

STATE OF ARKANSAS
ARKANSAS DEPARTMENT OF COMMERCE
ARKANSAS GEOLOGICAL COMMISSION

WATER RESOURCES SUMMARY NUMBER 9

USE OF WATER IN ARKANSAS, 1975

By
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U.S. Geological Survey

Prepared by the U.S. Geological Survey in cooperation
with the Arkansas Geological Commission

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STATE OF ARKANSAS

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CONTENTS

	Page
Abstract-----	1
Introduction-----	2
Water use and consumption-----	4
Public supplies-----	11
Industry and commerce-----	15
Rural households and livestock-----	15
Irrigation-----	17
Fish and minnow farms-----	19
Wildlife impoundments-----	19
Electric energy-----	20
Thermoelectric-----	20
Hydroelectric-----	20
Ground-water withdrawals-----	22
Selected bibliography-----	24

ILLUSTRATIONS

	Page
Figure 1. Diagram showing water used in Arkansas, 1975-----	5
2. Map showing water used in Arkansas counties, 1975-----	7
3. Map showing changes in water used in Arkansas counties, 1970 to 1975-----	10

TABLES

	Page
Table 1. Use and consumption of water in Arkansas, 1975-----	6
2. Use of water in Arkansas counties, 1975-----	8
3. Use and consumption of water in Water Resources Council subregions in Arkansas, 1975-----	12
4. Consumption of water in Arkansas counties, 1975-----	14
5. Industrial and commercial use of water in Arkansas counties, 1975-----	16
6. Water used to generate hydroelectric energy in Arkansas counties, 1975-----	21
7. Withdrawals of ground water from aquifers in Arkansas counties, 1975-----	23

CONVERSION TABLE

Multiply English unit	By	To obtain metric unit
acres	4047	m ² (square meters)
acres	.4047	hm ² (square hectometers)
acre-ft (acre-feet)	1233	m ³ (cubic meters)
	1.233x10 ⁻³	hm ³ (cubic hectometers)
ft (feet)	.3048	m (meters)
gal (gallons)	3.785x10 ⁻³	m ³ (cubic meters)
gal/d (gallons per day)	3.785x10 ⁻³	m ³ /d (cubic meters per day)
in. (inches)	25.4	mm (millimeters)
Mgal/d (million gallons per day)	3785	m ³ /d (cubic meters per day)
	3.785x10 ⁻³	hm ³ /d (cubic hectometers per day)

USE OF WATER IN ARKANSAS, 1975

By H. N. Halberg

ABSTRACT

Arkansas used an average of 5,064 Mgal/d (million gallons of water per day) in 1975, 65 percent more than in 1970. This total does not include 52,400 Mgal/d used in the generation of hydroelectric energy. The principal categories of water use other than hydroelectric energy generation, are public supply, self-supplied industrial use, rural domestic and livestock use, irrigation, fish and minnow farming, water for wildlife impoundments, and thermoelectric-energy generation. About half the total, or 2,440 Mgal/d was used for irrigation, most of which, 86 percent, was ground water. Generation of thermoelectric energy, using fossil and nuclear fuels, required 1,717 Mgal/d or one-third of the State's water use. Fish and minnow farming used 342 Mgal/d, 7 percent of the total. Forty three percent of the total, 2,203 Mgal/d was consumed.

A little more than half the water used was ground water; streams and reservoirs supplied the rest. As in the past, ground water was the principal source of supply in eastern and southern Arkansas, where the deposits of Quaternary age supplied most of the water for irrigation and the deposits of Tertiary age, the Sparta Sand, and the Wilcox Group, supplied most of the water for industry and public supply. Surface

water supplied much of the needs of the northwestern part of the State, although many of the public-supply systems of the smaller cities and towns, and some of the industry in that part of the State drew their water from rocks of Ordovician age. The 1975 withdrawals of water for irrigation, principally for rice production, were double those of 1970, reflecting the large increases of rice acreage after governmental acreage controls were relaxed. The largest single increase was the more than 900 Mgal/d used as cooling water at the new thermoelectric power plant in Pope County, which uses nuclear fuel.

The public-supply systems furnished 207 Mgal/d, 41 Mgal/d more than in 1970; industry supplied itself with 196 Mgal/d, which was 13 Mgal/d less than in 1970.

INTRODUCTION

Much of Arkansas' agriculture and industry is dependent upon an adequate supply of good-quality water. The State's total of 49 inches of precipitation is attractive to both activities. It is necessary for both current and future water users to know how fast our available supply is being used; for, how can we tell how much there is left to use, both now and in the future, if we do not know how much is being used now? This report supplies quantitative data on present use and consumption that should be helpful in planning future water-related projects.

The information in this report was collected by the U.S. Geological Survey in cooperation with the Arkansas Geological Commission. The writer expresses his appreciation to the many public agencies, industries, public utilities, other organizations, and individuals who provided the data. Especially, he is indebted to the Arkansas Geological Commission,

Arkansas Department of Commerce; the Arkansas Department of Health; the Cooperative Extension Service, College of Agriculture, University of Arkansas; the Agricultural Stabilization and Conservation Service, Soil Conservation Service, Statistical Reporting Service, and other bureaus of the U.S. Department of Agriculture; the Bureau of Mines, and the Bureau of Sport Fisheries and Wildlife of the U.S. Department of the Interior; the U.S. Army Corps of Engineers; and the Arkansas Power and Light Company. Particularly, he is indebted to Norman F. Williams, State Geologist, Arkansas Geological Commission; Glen T. Kellogg, Director and Chief Engineer, Bureau of Public Health Engineering, Arkansas Department of Health; John Langston, Extension Agricultural Engineer, Cooperative Extension Service; Algeon Stuckey, State Executive Director, Agricultural and Conservation Service, and Raymond B. Stroud, Liaison Officer for Arkansas, U.S. Bureau of Mines, and others who furnished detailed data regarding use and consumption of water by public-supply systems, self-supplied industries, for irrigation, and in the generation of electric energy.

The information in this report will be used by the U.S. Geological Survey in its nation-wide report on water use and consumption during 1975. The 1975 report is one of a 5-year series of reports on water use and consumption.

In this report, "use" is defined as withdrawal of water from a source, for use. Some of the water is returned to the source after use and is withdrawn again. It is tallied each time it is withdrawn. If the water is recirculated, it is counted only once, when it is withdrawn from the source. Part of the water withdrawn is consumed.

In this report "consumed water" is defined as water that is evaporated or transpired, incorporated into a product, or is ingested by humans and animals; it is not returned to a source and cannot be used again.

The only saline water used in Arkansas at the present time is associated with the petroleum and bromine industries of southern Arkansas. Wells are drilled specifically for the purpose of producing saline water, some of which contains enough bromine to warrant processing for bromine recovery. Other saline water is pumped into disposal wells to maintain oil-field pressures and to assist in petroleum recovery. Saline-water use in Arkansas is not tabulated in this report.

Water use for recreational activities, such as boating or fishing, or for navigation is not included in the report.

For those readers who prefer to use metric units instead of English units, the conversion factors for the terms used in this report are listed at the end of the table of contents.

WATER USE AND CONSUMPTION

Arkansas used an average of 5,064 Mgal/d of fresh ground and surface water in 1975, exclusive of water used in the production of hydroelectric energy (fig. 1 and table 1). This total is 65 percent more than in 1970 and 136 percent more than in 1965. Nearly half the total (48 percent) was used to irrigate crops and of this, 86 percent was well water; most of this water was used in eastern Arkansas. More water was used in Pope County, 927 Mgal/d, than in any other county (fig. 2 and table 2);

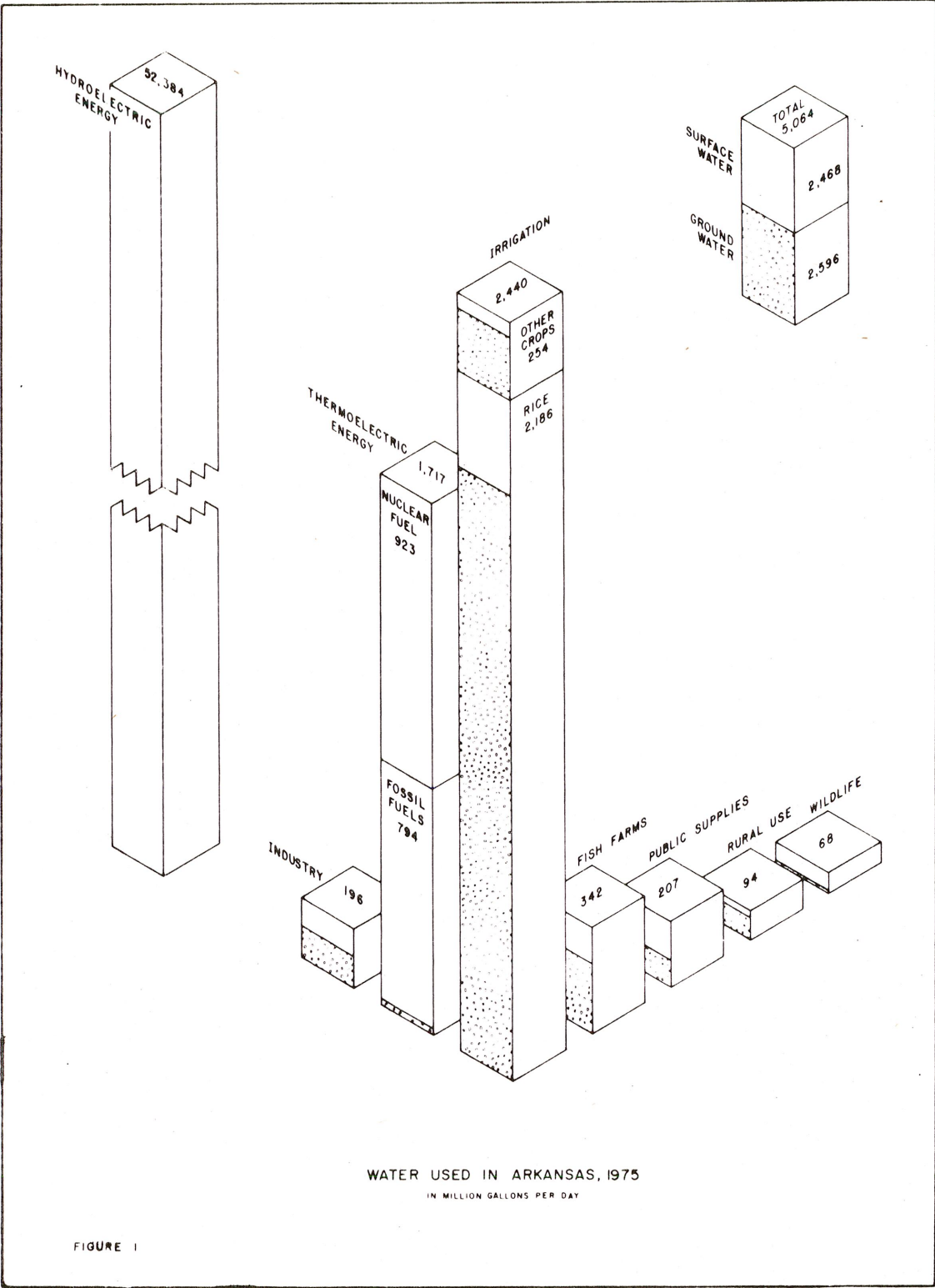
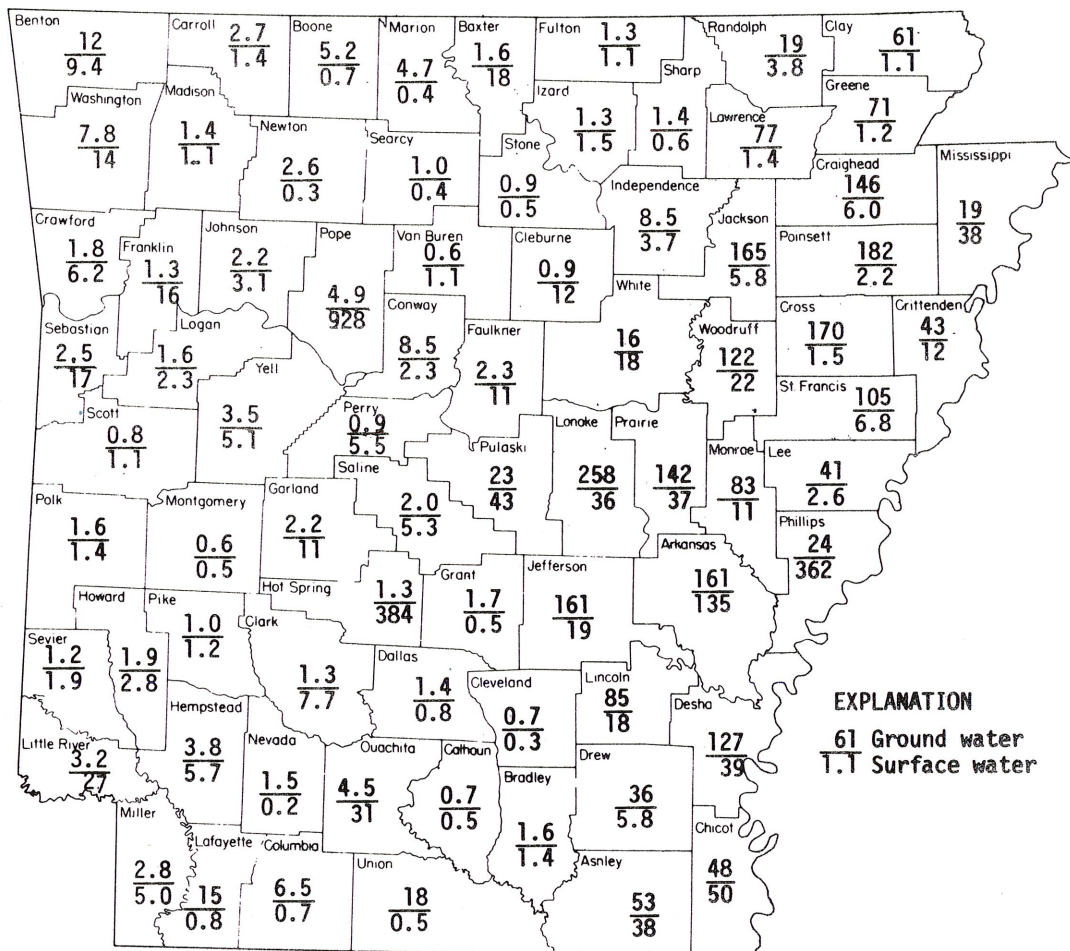


FIGURE 1

Table 1.--Use and consumption of water in Arkansas, 1975, and change since 1970

Use category	[Million gallons per day]			Ground water	Surface water	Total
	Ground water	Surface water	Total			
	Use			Change in water use since 1970, increase (+) or decrease (-)		
Public supply	89	118	207	+18	+23	+41
Self-supplied industry	106	90	196	-9	-4	-13
Rural use						
Domestic	46	0	46	-3	0	-3
Livestock	29	19	48	+14	0	+14
Irrigation						
Rice	1,882	304	2,186	+1,079	+145	+1,224
Other crops	212	42	254	-49	-28	-77
Fish and minnow farms ^a	229	113	342	+17	+11	+28
Wildlife impoundments	1	67	68	+1	+27	+28
Subtotal	2,594	753	3,347	+1,068	+174	+1,242
Thermoelectric energy						
Fossil fuels	2	792	794	-2	-160	-162
Nuclear fuel	0	923	923	0	0	0
Total	2,596	2,468	5,064	+1,066	+14	+1,080
Hydroelectric energy	--	52,384	52,384	--	+27,684	+27,684
	Consumption					
	1,779	424	2,203	+836	+141	+977

^aFigures include 28 Mgal/d used at National Fish Hatcheries and at the U.S. Fish Farming Experimental Station.



WATER USED IN ARKANSAS COUNTIES, 1975
in million gallons per day

Figure 2

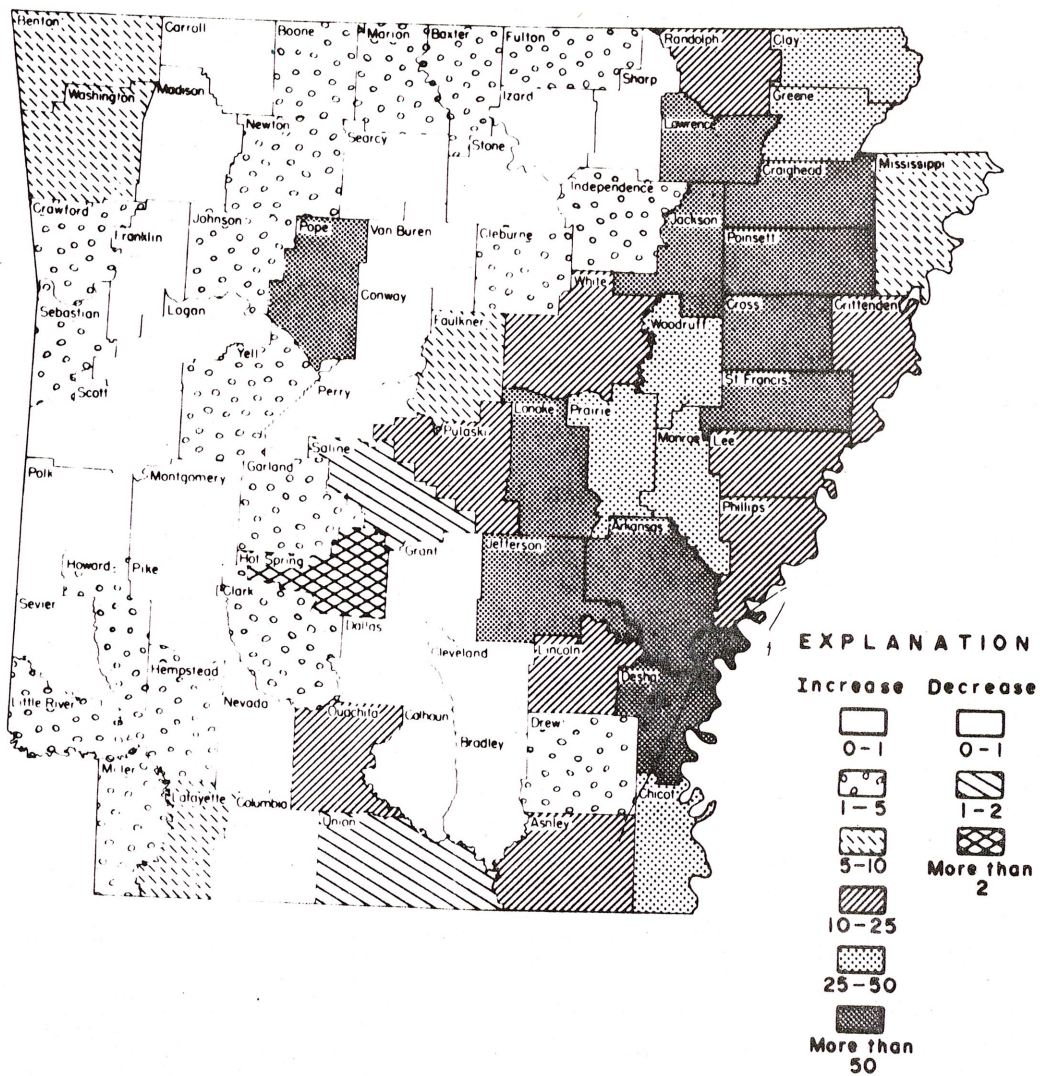
however, practically all this water was surface water used for cooling at a thermoelectric power plant using nuclear fuel. Exclusive of the counties in which much surface water was used for cooling at thermoelectric power plants, more water, 295 Mgal/d, was used in Arkansas County than in any other; most of which was used for irrigation. The smallest quantity of water, 1.0 Mgal/d, was used in Cleveland County. The largest county increases were in the eastern part of the State (fig. 3).

The quantity of irrigation water used in 1975 was more than twice that used in 1970; the increase was due to the fact that governmental rice-acreage controls were relaxed, and more than twice as many acres of rice were planted in 1975 than in 1970. Use of water for raising fish for bait or food (fish farming) was greatest in Lonoke County. The total use figure of 5,064 Mgal/d is the equivalent of supplying 2,393 gal/d to each of the State's 2,116,000 residents (U.S. Bureau Census, 1976a), as compared with 1,592 gal/d in 1970.

In addition to the above uses of water, 52,384 Mgal/d was used in the production of hydroelectric energy.

Arkansas consumed an average of 2,203 Mgal/d of ground and surface water in 1975 (tables 1, 3, and 4), or 14 percent of the total use. About 51 percent of the consumed water was drawn from ground-water sources.

Water use is tabulated by county, category of use, and source, in table 2. Water use is also tabulated by Water Resources Council (1970) subregions (table 3), for use in river-basin studies. The principal



CHANGES IN WATER USE IN ARKANSAS COUNTIES, 1970 to 1975
in million gallons per day

Figure 3

categories are public supply, self-supplied industrial use, use in rural households and by livestock, irrigation, fish and minnow farming, water for wildlife impoundments, and thermoelectric-energy generation. The data are given in average million gallons per day; for example, the water used to irrigate rice may have been applied in 40 days, but it is tabulated as though the water were applied at a constant rate throughout the entire year. Although the detailed data are given to the nearest 0.01 Mgal/d (10,000 gallons per day), this precision was used only in order to facilitate tabulation.

Water consumption is tabulated by county and source in table 4. It is also summarized by Water Resources Council (WRC) subregions in table 3.

Water use and consumption figures are tabulated under the county or subregion where the water is used, not under the location of the source. For example, in 1970, Little Rock drew about 23 Mgal/d from Lake Winona, which is in Saline County, on the Alum Fork of the Saline River (WRC subregion 0804). The water was used in Pulaski County, in the Arkansas River basin (WRC subregion 1111). The city of Texarkana imports 2.08 Mgal/d from Lake Wright Patman in Texas.

Public Supplies

The public water-supply systems of 503 cities, towns, and other water districts drew 207 Mgal/d from their sources in 1975. (See table 2.) Three hundred thirty four systems supplied 89 Mgal/d of ground water, 58 supplied 118 Mgal/d of surface water, 2 supplied 1.6 Mgal/d of ground and surface water, 2 bought water and used their own wells,

Table 3.--Use and consumption of water in Water Resources Council subregions in Arkansas, 1975

[Million gallons per day]

WRC subregion	Use			Consumption		
	Ground water	Surface water	Total	Ground water	Surface water	Total
0801--Mississippi-Hatchie	0.1	0	0.1	0.1	0	0.1
0802--Mississippi-St. Francis	1,832.8	696.0	2,528.8	1,281.8	224.6	1,506.4
0803--Mississippi-Yazoo	.2	.2	.4	.2	.2	.4
0804--Ouachita	195.1	501.4	696.5	101.4	34.4	135.8
0805--Mississippi-Tensas	259.5	103.0	362.5	184.0	78.1	262.1
1101--White	221.0	72.0	293.0	155.9	25.8	181.7
1107--Verdigris-Neosho	7.1	6.3	13.4	2.5	1.7	4.2
1111--Lower Arkansas	46.3	1,048.8	1,095.1	28.1	49.5	77.6
1114--Lower Red	34.1	40.0	74.1	24.7	10.3	35.0
State	2,596.2	2,467.7	5,063.9	1,778.7	424.6	2,203.3

and 107 bought water from the systems that have their own sources. The water was distributed to about 1,485,000 people and the commercial and industrial establishments in the communities. About 70 Mgal/d of the water was used by commerce and industry. The totals above include water used for public facilities and fire fighting; they also include leakage and wastage. Supplying 207 Mgal/d to 1,485,000 people is the equivalent of supplying each person 180 gallons per day.

Consumption-of-water figures were computed from information supplied by the municipalities, or were estimated to be 20 percent of withdrawals if no consumption figures were available. (See tables 1, 3, and 4.) Consumption of water was assumed to be 100 percent of withdrawals for those communities that have no sewer systems.

Several Arkansas communities import water from other counties, river basins, or States. Little Rock, as mentioned previously, draws about 23 Mgal/d from Lake Winona, which is in Saline County, in the Saline River basin (WRC subregion 0804). The water is used in Pulaski County and the effluent from the sewer systems flows into the Arkansas River (WRC subregion 1111). Most of the communities in Benton and Washington Counties are supplied from Beaver Lake in the White River basin (WRC subregion 1101). The water for some of the communities is used in and wasted into the Arkansas River basin (WRC subregions 1107 or 1111). The city of Texarkana imports its supply from Lake Wright Patman, in Bowie and Cass Counties, Texas. Fort Smith exports a small quantity of water to supply Moffett, Okla.

Water-use information for the public-supply systems was obtained from a survey made by the Arkansas Department of Health.

Table 4.--Consumption of water in Arkansas counties, 1976

[Million gallons per day]

County	Ground water	Surface water	Total
Arkansas-----	115.80	105.92	221.72
Ashley-----	29.94	2.15	32.09
Baxter-----	1.30	.66	1.96
Benton-----	4.56	3.08	7.64
Boone-----	1.83	.72	2.55
Bradley-----	0.88	1.16	2.04
Calhoun-----	.55	.16	.71
Carroll-----	1.60	.77	2.37
Chicot-----	34.49	38.34	72.83
Clark-----	1.08	4.59	5.67
Clay-----	45.19	0.62	45.81
Cleburne-----	.85	.55	1.40
Cleveland-----	.58	.25	.83
Columbia-----	4.94	.59	5.53
Conway-----	2.46	1.59	4.05
Craighead-----	104.65	4.52	109.17
Crawford-----	1.53	1.94	3.47
Crittenden-----	29.49	.80	30.29
Cross-----	124.19	1.47	125.66
Dallas-----	.68	.65	1.33
Desha-----	89.70	29.12	118.82
Drew-----	22.10	4.52	26.62
Faulkner-----	2.11	5.93	8.04
Franklin-----	1.11	.90	2.01
Fulton-----	.92	.49	1.41
Garland-----	1.36	3.79	5.15
Grant-----	.97	.37	1.34
Greene-----	50.92	1.12	52.04
Hempstead-----	2.04	8.42	10.46
Hot Spring-----	1.22	2.66	3.88
Howard-----	1.62	1.61	3.23
Independence-----	6.62	1.28	7.90
Izard-----	.84	.32	1.16
Jackson-----	119.36	4.41	123.77
Jefferson-----	91.91	14.29	106.20
Johnson-----	1.77	1.97	3.74
Lafayette-----	10.97	.78	11.75
Lawrence-----	56.23	.96	57.19
Lee-----	30.57	2.58	33.15
Lincoln-----	59.41	14.31	73.72
Little River-----	2.23	2.69	4.92
Logan-----	1.56	1.16	2.72
Lonoke-----	159.65	26.98	186.63
Madison-----	1.44	.69	2.13
Marion-----	1.02	.32	1.34
Miller-----	2.21	2.55	4.76
Mississippi-----	8.97	4.22	13.19
Monroe-----	58.14	7.62	65.76
Montgomery-----	.62	.28	.90
Nevada-----	1.13	.23	1.36
Newton-----	0.70	0.23	0.93
Ouachita-----	1.91	1.86	3.77
Perry-----	.72	3.20	3.92
Phillips-----	13.97	.25	14.22
Pike-----	.98	.40	1.38
Poinsett-----	133.89	1.92	135.81
Polk-----	1.29	.84	2.13
Pope-----	3.07	1.51	4.58
Prairie-----	99.61	32.60	132.21
Pulaski-----	14.74	18.68	33.42
Randolph-----	14.65	2.51	17.16
St. Francis-----	75.11	5.40	80.51
Saline-----	1.64	3.41	5.05
Scott-----	.83	.51	1.34
Seach-----	.82	.35	1.17
Sebastian-----	2.50	7.50	10.00
Sevier-----	1.04	.56	1.60
Sharp-----	1.32	.59	1.91
Stone-----	.81	.31	1.12
Union-----	5.87	.35	6.22
Van Buren-----	0.58	0.63	1.21
Washington-----	4.20	4.25	8.45
White-----	11.53	12.66	24.19
Woodruff-----	89.22	3.92	93.14
Yell-----	2.41	3.01	5.42
Total	1,778.72	424.55	2,203.27

Industry and Commerce

Industry and commerce used 266 Mgal/d in 1975, which includes 70 Mgal/d furnished by the public-supply systems and 196 Mgal/d with which industry supplied itself (tables 2 and 4). Self-supplied industrial use in 1975 was 6 percent less than in 1970; and total industrial and commercial use was 2 percent less. The water was used by agricultural, chemical, metal, mining, paper, petroleum, and other types of manufacturing industries; also at mines, quarries, sand and gravel pits, and oil and gas wells. The self-supplied category also includes water used by those hospitals, institutions, military establishments, schools, and recreation areas that have their own sources of supply. Table 5 was prepared to indicate total use of water by industry and commerce in each county, regardless of whether or not the water was purchased by the industry or was self supplied.

The information for the water furnished by the public-supply systems and the self-supplied industries was obtained from a survey made by the Arkansas Department of Health.

Rural Households and Livestock

Farmers and others who furnish their own water supplies are classed as rural domestic users in this report. In 1975, about 631,000 people withdrew 46 Mgal/d from their own wells and springs. This withdrawal figure was computed on the basis of use of 77 gallons of water per day per capita by the 93 percent of the rural population who have running water in their homes and 20 gallons per day per capita by the others. All rural residents of Pulaski County were considered as having running water in their homes. County rural-resident-

Table 5.--Industrial and commercial use of water in Arkansas counties, 1975

[Million gallons per day]

County	Furnished by public-supply systems			Self-supplied industry			County total		
	Ground water	Surface water	Total	Ground water	Surface water	Total	Ground water	Surface water	Total
Arkansas-----	1.04	--	1.04	0.01	--	0.01	1.05	--	1.05
Ashley-----	.28	--	.28	10.67	35.72	46.39	10.95	35.72	46.67
Baxter-----	.02	0.49	.51	.28	.24	.52	.30	.73	1.03
Benton-----	1.21	4.15	5.36	.70	--	.70	1.91	4.15	6.06
Boone-----	.62	--	.62	--	--	--	.62	--	.62
Bradley-----	0.22	--	0.22	0.53	--	0.53	0.75	--	0.75
Calhoun-----	.04	--	.04	.21	0.38	.59	.25	0.38	.63
Carroll-----	.78	0.46	1.24	.01	.05	.06	.79	.51	1.30
Chicot-----	.23	--	.23	.03	--	.03	.26	--	.26
Clark-----	.01	.75	.76	.13	1.41	1.54	.14	2.16	2.30
Clay-----	0.15	--	0.15	0.01	--	0.01	0.16	--	0.16
Cleburne-----	.01	0.13	.14	.09	--	.09	.10	0.13	.23
Cleveland-----	.06	--	.06	--	--	--	.06	--	.06
Columbia-----	.86	--	.86	3.23	.12	3.35	4.09	.12	4.21
Conway-----	.47	--	.47	5.02	.05	5.07	5.49	.05	5.54
Craighead-----	0.92	--	0.92	0.30	--	0.30	1.22	--	1.22
Crawford-----	--	1.23	1.23	--	2.38	2.38	--	3.61	3.61
Crittenden-----	1.43	--	1.43	.01	--	.01	1.44	--	1.44
Cross-----	.35	--	.35	1.60	--	1.60	1.95	--	1.95
Dallas-----	.16	--	.16	.06	--	.06	.22	--	.22
Desha-----	0.06	--	0.06	0.03	--	0.03	0.09	--	0.09
Drew-----	1.46	--	1.46	.01	--	.01	1.47	--	1.47
Faulkner-----	.02	1.51	1.53	--	0.54	.54	.02	2.05	2.07
Franklin-----	--	.19	.19	.19	.03	.22	.19	.22	.41
Fulton-----	.02	--	.02	--	.06	.06	.02	.06	.08
Garland-----	--	2.69	2.69	0.74	2.66	3.40	0.74	5.35	6.09
Grant-----	0.40	--	.40	.10	.03	.13	.50	.03	.53
Greene-----	.69	--	.69	.45	--	.45	1.14	--	1.14
Hempstead-----	1.38	--	1.38	.01	.03	.04	1.39	.03	1.42
Hot Spring-----	--	.21	.21	.15	3.84	3.99	.15	4.05	4.20
Howard-----	--	0.84	0.84	0.72	0.21	0.93	0.72	1.05	1.77
Independence-----	0.05	1.46	1.51	.04	.42	.46	.09	1.88	1.97
Izard-----	.09	--	.09	.01	1.19	1.20	.10	1.19	1.29
Jackson-----	.10	--	.10	2.06	.16	2.22	2.16	.16	2.32
Jefferson-----	2.64	--	2.64	44.83	.51	45.34	47.47	.51	47.98
Johnson-----	--	0.92	0.92	0.03	--	0.03	0.03	0.92	0.95
Lafayette-----	0.35	--	.35	.20	0.06	.26	.55	.06	.61
Lawrence-----	.23	.01	.24	.01	.21	.22	.24	.22	.46
Lee-----	.14	--	.14	.01	--	.01	.15	--	.15
Lincoln-----	.06	--	.06	.34	--	.34	.40	--	.40
Little River-----	0.13	--	0.13	1.29	25.28	26.57	1.42	25.28	26.70
Logan-----	.02	0.12	.14	.01	.10	.11	.03	.22	.25
Lonoke-----	.25	--	.25	.52	--	.52	.77	--	.77
Madison-----	0	.21	.21	--	--	--	0	.21	.21
Marion-----	.11	--	.11	.08	.05	.13	.19	.05	.24
Miller-----	0.01	0.81	0.82	0.21	0.49	0.70	0.22	1.30	1.52
Mississippi-----	1.94	--	1.94	7.33	--	7.33	9.27	--	9.27
Monroe-----	.35	--	.35	--	.03	.03	.35	.03	.38
Montgomery-----	--	.02	.02	.06	.04	.10	.06	.06	.12
Nevada-----	.08	--	.08	.13	--	.13	.21	--	.21
Newton-----	0.02	--	0.02	0.13	--	0.13	0.15	--	0.15
Ouachita-----	.21	0.10	.31	2.84	8.11	10.95	3.05	8.21	11.26
Perry-----	0	--	0	.02	--	.02	.02	--	.02
Phillips-----	1.12	--	1.12	5.07	.01	5.08	6.19	.01	6.20
Pike-----	0	.60	.60	.15	.11	.26	.15	.71	.86
Poinsett-----	0.79	--	0.79	0.35	--	0.35	1.14	--	1.14
Polk-----	.01	0.20	.21	.33	--	.33	.34	0.20	.54
Pope-----	.12	2.00	2.12	.04	0.01	.05	.16	2.01	2.17
Prairie-----	.07	--	.07	--	--	--	.07	--	.07
Pulaski-----	.64	12.32	12.96	.74	1.30	2.04	1.38	13.62	15.00
Randolph-----	0.01	0.10	0.11	0.01	--	0.01	0.02	0.10	0.12
St. Francis-----	.24	--	.24	.37	--	.37	.61	--	.61
Saline-----	.22	.01	.23	.18	3.02	3.20	.40	3.03	3.43
Scott-----	--	.41	.41	.01	--	.01	.01	.41	.42
Searcy-----	.06	--	.06	.01	--	.01	.07	--	.07
Sebastian-----	0.01	5.44	5.45	0.04	0.51	0.55	0.05	5.95	6.00
Sevier-----	.02	.77	.79	--	.02	.02	.02	.79	.81
Sharp-----	.06	--	.06	--	--	--	.06	--	.06
Stone-----	--	.04	.04	.03	--	.03	.03	.04	.07
Union-----	1.77	--	1.77	12.47	.35	12.82	14.24	.35	14.59
Van Buren-----	--	0.47	0.47	--	--	--	--	0.47	0.47
Washington-----	0.02	4.94	4.96	0.02	--	0.02	0.04	4.94	4.98
White-----	.09	1.24	1.33	.05	0.01	.06	.14	1.25	1.39
Woodruff-----	.03	--	.03	.03	--	.03	.06	--	.06
Yell-----	.27	.45	.72	.47	.25	.72	.74	.70	1.44
Total	25.22	45.29	70.51	105.81	89.99	195.80	131.03	135.28	266.31

population figures were determined by subtracting the number of persons supplied by public water-supply systems from 1975 estimates of county total populations (U.S. Bureau Census, 1976a).

About 60 percent of the 48 Mgal/d used to raise cattle, hogs, and poultry was drawn from wells, the rest was surface water. The number of other domestic animals in the State was so small that their total use was too small to tabulate. The quantities of water used were computed on the basis of population figures for cattle and hogs reported by the Statistical Reporting Service (U.S. Department of Agriculture, 1975), and for poultry by the Cooperative Extension Service (no date). Per capita daily use was computed on the basis of 15 gallons for cattle and calves, 30 gallons for milch cows, and 2 gallons for hogs and pigs.

Per capita daily use by poultry was computed on the basis of 4 gallons per 100 broilers, 6 per 100 hens, and 8 per 100 turkeys.

In this report, 100 percent of the water used in rural households or by livestock is considered to be consumed; however, the 100-percent figure may be high because no allowance was made for loss by infiltration.

Irrigation

A little less than half the water withdrawn in Arkansas in 1975, 2,440 Mgal/d, was used to irrigate crops; of this, 86 percent or 2,096 Mgal/d was ground water (tables 1 and 2). The quantity of water used to irrigate rice, 2,186 Mgal/d, was more than double that of 1970. The large increase in the quantity of water used to irrigate rice resulted from the increase in the number of acres of rice grown in 1975,

after the relaxation of governmental acreage controls. In 1970, 443,000 acres of rice were grown; in 1975, 931,000 acres; and all rice is irrigated. Depths of water applied, based on the author's field studies, were used to compute the quantity of water used to irrigate rice in different parts of the State as follows: east of Crowley's Ridge, 39 in. (3.25 acre-ft per acre); between the White River and Crowley's Ridge, 31 in.; between the White River and Bayou Meto (the Grand Prairie), 25 in.; between Bayou Meto and the Arkansas River, 34 in.; south of the Arkansas River, 45 in. in the areas underlain by alluvial flood-plain deposits, and 27 in. in the areas underlain by alluvial terrace deposits; in all other areas, 25 in.

The 254 Mgal/d of water used to irrigate crops other than rice was less than the 331 Mgal/d used in 1970; most of the water was used to irrigate cotton and soybeans. Application figures of 8 inches, 6 inches, and 4 inches, plus 7 percent for conveyance losses were used to compute withdrawals of water for irrigation of cotton, soybeans, and "other crops and pasture," respectively. An application figure of 6 inches was used to compute the quantity of water used to irrigate vegetables and fruit trees.

Consumption of irrigation water was estimated to be about three-fourths of that applied to rice and two-thirds of that applied to all other crops. These figures may be high because no allowances were made for infiltration losses.

The acreage figures for rice used to compute the quantity of water used and consumed were furnished by the Agricultural Stabilization and Conservation Service; the irrigated acreage figures for all other crops were furnished by the Cooperative Extension Service.

Fish and Minnow Farms

Raising fish for food and minnows for bait in Arkansas is an economically important activity that uses large quantities of water. In 1975, 342 Mgal/d, 7 percent of the State's total water withdrawal, was used for this purpose (table 2); 70 percent of the water was drawn from wells. The fish and minnows are raised in large leveed ponds, most of which are in the Grand Prairie region; well water is used almost exclusively in these ponds. An application figure of 7 feet (7 acre-ft per acre) was used to compute the quantity of water pumped into the 32,000 acres of catfish and minnow ponds in 1975; an application figure of 3 feet was used to compute the quantity of water pumped into the 32,000 acres of "rough" fish ponds and fishing lakes. The application figures were arrived at by consultation with personnel of the Soil Conservation Service, the Fish Farming Experimental Station of the U.S. Bureau of Sport Fisheries and Wildlife at Stuttgart, and the Arkansas Game and Fish Commission. The use figures in table 2 include 28 Mgal/d of surface water that was diverted for raising trout at National Fish Hatcheries in Baxter and Cleburne Counties and returned to the Streams.

Consumption of water at all fish ponds was estimated to be 3 feet; consumption at trout hatcheries was considered to be negligible.

Wildlife Impoundments

The 68 Mgal/d withdrawn from wells or diverted from streams to fill impoundments for migrating ducks and geese comprise this category of use. (See table 2.)

Electric Energy

Thermoelectric

Most of the water used in electric utility generation of thermoelectric energy was river water that was used once for cooling and then was returned to the streams. The small amount of ground water that was used (2 Mgal/d), was recirculated. (See table 2.) About one half (46 percent) of the water was used at power plants using fossil fuels (natural gas or petroleum); the remainder was used at a plant in Pope County at which nuclear fuel is used. The 1975 total, 1,717 Mgal/d was 80 percent more than the quantity used in 1970; the increase is primarily due to the construction of the plant in Pope County.

Hydroelectric

The 52,384 Mgal/d of water used in electric-utility generation of hydroelectric energy in 1975 was more than double the quantity used in 1970. Hydroelectric energy is generated at many of the dams on Corps of Engineers reservoirs and by Arkansas Power and Light Company at Carpenter and Remmel Dams on the Ouachita River. (See tables 2 and 6.) The increase in water use in 1975 over the use in 1970 was partly due to the construction of power plants at the dams on Ozark Lake on the Arkansas River and DeGray Lake on the Caddo River. Generation of energy at Mammoth Spring has been discontinued. Quantity of water used in generation of hydroelectric energy is tabulated by WRC subregions and counties in table 6.

Table 6.--Use of water to generate hydroelectric energy, 1975

[Million gallons per day]

County	Location	Water Resources Council Subregion			County total
		0804	1101	1111	
Baxter	Bull Shoals Lake		4,722		
Baxter	Norfolk Lake		1,545		6,267
Carroll	Beaver Lake		1,159		1,159
Clark	DeGray Lake	^a 495			^a 495
Cleburne	Greers Ferry Lake		1,386		1,386
Franklin	Ozark Lake			19,991	19,991
Garland	Blakely Dam	1,232			
Garland	Carpenter Dam	1,104			2,336
Hot Spring	Rommel Dam	992			992
Pike	Narrows Dam	285			285
Yell	Lake Dardanelle			19,473	19,473
Total		^a 4,108	8,812	39,464	^a 52,384

^aDoes not include 8.31 mgd pumped storage.

Ground-Water Withdrawals

The quantity of water used (withdrawn) is tabulated in table 7 by counties in order to present areally the withdrawals from each aquifer. The deposits of Quaternary age supply most of the water for irrigation in the Coastal Plain, supplemented in Arkansas and Prairie Counties (the Grand Prairie) by water from the Sparta Sand. The Sparta Sand supplies much of the water for public supply and industry in southern and southeastern Arkansas. In the southeast corner of the State, where the Sparta Sand contains salt water, it is replaced by the Cockfield Formation as the principal aquifer tapped for public supply and for some homes. East of the White River and west of Crowleys Ridge, public and industrial supplies are drawn from the Memphis aquifer or the Sparta Sand; east of the ridge practically all public supplies and industries use water from the Wilcox Group. In north Arkansas, in eastern Clay County and northeastern Greene County, the Wilcox Group is replaced by the Nacatoch Sand as the main source of ground water. Rocks of Cretaceous age, the Nacatoch Sand, Tokio Formation, and Trinity Group furnish much of the water for public supplies, rural homes, and industries in the Coastal Plain in the southwestern part of the State. Rocks of Ordovician age, the Roubidoux Formation and the Gunter Sandstone Member of the Van Buren Formation furnish most of the water for the public supplies and industries of the northern Ozarks. Other formations of Paleozoic age furnish water to homes throughout the Interior Highlands and to some public supplies and industries.

Table 7.--Withdrawals of ground water from aquifers in Arkansas counties, 1975

[Million gallons per day]

County	Deposits of Quaternary age ^a	Jackson Group, undifferentiated	Cockfield Formation	Sparta Sand	Memphis aquifer ^b	Cane River Formation	Carrizo Sand	Wilcox Group, undifferentiated	Clayton Formation	Tertiary System, undifferentiated	Nacatoch Sand	Ozan Formation	Tokio Formation	Trinity Group, undifferentiated	Rocks of Paleozoic age, undifferentiated	County total
Arkansas-----	136.27	--	--	24.25	--	--	--	--	--	--	--	--	--	--	--	160.52
Ashley-----	53.27	--	0.50	--	--	--	--	--	--	--	--	--	--	--	--	53.77
Baxter-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.63	1.63
Benton-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.69	11.69
Boone-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.15	5.15
Bradley-----	--	0.02	0.27	1.34	--	--	--	--	--	--	--	--	--	--	--	1.63
Calhoun-----	--	--	.26	.47	--	--	--	--	--	--	--	--	--	--	--	.73
Carroll-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.70	2.70
Chicot-----	46.61	--	1.16	--	--	--	--	--	--	--	--	--	--	--	--	47.77
Clark-----	.13	--	--	--	--	--	--	0.19	--	--	0.64	0.19	0.02	--	.10	1.27
Clay-----	60.33	--	--	--	--	--	--	0.18	--	--	0.63	--	--	--	--	61.14
Cleburne-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.85	.85
Cleveland-----	.02	0.06	0.44	0.16	--	--	--	--	--	--	--	--	--	--	--	.68
Columbia-----	--	--	.34	6.02	--	0.10	--	--	--	--	--	--	--	--	--	6.46
Conway-----	7.53	--	--	--	--	--	--	--	--	--	--	--	--	--	.99	8.52
Craighead-----	145.27	--	--	--	0.19	--	--	0.62	--	--	--	--	--	--	--	146.08
Crawford-----	.84	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97	1.81
Crittenden-----	38.16	--	--	--	--	--	--	4.77	--	--	--	--	--	--	--	42.93
Cross-----	169.61	--	--	--	.40	--	--	--	--	--	--	--	--	--	--	170.01
Dallas-----	--	--	0.07	1.19	--	0.13	--	--	--	--	--	--	--	--	--	1.39
Desha-----	114.04	--	0.34	1.35	--	--	--	--	--	--	--	--	--	--	--	115.73
Drew-----	32.10	0.26	.21	2.97	--	--	--	--	--	--	--	--	--	--	--	35.54
Faulkner-----	.36	--	--	--	--	--	--	--	--	--	--	--	--	--	1.93	2.29
Franklin-----	.27	--	--	--	--	--	--	--	--	--	--	--	--	--	1.01	1.28
Fulton-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.14	1.14
Garland-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.22	2.22
Grant-----	0.12	0.01	0.19	1.41	--	--	--	--	--	--	--	--	--	--	--	1.73
Greene-----	67.93	--	--	--	0.31	--	--	2.19	--	--	0.08	--	--	--	--	70.51
Hempstead-----	--	--	--	--	--	--	--	.08	--	--	1.44	--	2.15	--	--	3.76
Hot Spring-----	.14	--	--	.15	--	0.08	.06	.29	0.05	--	--	--	--	--	.53	1.30
Howard-----	--	--	--	--	--	--	--	--	--	--	0.22	--	0.97	0.30	0.43	1.92
Independence-----	7.67	--	--	--	--	--	--	--	--	--	--	--	--	--	.87	8.54
Izard-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.31	1.31
Jackson-----	164.79	--	--	--	--	--	--	--	--	--	--	--	--	--	--	164.79
Jefferson-----	106.79	0.03	0.17	53.82	--	--	--	--	--	--	--	--	--	--	--	160.81
Johnson-----	1.25	--	--	--	--	--	--	--	--	--	--	--	--	--	0.91	2.16
Lafayette-----	12.19	--	--	0.24	--	2.47	--	--	--	--	--	--	--	--	--	14.90
Lawrence-----	77.02	--	--	--	--	--	--	--	--	--	--	--	--	--	.34	77.36
Lee-----	40.32	--	0.02	.98	--	--	--	--	--	--	--	--	--	--	--	41.30
Lincoln-----	83.92	0.07	.07	1.20	--	--	--	--	--	--	--	--	--	--	--	85.26
Little River-----	3.17	--	--	--	--	--	--	--	--	--	0.04	--	--	--	--	3.21
Logan-----	.29	--	--	--	--	--	--	--	--	--	--	--	--	--	1.34	1.63
Lonoke-----	257.15	--	0.30	0.06	--	--	--	0.55	--	--	--	--	--	--	--	258.06
Madison-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.44	1.44
Marion-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.72	4.72
Miller-----	1.74	--	--	0.35	--	0.42	0.08	0.14	--	--	0.04	--	--	--	--	2.77
Mississippi-----	8.48	--	--	--	--	--	--	10.90	--	--	--	--	--	--	--	19.38
Monroe-----	81.80	--	--	.83	--	--	--	--	--	--	--	--	--	--	--	82.63
Montgomery-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.63	.63
Nevada-----	--	--	--	.13	--	.13	.04	.07	--	--	.55	--	0.55	--	--	1.47
Newton-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.59	2.59
Ouachita-----	--	--	--	4.28	--	0.15	0.06	--	--	--	--	--	--	--	--	4.49
Perry-----	0.28	--	--	--	--	--	--	--	--	--	--	--	--	--	.58	.86
Phillips-----	16.85	--	--	7.56	--	--	--	--	--	--	--	--	--	--	--	24.41
Pike-----	.03	--	--	--	--	--	--	--	--	--	--	--	0.43	0.01	0.51	.98
Poinsett-----	177.68	--	--	--	0.78	--	--	3.04	--	--	--	--	--	--	--	181.50
Polk-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.60	1.60
Pope-----	3.25	--	--	--	--	--	--	--	--	--	--	--	--	--	1.67	4.92
Prairie-----	125.79	--	0.01	15.80	--	--	0.19	--	--	--	--	--	--	--	--	141.79
Pulaski-----	21.69	--	--	.20	--	--	--	.47	--	--	--	--	--	--	1.07	23.43
Randolph-----	18.85	--	--	--	--	--	--	--	--	--	--	--	--	--	0.43	19.28
St. Francis-----	104.25	--	0.17	--	0.36	--	--	0.16	--	--	--	--	--	--	--	104.94
Saline-----	.12	--	--	0.18	--	--	--	.18	0.76	0.12	--	--	--	--	.65	2.01
Scott-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.83	.83
Searcy-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.96	.96
Sebastian-----	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	2.38	2.55
Sevier-----	.04	--	--	--	--	--	--	--	--	--	--	0.25	0.65	--	.22	1.16
Sharp-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.40	1.40
Stone-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.85	.85
Union-----	--	--	0.67	17.40	--	--	--	--	--	--	--	--	--	--	--	18.07
Van Buren-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.59	0.59
Washington-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.75	7.75
White-----	14.43	--	--	--	--	--	--	0.50	--	--	--	--	--	--	1.02	15.95
Woodruff-----	22.39	--	--	--	0.10	--	--	--	--	--	--	--	--	--	--	22.49
Yell-----	2.15	--	--	--	--	--	--	--	--	--	--	--	--	--	1.37	3.52
State	2,227.54	0.45	5.19	142.34	2.14	3.48	0.52	24.33	0.81	0.12	3.64	0.19	4.37	0.96	69.38	2,485.47
Coastal Plain	2,211.33	0.45	5.19	142.34	2.14	3.48	0.52	24.33	0.81	0.12	3.64	0.19	4.37	0.96	--	2,399.67
Interior High-lands	16.42	--	--	--	--	--	--	--	--	--	--	--	--	--	69.38	85.80

^aAlluvial terrace and flood-plain deposits comprise the deposits of Quaternary age.^bThe Carrizo Sand, the sandy facies of the Cane River Formation, and the Sparta Sand comprise the Memphis aquifer, a massive fine to medium sand extending northeastward from approximately latitude 35°N. (Hosman, 1969).

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