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Alabama Water Use, 2005

Water is one of Alabama's most precious natural resources. It is a vital component of human existence and essential to the overall quality of life. Wise stewardship of this valuable resource depends on a continuing assessment of water availability and water use. Population growth in many parts of the State has resulted in increased competition for available water resources. This competition includes offstream uses, such as residential, agricultural, and industrial, and instream uses for maintenance of species habitat and diversity, navigation, power generation, recreation, and water quality. Accurate water-use information is required for sound management decisions within this competitive framework and is necessary for a more comprehensive understanding of the link between water use, water supply, and overall water availability. A study of water use during 2005 was conducted by the U.S. Geological Survey (USGS), in cooperation with the Alabama Department of Economic and Community Affairs, Office of Water Resources, Water Management Branch (ADECA-OWR), to provide water-use data for local and State water managers. The results of the study about the amount of water used, how it was used, and where it was used in Alabama have been published in "Estimated use of water in Alabama in 2005" by Hutson and others, 2009, and is accessible on the Web at *http://pubs.usgs.gov/sir/2009/5163* and available upon request as a CD–ROM through USGS and ADECA-OWR.

Lower High Falls, High Falls Creek, Talladega National Forest, Clay County, Alabama. (Photo courtesy of Alan M. Cressler, USGS.)

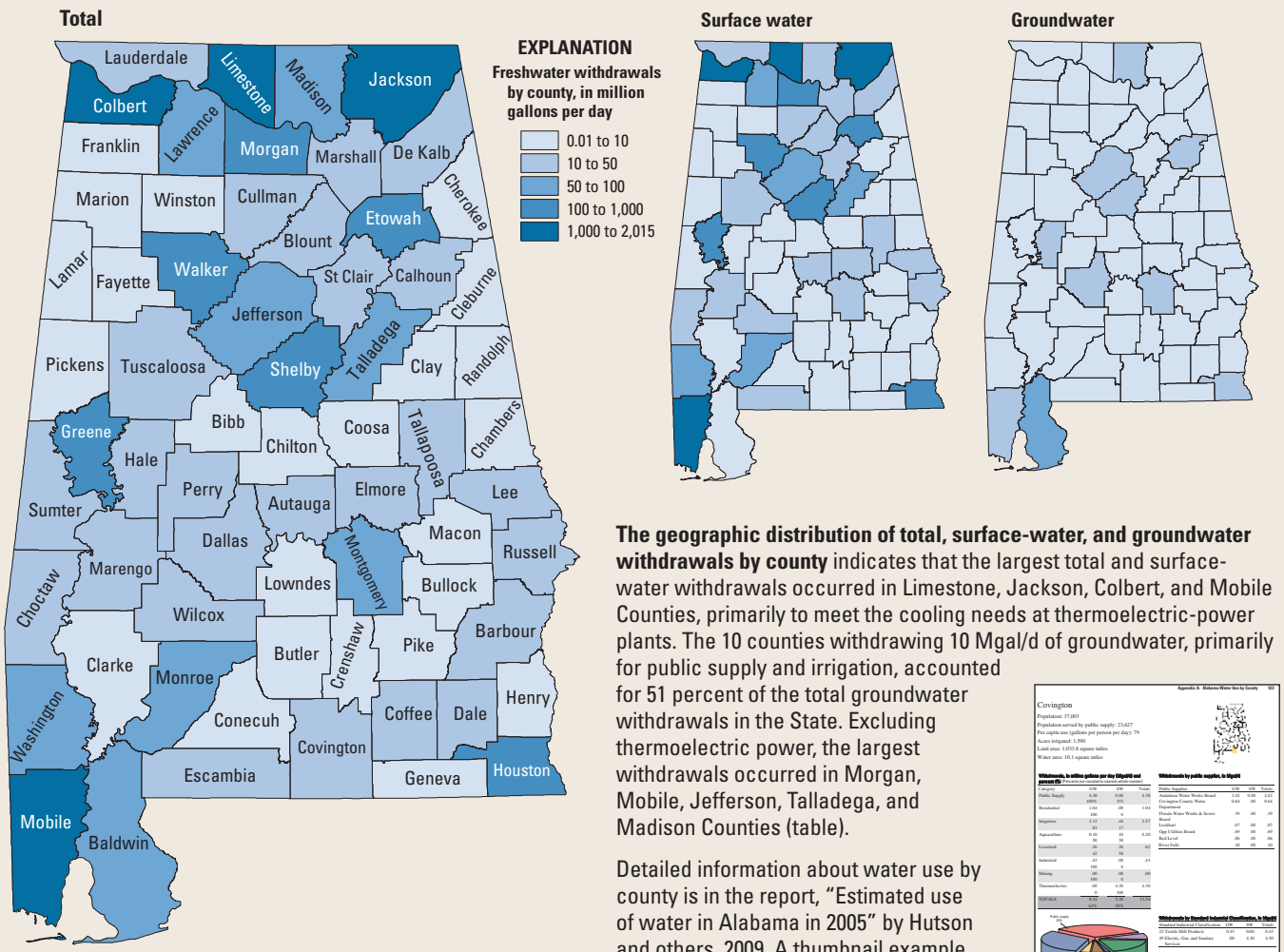
Extensive river systems and abundant groundwater have contributed greatly to development in Alabama. The Tennessee and Mobile Rivers, along with numerous other streams, provide water to Alabama residents for a variety of offstream and instream uses (Lineback, 1973). Since 1910, the cumulative reservoir storage has increased to about 8 million acre-feet. Most of the State has aquifers capable of producing sufficient quantities of freshwater (Mooty and others, 1990). Except for east-central and north-central Alabama, most of the State is underlain by thick sand or limestone aquifers.

- Total freshwater withdrawals were 9,958 million gallons of water per day (Mgal/d) for Alabama in 2005. Surface water provided 95 percent of the total, and groundwater provided the remaining 5 percent. Total withdrawals excluding thermoelectric power were 1,684 Mgal/d.

- Thermoelectric power accounted for 87 percent of the total surface-water withdrawals.
- Public supply and self-supplied residential groundwater withdrawals accounted for 64 percent of the total groundwater use.
- More surface water was withdrawn than groundwater for all categories except aquaculture, mining, and self-supplied residential.
- Withdrawals for thermoelectric power were more than six times larger than the combined public-supply and self-supplied industrial withdrawals. Most of the thermoelectric withdrawals were returned to the rivers from which the water was withdrawn.
- Public-supply and self-supplied industrial withdrawals were nearly four times larger than the combined self-supplied residential, mining, livestock, and aquaculture withdrawals.
- Total per capita use was 2,185 gallons per day for the 4,557,808 residents of Alabama. This amount includes not only drinking water, but also water used to generate electricity and to support industrial and agricultural activities.

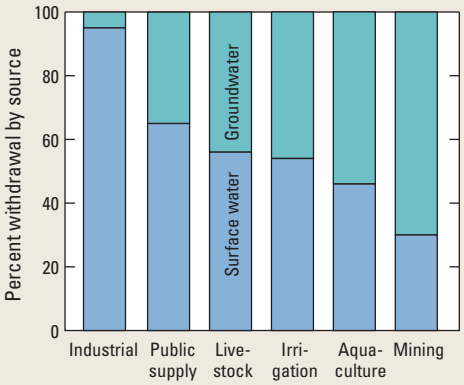
U.S. Department of the Interior
U.S. Geological Survey

Fact Sheet 2009–3081
August 2009

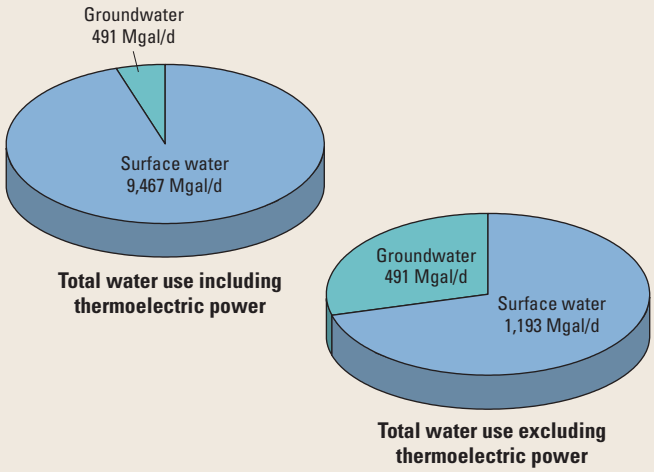


The geographic distribution of total, surface-water, and groundwater withdrawals by county indicates that the largest total and surface-water withdrawals occurred in Limestone, Jackson, Colbert, and Mobile Counties, primarily to meet the cooling needs at thermoelectric-power plants. The 10 counties withdrawing 10 Mgal/d of groundwater, primarily for public supply and irrigation, accounted for 51 percent of the total groundwater withdrawals in the State. Excluding thermoelectric power, the largest withdrawals occurred in Morgan, Mobile, Jefferson, Talladega, and Madison Counties (table).

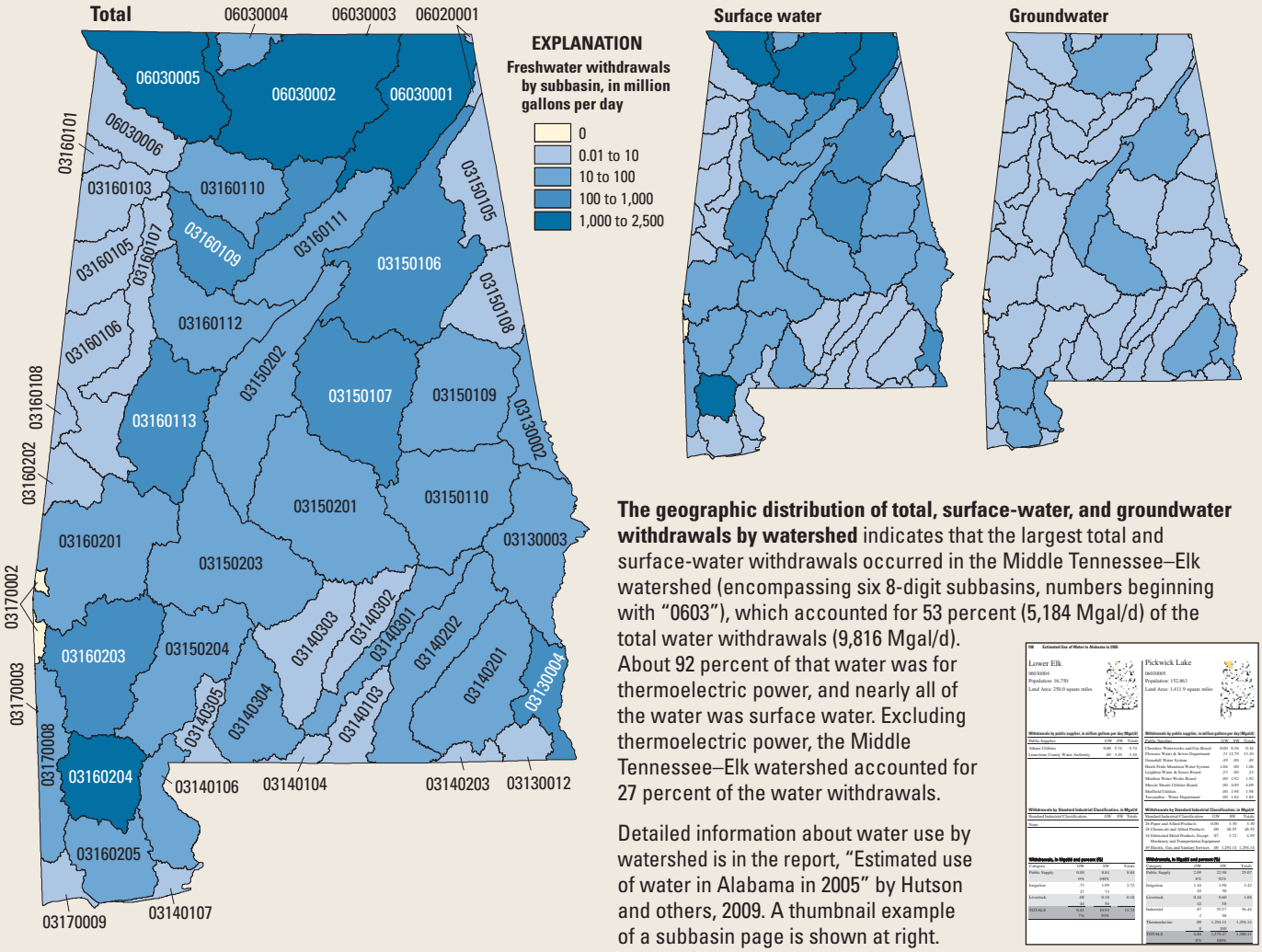
Detailed information about water use by county is in the report, "Estimated use of water in Alabama in 2005" by Hutson and others, 2009. A thumbnail example of a county page is shown at right.



Relative distribution of freshwater withdrawals by category and source of supply. Thermoelectric-power withdrawals were nearly exclusively from surface water, and all self-supplied residential withdrawals were from groundwater.

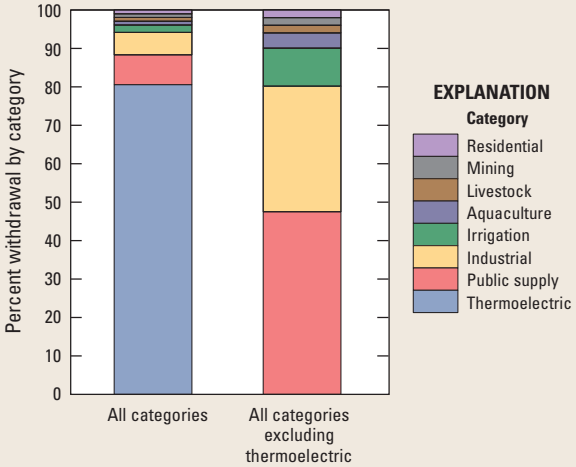


Relative distribution of freshwater withdrawals by source. Surface-water withdrawals were 95 percent of the total water withdrawals and 71 percent of the total withdrawals excluding thermoelectric power.

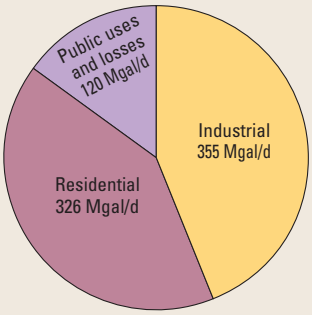


The geographic distribution of total, surface-water, and groundwater withdrawals by watershed indicates that the largest total and surface-water withdrawals occurred in the Middle Tennessee–Elk watershed (encompassing six 8-digit subbasins, numbers beginning with "0603"), which accounted for 53 percent (5,184 Mgal/d) of the total water withdrawals (9,816 Mgal/d). About 92 percent of that water was for thermoelectric power, and nearly all of the water was surface water. Excluding thermoelectric power, the Middle Tennessee–Elk watershed accounted for 27 percent of the water withdrawals.

Detailed information about water use by watershed is in the report, "Estimated use of water in Alabama in 2005" by Hutson and others, 2009. A thumbnail example of a subbasin page is shown at right.



Relative distribution of freshwater withdrawals by category. Total freshwater withdrawals were 9,958 million gallons per day (Mgal/d) during 2005. Total freshwater withdrawals excluding thermoelectric power were 1,683 Mgal/d.



Relative distribution of public-supply water by sector. Most of the public-supply water, 44 percent, was for industrial use, which also includes commercial and thermoelectric power; residential use was about 41 percent; and public use and losses were 15 percent. Values, in Mgal/d, are rounded.

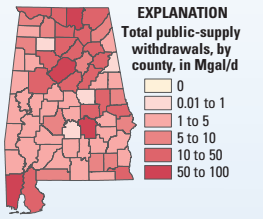
Total freshwater withdrawals by county and category of use, Alabama, 2005.

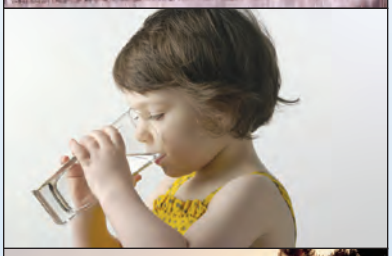
[Withdrawals are in million gallons per day; largest category rank emboldened; values may not sum to total estimated use(s) because of rounding]

County	Population	Population served, in percent	Public supply	Self-supplied residential[1]	Irrigation	Livestock	Aqua-culture[1]	Self-supplied industrial	Mining[1]	Thermo-electric	Total
Autauga	48,612	88	3.18	0.32	2.78	0.22	0.30	32.29	0.43	4.14	43.66
Baldwin	162,586	84	21.59	**2.48**	**43.82**	0.44	0.05	0.00	0.63	0.00	69.01
Barbour	28,414	93	4.15	0.11	3.59	0.35	5.91	1.18	1.20	0.00	16.49
Bibb	21,516	93	4.16	0.13	0.09	0.07	0.36	0.00	0.17	0.00	4.98
Blount	55,725	78	16.19	0.77	0.76	0.96	0.00	0.00	0.27	0.00	18.95
Bullock	11,055	93	2.04	0.06	3.12	0.16	0.00	0.00	0.06	0.00	5.44
Butler	20,766	84	3.00	0.19	0.54	0.35	0.00	0.31	0.00	0.00	4.39
Calhoun	112,141	95	22.10	0.83	4.28	0.29	0.07	1.10	0.28	0.00	28.95
Chambers	35,460	76	5.24	0.58	0.22	0.20	0.00	2.16	0.00	0.00	8.40
Cherokee	24,522	69	3.21	0.70	2.62	0.28	0.39	0.00	0.00	0.00	7.20
Chilton	41,744	79	4.34	0.58	0.64	0.22	0.00	0.00	0.47	0.00	6.25
Choctaw	14,807	41	1.30	0.63	0.06	0.09	0.08	47.41	0.00	0.00	49.57
Clarke	27,269	73	4.00	0.56	0.08	0.08	0.07	0.00	0.11	0.00	4.90
Clay	13,964	46	1.87	0.39	0.11	0.32	0.01	0.00	0.00	0.00	2.70
Cleburne	14,460	44	0.51	0.72	0.06	0.37	0.00	0.71	0.00	0.00	2.37
Coffee	45,567	82	6.67	0.38	3.46	0.84	0.74	0.86	0.00	0.00	12.95
Colbert	54,660	93	9.56	0.31	2.34	0.30	0.02	56.44	0.05	1,294.14	1,363.16
Conecuh	13,257	57	1.60	0.40	0.06	0.18	0.02	0.00	0.11	0.00	2.37
Coosa	11,162	58	0.46	0.28	0.03	0.07	0.00	0.00	0.16	0.00	1.00
Covington	37,003	64	4.38	1.04	2.57	0.62	0.20	0.43	0.00	4.30	13.54
Crenshaw	13,727	76	2.15	0.12	0.38	0.58	0.00	0.00	0.00	0.00	3.23
Cullman	79,886	97	27.01	0.21	1.26	**2.23**	0.00	1.79	0.16	0.00	32.66
Dale	48,748	82	8.78	0.57	2.45	0.33	0.10	0.00	0.00	0.00	12.23
Dallas	44,366	79	6.60	0.75	2.06	0.40	7.14	0.00	0.83	0.00	17.78
De Kalb	67,271	73	9.92	1.46	2.29	2.04	0.01	0.65	0.06	0.00	16.43
Elmore	73,937	93	12.46	0.38	1.27	0.22	0.18	0.00	0.31	0.00	14.82
Escambia	38,082	82	6.30	0.47	1.42	0.15	0.05	33.78	0.67	0.00	42.84
Etowah	103,189	96	19.32	0.32	1.04	0.45	0.02	9.87	0.16	142.68	173.86
Fayette	18,228	59	2.41	0.42	0.06	0.20	0.04	0.00	0.80	0.00	3.93
Franklin	30,737	79	4.93	0.33	0.50	0.77	0.00	0.00	0.57	0.00	7.10
Geneva	25,735	58	1.92	0.58	3.93	0.85	0.30	0.00	0.03	0.00	7.61
Greene	9,661	70	1.18	0.18	0.20	0.25	10.63	0.00	0.00	386.14	398.58
Hale	18,316	82	2.88	0.22	0.10	0.33	**24.80**	0.02	0.04	0.00	28.39
Henry	16,610	77	1.89	0.25	2.94	0.25	0.00	0.46	0.03	0.00	5.82
Houston	94,249	81	15.85	1.49	8.59	0.32	0.00	0.00	0.00	105.53	131.78
Jackson	53,650	74	10.72	0.91	0.71	0.72	0.00	8.78	0.10	1,476.30	1,498.24
Jefferson	**657,229**	**99**	73.34	0.39	2.82	0.08	0.58	0.40	3.40	0.00	81.01
Lamar	14,962	64	1.47	0.30	0.28	0.13	0.00	0.07	0.00	0.00	2.25
Lauderdale	87,691	84	14.19	1.30	1.17	0.48	0.03	0.00	0.00	0.00	17.17
Lawrence	34,605	84	6.91	0.49	1.79	0.75	0.08	57.18	0.23	0.00	67.43
Lee	123,254	93	16.35	0.70	1.60	0.10	0.15	2.23	0.38	0.00	21.51
Limestone	70,469	85	13.39	1.05	8.26	0.44	0.00	0.00	0.50	**1,990.24**	**2,013.88**
Lowndes	13,076	93	0.96	0.06	3.84	0.65	0.02	0.00	0.44	0.00	5.97
Macon	22,810	87	4.07	0.20	5.31	0.13	0.00	0.05	0.18	0.00	9.94
Madison	298,192	97	62.56	1.12	4.91	0.33	0.00	0.89	0.70	0.00	70.51
Marengo	21,879	60	2.71	0.55	0.15	0.38	3.64	19.08	0.28	0.00	26.79
Marion	30,154	68	6.30	0.92	0.08	0.41	0.00	0.00	0.13	0.00	7.84
Marshall	85,634	94	24.15	0.38	0.68	1.20	0.01	0.36	0.28	0.00	27.06
Mobile	401,427	91	**76.82**	3.01	1.10	0.27	0.00	5.67	0.46	1,043.61	1,130.94
Monroe	23,733	74	3.85	0.31	0.46	0.20	0.07	55.01	0.11	0.00	60.01
Montgomery	221,619	98	64.47	0.36	1.17	0.66	1.14	0.01	1.92	0.00	69.73
Morgan	113,740	97	30.42	0.30	0.86	0.73	0.10	**90.65**	0.54	1.20	124.80
Perry	11,371	60	1.82	0.32	0.05	0.21	9.99	0.00	0.00	0.00	12.39
Pickens	20,178	78	2.71	0.48	0.73	0.63	1.00	0.12	0.00	0.00	5.67
Pike	29,639	88	4.68	0.42	1.34	0.55	0.00	0.00	0.00	0.00	6.99
Randolph	22,717	53	1.68	0.53	0.08	0.49	0.00	0.00	0.00	0.00	2.78
Russell	49,326	92	8.11	0.26	6.05	0.10	0.00	28.52	0.68	0.00	43.72
St. Clair	171,465	96	8.13	0.72	7.37	0.39	0.03	3.50	0.87	0.00	21.01
Shelby	72,330	89	14.12	0.52	2.19	0.15	0.05	0.00	**3.90**	812.32	833.25
Sumter	13,819	91	1.82	0.10	0.10	0.35	4.29	1.22	2.39	0.00	10.27
Talladega	80,457	75	18.48	1.26	2.53	0.29	0.00	54.62	1.10	0.00	78.28
Tallapoosa	40,717	85	12.55	0.28	0.39	0.12	1.30	0.00	0.00	0.00	14.64
Tuscaloosa	168,908	94	28.29	0.84	4.44	0.21	0.07	1.92	0.25	0.00	36.02
Walker	70,117	89	40.34	0.54	0.49	0.31	0.09	0.00	0.41	927.28	969.46
Washington	17,773	57	1.19	0.51	0.11	0.19	0.08	9.64	0.91	86.54	99.17
Wilcox	12,937	62	1.02	0.34	0.36	0.21	0.68	21.04	0.00	0.00	23.65
Winston	24,498	65	0.89	0.44	0.06	0.47	0.00	0.00	0.06	0.00	1.92
Total	**4,557,808**	**89**	**801.66**	**39.12**	**161.20**	**28.11**	**74.89**	**550.42**	**27.82**	**8,274.42**	**9,957.64**

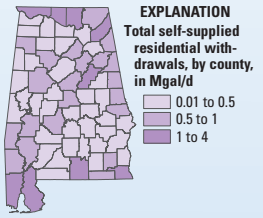
[1] Category excluded from watershed total

Public-supply withdrawals were 802 Mgal/d. Counties with large populations had the largest withdrawals for public supply. Mobile (City of Mobile), Jefferson (Birmingham), Montgomery (City of Montgomery), Madison (Huntsville), and Walker (source of water for Metropolitan Birmingham) Counties accounted for 40 percent of the water withdrawn and 39 percent of the population served by public suppliers. Jefferson County had the highest percentage of population served by a public supply. (Photo: Public-supply intake, Montgomery County, courtesy of Montgomery Water Works and Sanitary Sewer Board.)

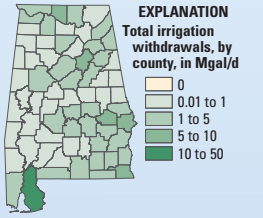




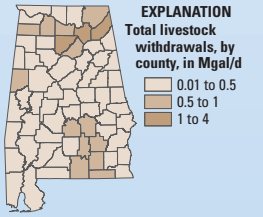
Total **residential** use was 365 Mgal/d and combines public-supplied deliveries (326 Mgal/d) and self-supplied withdrawals (39 Mgal/d). About 4.04 million people, or 89 percent of the population, depended on water from public suppliers. About 11 percent of the population (or 521,338 people) relied on private wells. Residential per capita use—public-supplied residential deliveries plus self-supplied residential withdrawals divided by the total population—was 80 gallons per day. (Photo: Hannah, courtesy of Glenn Phillips.)



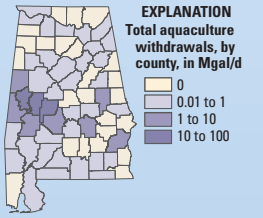
About 161 Mgal/d was applied to 135,800 acres in Alabama for **irrigation**. About 33 percent of the total irrigated acreage (43,970 acres), and about 37 percent of crop irrigated acreage (40,280 acres of the 109,080 acres) were in Baldwin, Houston, Limestone, and Geneva Counties. Most acreage (132,380 acres; crops and golf courses) was irrigated with sprinkler systems. The statewide application rate was 1.33 acre-feet per acre. The highest application rate, 3.74 acre-feet per acre, was for nursery stock. (Photo: Golf course, Baldwin County, courtesy of Alabama Bureau of Tourism & Travel.)



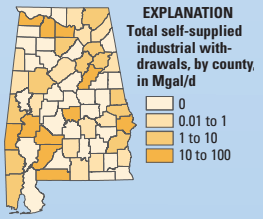
Livestock withdrawals were 28 Mgal/d. Blount, Cullman, De Kalb, and Marshall, the top four broiler chicken producing counties in Alabama (U.S. Department of Agriculture, National Agricultural Statistics Service [USDA-NASS], 2006), accounted for about 23 percent of the total livestock water withdrawals. Water-use estimates were based on livestock count numbers tabulated by USDA-NASS and livestock water-requirement coefficients, such as 35 gallons per capita per day (gpcd) for dairy cows, 12 gpcd for cattle, and 0.05 gpcd for poultry. (Photo: Breeder chickens, Cleburne County, courtesy of Michael J. Harper, ADECA-OWR.)



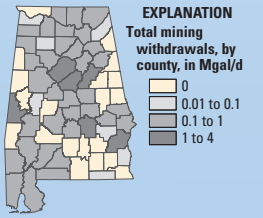
Aquaculture withdrawals were 75 Mgal/d. Hale, Greene, and Perry Counties in the west-central part of the State accounted for 61 percent (45 Mgal/d) of the aquaculture withdrawals. Catfish farming predominates in this area. In 2005, pond surface area totaled 25,001 acres, and approximately 230 catfish farms were operating (Alabama Cooperative Extension System, 2006). (Photo: Catfish ponds built and operated by Auburn University, courtesy of Alan Wilson, Department of Fisheries and Allied Aquacultures at Auburn University, Auburn, Alabama.)



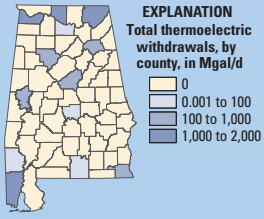
Total **industrial** water use was 906 Mgal/d and combines self-supplied withdrawals (550 Mgal/d) and public-supply deliveries (355 Mgal/d). Paper (304 Mgal/d), chemicals (152 Mgal/d), and lumber and wood products (52 Mgal/d) accounted for 92 percent of self-supplied industrial withdrawals. Paper products accounted for the largest surface-water use (214 Mgal/d), and chemical products (166 Mgal/d) accounted for the largest groundwater use. (Photo: Industrial clarifier, Russell County, courtesy of Tony Owen, MeadWestvaco Corporation.)

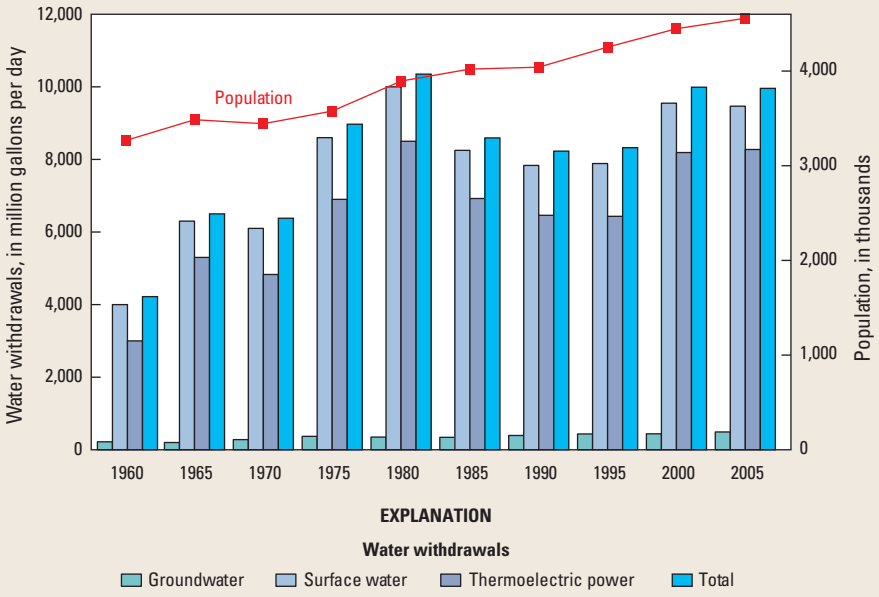


Mining withdrawals were 28 Mgal/d. Shelby, Jefferson, Sumter, Montgomery, Barbour, and Talladega Counties accounted for about half of the total water withdrawals for mining. Coal mining, which is concentrated in the northern counties, is important to the industrial economy in Alabama. Most of the coal is used in Alabama to produce fuel for the thermoelectric plants and coke for the steel industry (Richard Carroll, Alabama Geological Survey, oral commun., September 10, 2008; Geological Survey of Alabama, 2008). (Photo: Sand screw used to classify manufactured sand, courtesy of Vulcan Construction Materials.)



Thermoelectric-power withdrawals were 8,274 Mgal/d to produce 114,144 net gigawatt-hours of energy. Once-through cooling (OTC) plants accounted for 98 percent of thermoelectric withdrawals. An OTC unit typically used 60 gallons of water to produce 1 kilowatt-hour (kWh) of electricity compared to a recirculating-cooling (RC) unit, which typically used 20 gallons of water to produce 1 kWh of electricity. Median consumptive use—water withdrawal minus return flow—was 0.1 percent for an OTC system and 44 percent for an RC system. (Photo: Steam plant employs a tower to cool water before release as return flow to a river, courtesy of Alabama Power Company.)





Differences in water-use estimates over time were the result of more comprehensive data collection and analysis, and changes in demographic, socioeconomic, and climatic conditions. Water withdrawals have more than doubled in Alabama from 1960 to 2005 from about 4,220 Mgal/d to 9,958 Mgal/d. The entire increase in withdrawals actually occurred from 1960 to 1980 (4,220 Mgal/d to more than 10,350 Mgal/d). Water withdrawals in subsequent years have varied but have been less than the 1980 estimate (8,593 Mgal/d in 1985; 8,074 Mgal/d in 1990; 8,286 Mgal/d in 1995; 9,990 Mgal/d in 2000; and 9,958 Mgal/d in 2005). Population increased about 19 percent from 1960 to 1980 and increased another 17 percent from 1980 to 2005. The leveling off of withdrawals as population increased resulted in a decline in gross per capita use—total water withdrawals divided by total population. The data show that gross per capita water use increased from about 1,292 gal/d in 1960 to about 2,661 gal/d in 1980 and then decreased to about 2,185 gal/d in 2005. The change in gross per capita water use is mainly attributed to the fluctuation in thermoelectric-power withdrawals during the period.

Groundwater use has steadily increased and more than doubled from 1960 to 2005, primarily because of increased groundwater withdrawals for public supply. Since 1985, public-supply withdrawals have accounted for more than 50 percent of groundwater withdrawals in the State. Surface-water use increased at a higher rate than groundwater use from 1960 to 2005. Fluctuations in surface-water use were mainly attributed to changes in thermoelectric-power withdrawals during the period.

Overall, total water use in 2005 varied little from total use in 2000. Total water withdrawals decreased less than 1 percent from 2000 to 2005 (from 9,990 Mgal/d to 9,958 Mgal/d). Surface-water withdrawals decreased less than 5 percent (from 9,950 Mgal/d to 9,467 Mgal/d) in 2005. In contrast, groundwater withdrawals increased about 12 percent (from 440 Mgal/d in 2000 to 491 Mgal/d) in 2005. The change in withdrawals varied across categories from 2000 to 2005, and increases in irrigation (118 Mgal/d), thermoelectric power (84 Mgal/d), and aquaculture (65 Mgal/d) were offset by declines in public supply (32 Mgal/d), self-supplied industrial (283 Mgal/d), and self-supplied residential (40 Mgal/d). During the same period, the estimate of total irrigated acreage increased about 94 percent (from 70,010 acres to 135,800 acres).

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