric use remained constant, while total net water demand fell from 2000 to 2005 (line 9 of Table 3–1).

Total withdrawals, excluding thermoelectric, continued the trend of decline from 1995, although the rate of decline between 2000 and 2005 was less than between 1995 and 2000 (line 19 of Table 3–1). Total returns excluding thermoelectric water returns were 15 percent of the total withdrawal in 2005 compared to 16 percent in 2000 (line 20 of Table 3–1).

Table 3–1: Comparing 2005 Water Withdrawal, Return, and Net Water Demand to Previous Years (Millions of Gallons per Day or Percent as Noted)

		1995	2000	2005
1.	Total withdrawals	10,008	12,211	12,437
2.	Percent change from previous report		22.0	1.9
3.	Total surface-water withdrawals	9,750	11,996	12,247
4.	Percent of total withdrawal	97.4	98.2	98.5
5.	Total groundwater withdrawals	258	215	190
6.	Percent of total withdrawal	2.6	1.8	1.5
7.	Total return flow		11,562	12,005
8.	Percent of total withdrawal		94.7	96.5
9.	Total net water demand (consumptive use)		649	432
10.	Percent of total withdrawal		5.3	3.5
11.	Total thermoelectric withdrawal	8,010	10,276	10,531
12.	Percent of total withdrawal	80.0	84.2	84.7
13.	Percent change from previous report		28.3	2.5
14.	Total thermoelectric return		10,244	10,498
15.	Percent of total return		88.6	87.4
16.	Total thermoelectric net water demand (consumptive use)		32	33
17.	Percent of thermoelectric withdrawal		<1	<1
18.	Percent of total net water demand		4.9	7.6
19.	Total withdrawals excluding thermoelectric	1,998	1,935	1,906
20.	Percent of total withdrawal	20	16	15
21.	Percent change from previous report		-3.2	-1.5
22.	Total returns excluding thermoelectric		1,318	1,508
23.	Percent change from previous report			14.4
24.	Total net water demand (consumptive use) excluding thermoelectric		617	398
25.	Total industrial withdrawal	1,030	1,205	1,179
26.	Percent of total withdrawal	10.3	9.9	9.5
27.	Percent change from previous report		17.0	-2.2
28.	Total industrial return		942	1,097
29.	Percent change from previous report			16.5
30.	Total industrial net water demand (consumptive use)		263	82
31.	Percent of industrial withdrawal		21.8	7.0
32.	Percent of total net water demand		40.5	19.0
33.	Public supply total withdrawal	574	662	684
34.	Percent of total withdrawal	5.7	5.4	5.5
35.	Percent change from previous report		15.3	3.2
36.	Total public supply return		377	411
37.	Percent change from previous report			9.0
38.	Total public supply net water demand (consumptive use)		285	273
39.	Percent of public supply withdrawal		43.1	39.8
40.	Percent of total net water demand		43.9	63.0
41.	Irrigation total withdrawal	48	69	43
42.	Percent of total withdrawal	<1	<1	<1
43.	Percent change from previous report		43.5	-37.6
44.	Irrigation total net water demand (consumptive use)		69	43
45.	Percent of total net water demand		11	10
46.	Net water demand by WUTA			
47.	Cherokee		88	90
48.	Douglas		65	53
49.	Fort Loudoun		23	1
50.	Fontana-Tellico		6	7
51.	Norris		45	28
52.	Hiwassee-Ocoee		16	10
53.	Watts Bar-Chickamauga		45	40
54.	Nickajack		12	-3
55.	Guntersville		16	30
56.	Tims Ford		21	8
57.	Wheeler-Wilson		196	112
58.	Pickwick		29	-13
59.	Normandy		26	25
60.	Kentucky		60	43
61.	Total net water demand (consumptive use)		649	432
62.	Diversions			
63.	To Tennessee-Tombigbee Waterway		200	200
64.	To Barkley Reservoir		3,361	4,146

Industrial water withdrawal decreased by about 2.2 percent (line 27 of Table 3–1), but industrial returns increased by 16.5 percent between 2000 and 2005 (line 29 of Table 3–1). The decrease in withdrawal, accompanied by the increase in returned water, resulted in a reduction in net water demand for industrial of 181 mgd (line 30 of Table 3–1). This was 83 percent of the total reduction in net water demand of 217 mgd between 2000 and 2005 (line 9 of Table 3–1).

Watershed population grew from 4.2 million in 1995 to 4.5 million in 2000, or by about 7 percent (Hutson and others, 2004). During the same time, the public-supply withdrawal grew by 15.3 percent (line 35 of Table 3–1). The 2005 population was 4.7 million (Table 2–2) or an increase of about 4.4 percent from 2000 while public-supply withdrawal increased by 3.2 percent. The increase in public-supply withdrawal from 2000 to 2005 more closely follows the population increase than it did from 1995 to 2000.

In 2000, net water demand was 43.1 percent of public-supply withdrawal. But by 2005, it had decreased slightly to 39.8 percent of public-supply withdrawal (line 39 of Table 3–1). Because of the large decrease in industrial net water demand, net water demand for public supply grew to 63 percent of total net water demand in 2005 (line 40 of Table 3–1). This was up from 43.9 percent in 2000.

Irrigation water use was down by 26 mgd or 37.6 percent between 2000 and 2005 (lines 41 and 43 of Table 3–1). Because no water is returned to the river system when used for irrigation, this reduction in irrigation water use also decreased total net water demand. Most of the reduction occurred in Alabama where the 2000 irrigation withdrawal might have been overstated.

The largest change in net water demand for the WUTAs occurred in Wheeler-Wilson where net water demand fell by 84 mgd (line 57 of Table 3–1). This was largely the result in the reduction in industrial water withdrawal and the increase in the percentage of industrial water return.

Water diversions from the Tennessee River to the Tennessee-Tombigbee Waterway in 2005 were 200 mgd and were the same as in 2000 (line 63 of Table 3–1). The flow between Kentucky Reservoir into Barkley Reservoir on the Cumberland River was more in 2005 than in 2000 (line 64 in Table 3–1). The Kentucky-Barkley transfer varies from year to year, but there is no reason to believe that there is a trend either increasing or decreasing. Over the long term, the transfer is about 3,900 mgd from Kentucky Reservoir to Barkley Reservoir.

Net Water Demand for Selected Industries

Because of the large change in net water demand in the industrial category, a secondary analysis was performed to determine reasons for the change.

Table 3–2 presents a comparison of industrial use for 10 companies which experienced significant changes in net water demand between 2000 and 2005. The total change in net water demand for these 10 companies explains 153 mgd of the 181 mgd change in industrial net water demand between 2000 and 2005. The reason for the change in net water demand for each company follows.

A paper mill increased its percent of water returned from 84 percent in 2000 to 91 percent in 2005 (line 3 of Table 3–2). Additionally, a chemical company decreased its withdrawal by 66 mgd, while keeping its water return about

Table 3–2: Differences in 2000 and 2005 Net Water Demands for Selected Industries (Millions of Gallons per Day or Percent as Noted)

Transaction	Withdrawal		Return		Net Water Demand		Change	Percent
	2000	2005	2000	2005	2000	2005		
1. 2000 and 2005 industrial totals	1205	1179	942	1097	263	82	-181	
2. Percent returned 2000 Percent returned 2005								78.2 93.0
Lawrence County, Alabama								
3. Paper mill	55.8	57.2	47.0	52.2	8.8	5.0	-3.8	
Morgan County, Alabama								
4. Chemical company	142.6	76.6	78.7	76.6	63.9	0.0	-63.9	
Livingston County, Kentucky								
5. Sand and gravel company	19.8	4.2	0.0	1.8	19.8	2.4	-17.4	
Benton County, Tennessee								
6. Sand and gravel company	18.9	2.1	0.0	0.0	18.9	2.1	-16.8	
Blount County, Tennessee								
7. Aluminum company	Purchase	Purchase	0.0	5.6	0.0	-5.6	-5.6	
Coffee County, Tennessee								
8. Government research	55.0	24.7	36.0	21.3	19.0	3.5	-15.6	
Humphreys County, Tennessee								
9. Chemical company	67.0	58.1	54.1	57.8	12.9	0.3	-12.6	
Jefferson County, Tennessee								
10. Mining company	10.0	2.7	2.3	2.6	7.7	0.0	-7.7	
Loudon County, Tennessee								
11. Tissue company	3.5	5.0	0.0	4.7	3.5	0.3	-3.2	
Polk County, Tennessee								
12. Acid plant	31.0	3.6	24.4	3.3	6.6	0.3	-6.3	
13. Total lines 3 through 12	404	234	243	226	161	8	-153	
14. 2000 and 2005 industrial totals less line 13	801	945	700	871	102	74	-28	
15. Percent change in withdrawal from 2000 to 2005								17.9
16. Percent returned 2000								87.3
17. Percent returned 2005								92.2

the same (line 4 of Table 3–2). It is likely the 2000 water withdrawal was significantly overstated for this company.

Two sand and gravel companies made significant reductions in water withdrawal between 2000 and 2005. In addition, no water returns for those companies were reported in 2000. The result was a 34.2 mgd reduction in net water demand (lines 5 and 6 of Table 3–2).

An aluminum company that purchases water reported no water discharge in 2000, but reported a 5.6 mgd water discharge in 2005 (line 7 of Table 3–2).

A research facility that uses significant amounts of cooling water reduced its water requirement between 2000 and 2005 (line 8 of Table 3–2).

A chemical company in Humphreys County, Tennessee, eliminated a 10 mgd groundwater withdrawal between 2000 and 2005. However, 2000 and 2005 water returns were reported to be about the same (line 9 of Table 3–2).

In Jefferson County, Tennessee, a mining company significantly reduced its water withdrawal between 2000 and 2005 (line 10 of Table 3–2).

In Loudon County, Tennessee, a tissue company did not have a reported water return in 2000, but did have one in 2005 that was almost equal to the water withdrawal (line 11 of Table 3–2).

A Polk County acid plant operated in 2000, but did not operate in 2005 (line 12 of Table 3–2).

The differences in water use, as explained above, essentially fall into the following categories:

1. A larger percentage of the water withdrawal was reported as return flow in 2005 compared to 2000. This might be due to greater water-use efficiency or the inclusion of more storm-water in the discharge measurements.
2. There were no discharge data for four companies in 2000, but all reported discharges in 2005.
3. Companies made process changes or discontinued a process operation.
4. Discharge data are required by law under the National Pollutant Discharge Elimination System (NPDES) and companies can be criminally cited for inaccurate reporting. In 2000, neither Tennessee nor Alabama had reporting requirements for industrial withdrawals, and withdrawals might not have been measured and reported as accurately as discharges.

Table 3–2 shows the total water usage of the 10 companies deleted from the 2000 and 2005 industrial totals (line 14 of Table 3–2). By excluding the 10 companies, the remainder of the industrial water withdrawal actually increased by 18 percent between 2000 and 2005 (line 15 of Table 3–2). However, the percent of the water withdrawal that was returned was still higher in 2005 than in 2000 (lines 16 and 17 of Table 3–2) and that resulted in a decrease in net water demand of 28 mgd between 2000 and 2005 (line 14 of Table 3–2). This suggests that after adjusting for special situations and onetime events, there is a trend of increasing industrial

withdrawal from 1995. It will take an additional five-year data cycle to determine if the percent of return flow stabilizes or not.

Inter-Basin Transfers

An inter-basin transfer (IBT), in the context of this report, is a transfer of water across the Tennessee River watershed boundary. Although there are numerous transfers between river basins within the Tennessee River watershed, an IBT as discussed below, refers only to a transfer across the watershed boundary.

IBTs are of concern because of the following reasons:

1. After the water is transferred, no water is returned to the Tennessee River for reuse.
2. Impacts may not occur at the point of withdrawal, but on reservoirs far from the point of withdrawal.
3. IBTs could impair TVA's ability to carry out mandated responsibilities for managing the Tennessee River system depending on when and where IBTs occur and the volume that is transferred.
4. IBTs will reduce hydrogeneration and may reduce water availability for power-plant cooling.
5. IBTs at some locations would create environmental conflicts with in-stream uses such as for fish and aquatic life.
6. IBTs are sensitive issues in all Valley states and are sources of potential conflict among the states.

Bohac and Koroa (2004) reported the estimated IBTs for 2000 to be a net 8.1 mgd of water transferred out of the watershed. The IBTs existing in 2005 are shown in Table 3–3.

There were 24 active IBTs in 2005. Most of these IBTs were the result of water supply systems providing water to customers across the Tennessee River watershed boundary. The IBTs range in size from less than 0.1 to 1.8 mgd. Of the 24 IBTs, 13 transferred water out of the Tennessee River watershed. The remainder moved water into the watershed for a net loss of 4.4 mgd.

Diversions

Under agreement with the U.S. Army Corps of Engineers (USACE), an average of 200 mgd in 2005 was diverted from Pickwick Reservoir to the Tennessee-Tombigbee Waterway to support its operations.

In western Kentucky at the northwest tip of Land Between the Lakes, the Barkley Canal connects the Tennessee River and the Cumberland River. Historic reservoir operations have resulted in a net flow of Tennessee River water to and through Barkley Canal. This averages about 3,900 mgd and provides electrical generating capacity during peak-power demands for USACE's Barkley Dam. This operation is authorized through agreements between TVA and USACE. In 2005, the flow was 4,246 mgd from Kentucky Reservoir to Barkley Reservoir.

Table 3–3: Inter-Basin Transfers in 2005
(Millions of Gallons per Day)

System	Transfer From	Transfer To	Amount Transferred (mgd)
Alabama			
Fort Payne	Tennessee River	Little River Basin	-1.7
Haleyville	Lower Tennessee River Basin	Buttahatchee River	-1.7
Albertville (estimated)	Lower Tennessee River Basin	Coosa River Basin	-2
Arab Water Works (estimated)	Lower Tennessee River Basin	Coosa River Basin	-0.6
Franklin County Water Service Authority	Lower Tennessee River Basin	Tombigbee River Basin	-0.4
Georgia			
Clayton-Rabun County W&S Authority	Savannah River	Tennessee River	0.1
Dalton Utilities	Coosa River	Tennessee River	0.6
Walker County Authority	Tennessee River	Coosa River	-0.4
North Carolina			
Hendersonville	French Broad River Basin	Broad River Basin	-0.1
Highlands	Little Tennessee River Basin	Savannah River Basin	-0.1
Tennessee			
City of Crossville	Upper Cumberland River	Upper Tennessee/Clinch/Emory Rivers	1.8
City of Lexington	Tennessee Western Valley	Mississippi River	-0.1
Cleveland Utilities	Lower Tennessee/Hiwassee Rivers	Conasauga River	-0.3
Cleveland Utilities	Conasauga River	Lower Tennessee/Hiwassee	0.7
Columbia Power & Water Systems	Western Tennessee River Valley	Lower Cumberland River	0
Cumberland Utility District	Upper Tennessee River	Upper Cumberland River	0
Duck River Utility Commission	Upper Cumberland River	Lower Tennessee/Hiwassee	0.09
Eastside Utility District	Lower Tennessee/Hiwassee Rivers	Conasauga River	-0.8
Huntsville Utility District	Upper Cumberland River	Upper Tennessee/Clinch/Emory Rivers	0.1
Ocoee Utility District	Conasauga River	Lower Tennessee	0.1
Plateau Utility District	Upper Tennessee/Clinch/Emory Rivers	Upper Cumberland/Obey/Caney Fork Rivers	-0.1
Tennessee American	Tennessee River	Coosa River	-0.1
Town of Selmer	Mississippi River	Tennessee Western Valley	0.2
West Warren—Viola Utility District	Upper Cumberland/Obey Caney Fork Rivers	Tennessee Western Valley	0.3
Total			**-4.4**

4 Projected Water Use

Introduction

Projections of water use for 2030 were prepared for the four use categories of thermoelectric, industrial, public supply, and irrigation. The projection methods for each category of use are described below.

Thermoelectric Water Use

Electrical Demand

Total TVA system output for 2001 through 2005 averaged 168,937 million kilowatt hours (Tennessee Valley Authority, 2001-2005).

Electrical Generation

Generation in 2005

Table 4–1 shows how the electrical demand within the TVA power service area was supplied for the fiscal year ending September 30, 2005 (Tennessee Valley Authority, 2005).

Table 4–1: Electrical Generation in the Tennessee Valley from 2004–2005

Generation Source	Generation (Millions of Megawatt Hours)
Hydro	15.7
Fossil	98.4
Nuclear	45.2
Combustion Turbine	0.6
Purchased	16.6
Total	**176.5**

Assumptions for Future Generation

Increasing power demand combined with rising fuel costs and global air quality concerns have kindled a renewed interest in nuclear generation. TVA restarted Browns Ferry Nuclear Plant Unit 1 in 2007 adding approximately 1,155 megawatts of nuclear capacity. Also during 2007, the TVA Board of Directors authorized completing the second unit at Watts Bar Nuclear Plant. In addition, TVA is exploring the possibility of building two new nuclear units at its Bellefonte Nuclear Plant in North Alabama.

Thermoelectric water use for 2030 was estimated based on TVA's proprietary power supply plan. The plan considers the most economical mix of generating facilities to meet the power demand in the TVA region based on factors such as fuel prices, air quality constraints, and unit-operating efficiency. Power supply options include generation from existing and new TVA units, purchases from existing and new merchant plants, and purchases

from other utilities. In addition to the new TVA generating units at Browns Ferry, Watts Bar, and Bellefonte, other new TVA and merchant generating units will be a mix of combined-cycle-combustion turbines, coal-fired units, and nuclear units. Water demand is projected for all generating units in the Tennessee River watershed, not just those owned or leased by TVA

Almost all of TVA's nuclear and coal-fired power plants presently rely on once-through cooling most of the time, with a few plants using cooling towers when the return flows would warm the river above water quality discharge limits. Once-through cooling is simply extracting water from the river, passing it through the power plant condenser, and returning it to the river. Almost all the withdrawal is returned to the river. Cooling towers require less water taken from the river than once-through systems, but little water is returned since it evaporates in the cooling process. Once-through cooling discharges the waste heat to the river, while cooling towers discharge it to the atmosphere.

It is believed that current environmental regulations will make it very difficult for new generating plants to use once-through cooling with direct-heat rejection to the river or reservoir based on a U.S. Second Circuit Court of Appeals decision that effectively requires all new power plants to install closed-cycle cooling technology (Second Circuit Court of Appeals, 2004). Therefore, it is believed that all new generation with the exception of Browns Ferry Unit 1, will require the use of cooling towers all the time.

The power supply plan anticipates that some of TVA's existing coal-fired generation will be replaced with nuclear generation by 2030. This will reduce the amount of existing once-through cooling and will result in a reduction of water withdrawal for thermoelectric use compared to 2005. However, because the use of cooling towers will increase, the net water demand for thermoelectric will increase compared to 2005.

To improve air-quality emissions, TVA plans to construct scrubbers at several coal-fired plants. Current project plans include adding scrubbers to the following plants in the Tennessee River watershed: Bull Run, all Colbert units, all Kingston units, and all John Sevier units.

Public Supply and Industrial Categories

For the public supply and industrial categories, the 2005 water-use estimates serve as the basis for the projections. Economic and demographic data at the county-level projected to 2030 (Woods and Poole Economics, Inc., 2004) were used to project water use to 2030. The change in the number of households was used to project public-supply withdrawal and return flow, and changes in manufacturing and mining earnings were used for the industrial withdrawal and return-flow projections. The county-specific-projection factor or multiplier for number of households or industrial and mining earnings, was applied to each water-use record in the 2005 water-use database to produce estimates of 2030 water use.

Irrigation Water Use

The 2002 Census of Agriculture and the 2003 Farm and Ranch Irrigation Survey (USGS, 2007) were used to project irrigated acreage in 2030.

Since 1982, irrigated acreage in the seven Tennessee watershed states increased with a range of about 1,200 acres per year in Kentucky, up to about 49,000 acres per year in Mississippi, even though the number of farms were decreasing. The average increase in irrigated acreage for the watershed states was 12,200 acres per year. In 2002, the percent of total land in farms that was irrigated ranged from less than 1 percent in Kentucky to almost 11 percent in Mississippi with an average of 3.5 percent for all seven watershed states. Irrigated acreage, as a percentage of harvested acreage, was 8.4 percent for the Valley states in 1997 and 10.4 percent in 2002.

The 20-year trend in conversion to irrigation from 1982 to 2002 was used to project the increase in irrigated acreage to 2030. The 2030 projected irrigated acreage, as a percentage of total farmland, was estimated to range from less than one percent in Kentucky to almost 26 percent in Mississippi with an average of 8.3 percent for all seven watershed states. This includes an adjustment for the trend of decreasing farmland. Projected 2030 irrigated acreage as a percentage of harvested acreage was estimated to be less than 20 percent by 2030. Using historical trends to project demand over an extended period is often unwise because the things that caused the historical trend could likely change over a long projection period. In addition, using historical trends to predict future demand might also violate a physical limitation (e.g. predict more irrigated land than there is farmland). However, the drought of 2007, in which non-irrigated land in Alabama and Tennessee suffered total crop failures or produced very small crops, will long be remembered by farmers who are coming to believe they cannot consistently grow crops without irrigation. For example, inadequate summer rainfall reduces Alabama's farm production about 1 of every 3 years (Christy, 2007). Another factor, currently only a small fraction of watershed farmland is irrigated. Projecting the historical trend forward results in only modest amounts of irrigated land even after 25 years, and the projection remains well below the constraints imposed by total farmland or even the much smaller harvested acreage.

Projected Water Use in 2030

Table 4–2 shows projected water use in the Tennessee River watershed in 2030. Total withdrawals are expected to be 11,551 mgd or a decrease of 7 percent over 2005 withdrawals. The consumptive use for the watershed is projected to be 757 mgd or and increase of 75 percent from 2005.

Table 4–2 presents projected 2030 water use by category from 1995 to 2030. Between 2005 and 2030 thermoelectric water use is projected to decrease by 12 percent due to an anticipated reduction in once-through cooling. Industrial water use (including mining) will increase by 10 percent, public-supply water use projected increase is 32 percent, and irrigation water use is expected to increase by 65 percent between 2005 and 2030. The trend in the increase in industrial withdrawal is anticipated to slow because of the elimination of once-through cooling for most new industrial withdrawals.

Transfers from the Watershed

In 2005, 24 public-supply IBTs resulted in a net loss of 4.4 mgd from the Tennessee River watershed. The forecast for 2030 is that this volume will increase at the same rate that water withdrawal for public supply increases. In addition, TVA has permitted two public-supply IBTs that have a projected 2030 withdrawal of 12 mgd. These increases are included in the 2030 estimate for public supply.

TVA estimated the increase in diversions to the Tennessee-Tombigbee Waterway is based on a projection of the increase in commercial lockages between the waterway and the Tennessee River. The estimated diversions to the waterway by 2030 range from 299 to 498 mgd with a midpoint of 399 mgd.

Water transfer from Kentucky Reservoir to Barkley Reservoir in 2030 is assumed to be the long-term average of 3,900 mgd.

Table 4–2: Trends of Estimated Water Use in the Tennessee River Watershed from 1995 to 2030 (Millions of Gallons Per Day)

Off-Stream Use	1995	2000	2005	2030	Percent Change 2005–2030
Total withdrawals	**10,008**	**12,211**	**12,437**	**11,551**	**-7**
Thermoelectric	8,010	10,276	10,531	9,275	-12
Industrial	1,030	1,205	1,179	1,300	10
Public supply	574	662	684	905	32
Irrigation	48	69	43	71	65
Rural	269				
Source of water					
Surface water	9,750	11,996	12,237		
Groundwater	258	215	200		
Consumptive use		649	432	757	75
Transfer to Tennessee-Tombigbee Waterway		200	200	399	100
Transfer to Barkely Reservoir		4,524	4,246	3,900	—

Note: Figures may not add to totals because of independent rounding.

5 Summary and Conclusion

Water Use in 2005

Water withdrawals during 2005 were estimated to average 12,437 mgd for offstream uses or 1.9 percent more than the 2000 withdrawals. Return flow was estimated as 12,005 mgd or 96.5 percent of the water withdrawn during 2005. Consumptive water use of 432 mgd accounted for the remaining 3.5 percent of total withdrawal.

During 2005, thermoelectric water withdrawals were an estimated 10,531 mgd; industrial, 1,179 mgd; public supply, 684 mgd; and irrigation, 43 mgd. Return flows were estimated as thermoelectric, 10,498 mgd; industrial, 1,097 mgd; and public supply 411 mgd. Consumptive use was estimated as thermoelectric power, 33 mgd; industrial, 82 mgd; public supply, 273 mgd; and irrigation, 43 mgd. During 2005, water withdrawals for thermoelectric power increased by 2.5 percent more than 2000, public supply by 3.2 percent while industrial and irrigation decreased by 2.2 percent and 37.6 percent, respectively.

The change in total water withdrawal between 2000 and 2005 (1.9 percent) was much lower than it was between 1995 and 2000 due largely to the big increase in thermoelectric water use that occurred between 1995 and 2000. While total industrial water use actually declined between 2000 and 2005, adjusting for a small percentage of unusual transactions between 2000 and 2005 suggests that there is a trend of increasing withdrawal from 1995.

Public-supply withdrawal increased by 3.2 percent from 2000 to 2005, while it increased by 15.3 percent from 1995 to 2000. The watershed total population increased by 7.3 percent between 1995 and 2000 and increased by 4.4 percent between 2000 and 2005. The increase in public-supply withdrawal between 2000 and 2005 more closely follows the population increase than does the increase in public-supply withdrawal that occurred between 1995 and 2000.

Although rainfall in 2000 and 2005 was similar across the watershed, irrigation decreased by almost 38 percent in 2005 compared to 2000. Irrigation in 2000 was up 43.5 percent from 1995. The study suggests that the 2000 irrigation data were overestimated.

Withdrawals from surface water totaled 12,247 mgd and groundwater withdrawals were 190 mgd. Surface water accounted for 98.5 percent of total water use while groundwater use was 1.5 percent of total use.

Projected Water Use in 2030

Total water withdrawals in 2030 are projected to decrease from the 2005 water withdrawal by about 886 mgd to 11,551 mgd. This is a reduction of about 7 percent of 2005 water withdrawals. Thermoelectric water withdrawals are estimated to decrease by 12 percent or 1,256 mgd due to less generation from some existing power plants that use once-through cooling. Withdrawals for other uses are estimated to increase as follows: industrial water use by 10 percent or 121 mgd; public supply water use by 32 percent or 221 mgd; and irrigation water use by 65 percent or 28 mgd.

Consumptive water use is projected to increase by 75 percent or 325 mgd. Transfers from the watershed through the Tennessee-Tombigbee Waterway might increase as much as 100 percent or 199 mgd.

Appendix

Source and Date of Water Withdrawal Data

State	Source	Organization	Data Type	Date
Alabama	S. Hutson	U.S. Geological Survey	IN, PS, MI	3/29/07
Alabama	T. Littlepage	OWR	Location coordinates	4/18/07
Alabama	S. Hutson	U.S. Geological Survey	IR	7/19/07
Georgia	S. Hutson	U.S. Geological Survey	IN, PS	5/22/07
Georgia	S. Hutson	U.S. Geological Survey	IR	6/1/07
Kentucky	S. Hutson	U.S. Geological Survey	IN, PS, MI	1/18/07
Kentucky	S. Hutson	U.S. Geological Survey	IR	6/27/07
Mississippi	S. Hutson	U.S. Geological Survey	PS	1/4/07
North Carolina	S. Hutson	U.S. Geological Survey	IN, PS, MI	4/16/07
North Carolina	S. Hutson	U.S. Geological Survey	IR	7/3/07
Tennessee	W. Muirhead	TDEC	IN, PS, MI	4/26/06
Tennessee	S. Hutson	U.S. Geological Survey	IR	6/27/07
Virginia	S. Hutson	U.S. Geological Survey	IN, PS, MI	1/4/07
Virginia	S. Hutson	U.S. Geological Survey	IR	6/27/07

Acronyms and Date Abbreviations

OWR — Alabama Department of Economic and Community Affairs, Office of Water Resources
TDEC — Tennessee Department of Environment and Conservation
IN — Industrial
PS — Public Supply
MI — Mining
IR — Irrigation

References

Bohac, C. E. and Koroa, M. C., 2004, "Water Supply Inventory and Needs Analysis," River Operations, Tennessee Valley Authority, Knoxville, Tennessee.

Christy, J., 2007, University of Alabama at Huntsville, http://irrigate.uah.edu.

Hutson, S. S., M. C. Koroa, and C. M. Murphree, 2004, "Estimated Use of Water in the Tennessee River Watershed in 2000 and Projections of Water Use in 2030," U.S. Geological Survey, Water-Resources Investigations Report 03-4302, Nashville, Tennessee.

Nuclear Energy Institute, U.S. Nuclear Generation and Capacity by State and Reactor 2005, Washington, DC, access at http://www.nei.org/financialcenter/industrydata.

Second Circuit Court of Appeals, 2004, Riverkeeper versus U. S. Environmental Protection Agency, No. 02-4-4005.

Tennessee Valley Authority, 2001-2005, "TVA Annual Report," Knoxville, Tennessee.

———, 2004, "Final Programmatic Environmental Impact Statement Reservoir Operations Study," Knoxville, Tennessee.

U. S. Department of Agriculture, 2003 Farm and Ranch Irrigation Survey and 2002 Census of Agriculture State Data, http://www.nass.usda.gov/census/census02/fris/fris03.html.

U. S. Environmental Protection Agency, 2005, National Pollutant Discharge Elimination System, Permit Compliance System: access at http://www.epa.gov/enviro/html/pcs/adhoc.html.

U. S. Department of Energy, 2005, Energy Information Administration, EIA-960/920, January–December 2005: accessed July 16, 2007 at http:/www.eia.doe.gov/cneaf/electrical/page/eia960_920.html.

Woods and Poole Economics, Inc., 2004, County Forecast Data, Washington, DC, http://wws.woodsandpoole.com.

Glossary, Terms, & Abbreviations

CFS	A rate of flow of water in cubic feet per second.
Cooling Water	Water used for noncontact cooling purposes for industrial processes and thermoelectric power generation.
Consumptive Use	Water that is withdrawn that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment; also referred to as water consumed.
Cumulative Consumptive Use	The sum of the net water demand upstream of the point of determination.
Disposition	For the purpose of this report, the act of disposing of wastewater.
Drought	A prolonged period of time with little or no rain, snow, sleet, or hail.
Evaporation	A process where water is changed from a liquid into a vapor.
Evapotranspiration	Water discharged into the atmosphere as a result of evaporation from the soil and bodies of water and as a result of plant transpiration.
Groundwater	Generally all subsurface water as distinct from surface water; specifically, the part of the subsurface water in the saturated zone (a zone in which all voids are filled with water) where the water is under pressure greater than atmospheric pressure.
Hydrologic Unit Code	The major drainage regions in the United States are subdivided into 2,149 drainage basins each represented by an 8-digit code.
Hydrology	The study of the characteristics, movements and effects of water in the atmosphere, earth's surface, rocks, and soil.
Industrial Water Use	Water used for purposes of product fabrication, processing, washing, and cooling for industries that produce steel, chemicals, paper, mining, refining, etc.
Inter-Basin Transfer	The act of moving water across watershed boundaries to another watershed.
Irrigation	The use of water for purposes of growing crops, livestock, or maintaining vegetative lands such as golf courses or parks.
mgd	A rate of flow of water in millions of gallons per day.
Offstream Use	Water withdrawn or diverted from a groundwater or surface-water source for thermoelectric power, industrial, irrigation, and public-supply water use.

Once-Through Cooling	The process of withdrawing water from a waterbody, using it for noncontact cooling purposes, and returning it to the waterbody.
Net Water Demand	An amount of water withdrawn, less the amount of water returned.
Public Supply	Water withdrawn by municipalities for use by public and private suppliers and delivered to users for domestic, commercial, industrial, and public uses.
Reservoir Catchment Area	The drainage area for a reservoir extending from the watershed boundary to a dam or the reservoir drainage area between an upstream dam and a downstream dam.
Reservoir Operations Study	An environmental study conducted by TVA in 2004 to determine the best overall public value of the TVA reservoir system.
Return Flow	Water released from the point of use and becomes available for reuse.
Scrubber	Flue gas desulfurization systems that reduce sulfur dioxide emissions.
Source	The origin of a water supply either surface water or groundwater.
Surface Water	A body of water such as a reservoir or stream.
Thermoelectric Use	Water used in the generation of electricity in which steam is obtained from combustion of fossil fuels or thermonuclear processes.
Transpiration	A process where water that is absorbed by plants through the roots is evaporated into the atmosphere from the plant surface.
TVA	Tennessee Valley Authority
Unregulated Stream	A river or stream that is not controlled by a dam.
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers
Watershed	A region draining into a river system or body of water.
Water-Use Tabulation Area	The boundaries of a water-use tabulation area are determined by the natural drainage area to account for water availability and the water-use transactions that occur within that drainage area. For this report, the water-use tabulation area accounts for the complete site-specific, water-use transactions between adjoining reservoir catchment areas and is used to determine consumptive use at a large scale.
Water Transfer	An artificial conveyance of water from one area to another.
Water-Use Transaction	A water-use activity that is a water withdrawal, water delivery, water release, return flow, or water transfer.
Water Withdrawal	Water removed from the ground or diverted from a surface-water source for use.
Watt-hour	An electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electrical circuit steadily for one hour.