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USE OF WATER IN ARKANSAS, 1965

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## USE OF WATER IN ARKANSAS, 1965

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By H. N. Halberg and J. W. Stephens

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### ABSTRACT

In 1965, Arkansas used an average of 2,142 mgd (million gallons per day) of ground and surface water, 35 percent more than the use in 1960. The quantity used in 1965 does not include more than 8,700 mgd used in the production of hydroelectric power. The principal categories of use are public supply, self-supplied industrial use, rural domestic and live-stock use, irrigation, fish and minnow farming, water for wildlife impoundments and fish hatcheries, and fuel-electric-power production. More than half the State's total was used for irrigation and 80 percent of the irrigation water was ground water.

Cooling water for fuel-electric-power production required 423 mgd, 20 percent of the State's total. Practically all of it was surface water. Fish and minnow farming, a rapidly expanding activity, used 179 mgd, 8 percent of the State's total.

More than half the water used was withdrawn from the ground; streams and reservoirs supplied the rest. Surface-water supplies are commonly used in the northwestern half of the State; ground-water supplies are more common in the southeastern half or Coastal Plain where the two principal underground reservoirs, the alluvium of Quaternary age, and the Sparta Sand, of Tertiary age, furnished practically all the ground water used. The deposits of Quaternary age provided most of the ground water used for irrigation; the Sparta Sand provided much of the ground water used for industry.

### INTRODUCTION

Water is our most essential natural resource, without it we cannot live and without enough our economy would wither away. We can make no plans for expansion of our industry or agriculture unless we know if enough water is available to support these activities. This report provides water-use data for 1965 that can be used in planning for the future.

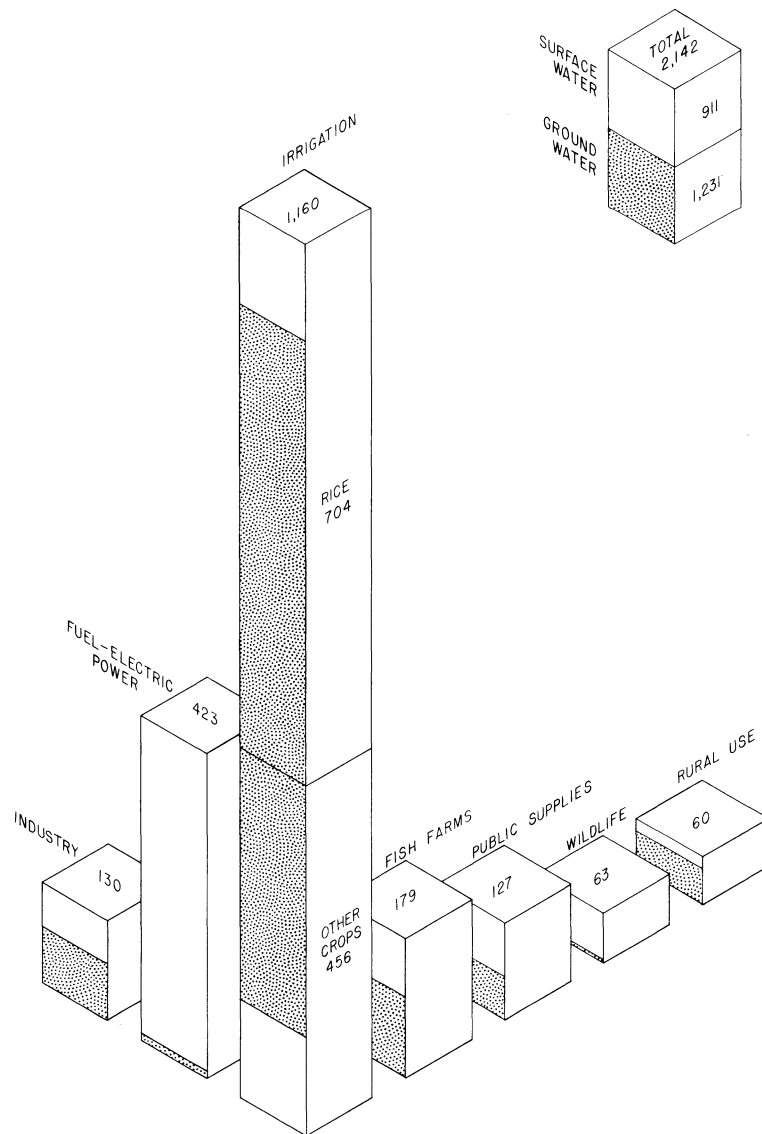
The information in this report has been collected by the U.S. Geological Survey in cooperation with the Arkansas Geological Commission. The writers express their appreciation to the many public agencies, industries, other organizations, and individuals that provided data. Especially, they thank the Arkansas Game and Fish Commission, the Arkansas State Board of Health, the Agricultural Extension Service of the University of Arkansas,

the Soil Conservation Service and other bureaus of the U.S. Department of Agriculture, the U.S. Bureau of Mines, the U.S. Fish and Wildlife Service, and the Arkansas Power & Light Company.

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. Consumed water is water that is evaporated or transpired, incorporated into a product, or is used by humans and animals; it is not returned to a source and cannot be used again. Consumed water is not reported separately in this study. Although air conditioning is practiced extensively throughout the State, little "new" water is used in the type of equipment that must be utilized because of the humid climate. For this reason, water used for air conditioning is not reported. This report is similar to the one for 1960 by Stephens and Halberg (1961), but this report includes data on total use of water by industry and commerce (table 3) and withdrawals of ground water from each water-bearing formation (table 4).

#### WATER USE

Arkansas used an average of 2,142 mgd of ground and surface water in 1965 (fig. 1 and table 1), 35 percent more than in 1960. The quantity used in 1965 does not include 8,730 mgd used in the production of hydroelectric power. More than half (57 percent) the 1965 total was drawn from the ground. The use figure of 2,142 mgd is the equivalent of supplying 1,125 gpd (gallons per day) to each resident of the State, as compared with 883 gpd in 1960. More than half the water was used to irrigate crops, most of which are in the eastern part of the State; 82 percent of the irrigation water was well water. More water (239 mgd) was used in Arkansas County than in any other county (fig. 2 and table 2); the smallest quantity (0.5 mgd) was used in Newton County. Most of the counties in which water use increased the most since 1960 are concentrated in the east-central part of the State (fig. 3). The increases are due to greater use of water for irrigation, for fish and minnow farming, and for cooling at fuel-electric plants built since 1960.



WATER USED IN ARKANSAS, 1965  
IN MILLION GALLONS PER DAY

FIGURE 1

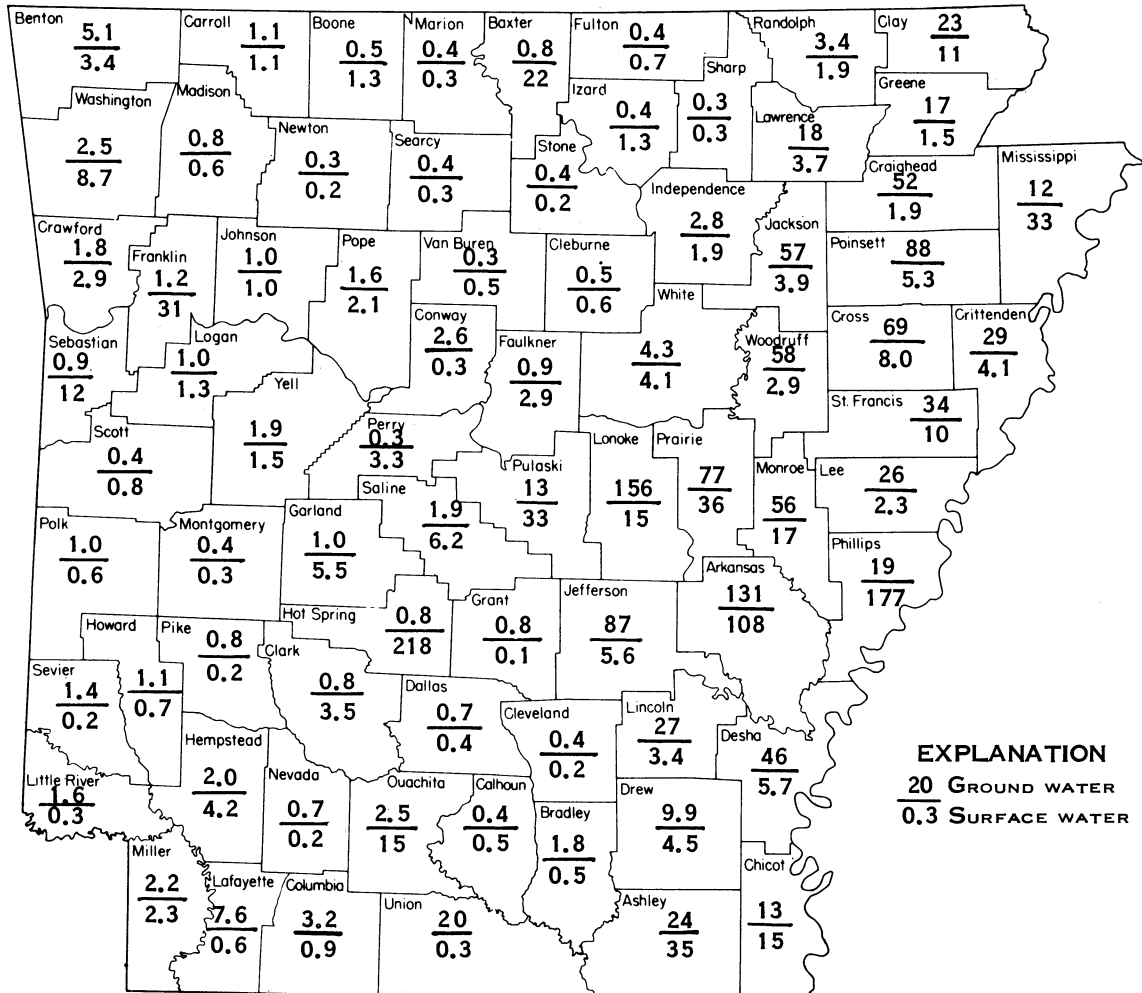
Table 1.--USE OF WATER IN ARKANSAS, 1965  
(Million gallons per day)

Type of use	Water used in 1965			Increase (+) or decrease (-) since 1960		
	Ground water	Surface water	Total	Ground water	Surface water	Total
Public supply	54	73	127	+6	+21	+27
Self-supplied industry	74	56	130	-24	+26	+2
Rural use						
Domestic	31	0	31	+3	0	+3
Livestock	13	16	29	+1	-4	-3
Irrigation						
Rice	577	127	704	+51	+16	+67
Other crops	372	84	456	+136	+29	+165
Fish and minnow farms	103	76	179	+60	+71	+131
Wildlife impound- ments and national fish hatcheries	1	62	63	0	+17	+17
Subtotal	1,225	494	1,719	+233	+176	+409
Fuel-electric power	6	417	423	0	+155	+155
Total	1,231	911	2,142	+233	+331	+564
Hydroelectric power	--	8,730	8,730	--	+530	+530

Water use is tabulated by county, category of use, and source (table 2). The principal categories are public supply, self-supplied industrial use, use by rural households and livestock, irrigation, fish and minnow farming, water for wildlife impoundments and fish hatcheries, and fuel-electric power production. The data are given in average million gallons per day; for example, the water used to irrigate rice may have been applied in 40 or 50 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 mgd, this precision was used only in order to add the figures. Most of the county totals are probably accurate within 5 percent.

#### Public Supplies

The supply systems of 302 cities, towns, and other water districts in the State, both publicly and privately owned, drew 127 mgd from their sources during 1965 (table 2). The water was distributed to about 1,100,000 people and the commercial and industrial establishments



**WATER USED IN ARKANSAS COUNTIES, 1965**  
 IN MILLION GALLONS PER DAY

FIGURE 2

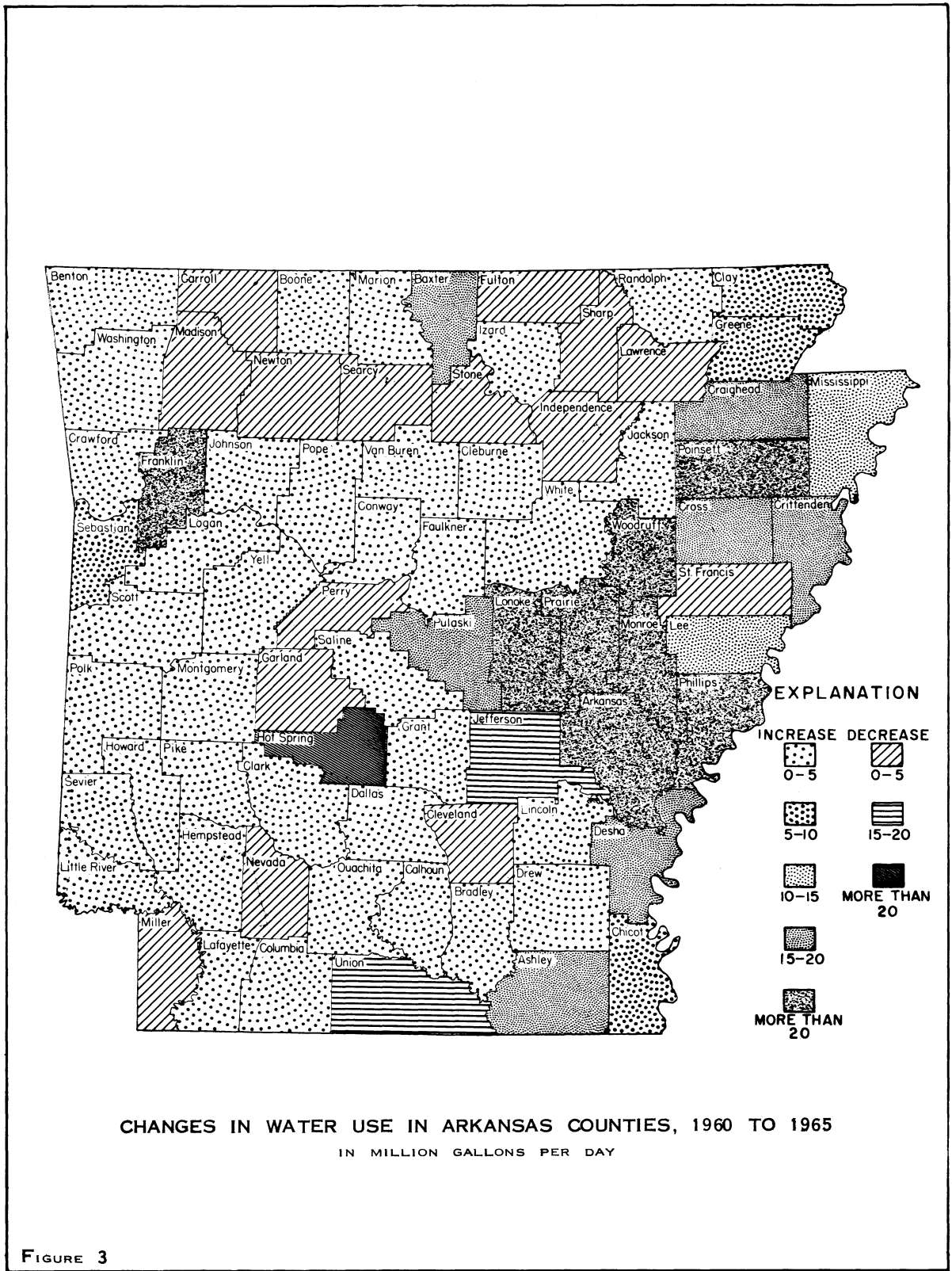


FIGURE 3





in the municipalities. The total includes water used for public facilities and fire fighting; it also includes leakage and wastage. About 35 percent of the water was used by commerce and industry. Supplying 127 mgd is the equivalent of furnishing 113 gpd to each resident of the municipalities.

#### Industry and Commerce

Arkansas industry and commerce used 173 mgd during 1965 (table 3), which includes water furnished by the public-supply systems and that which industry supplied itself.

Arkansas industry supplied itself with an average of 130 mgd in 1965 (table 2), a little more than in 1960. This 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. This category also includes water used by hospitals, institutions, military establishments, schools, and visitors at recreation areas. Water used for recreational activities, such as boating or fishing, or for navigation is not included in the report.

#### Rural Households and Livestock

Farmers and others who furnish their own water supplies are classed as rural domestic users. In 1965 about 800,000 rural users withdrew 31 mgd from their own wells and springs (table 2). This withdrawal was computed on the basis of use of 50 gallons of water per day per capita by the 75 percent of people who have running water in their homes and on the basis of 10 gallons per day by the remaining 25 percent. The 29 mgd used to raise cattle, swine, and poultry was drawn about equally from wells, and from streams and ponds. The number of other animals in the State was so small that their total water use was too small to tabulate.

#### Irrigation

More than half the water withdrawn in Arkansas in 1965 (1,160 mgd) was used to irrigate crops (table 2). Irrigation of rice accounted for 61 percent of this water; the quantity used on rice was 11 percent greater than in 1960 because of increased acreage planted. A figure of 1.8 acre-feet per acre (Engler and others, 1945, p. 23) was used to compute the quantity of water used to irrigate rice. Most of the rest of the irrigation water was applied to cotton and soybeans; the 456 mgd used on crops other than rice was 57 percent greater than the use in 1960. The quantities of irrigation water given in this report include conveyance losses, which are small (estimated to be 7 percent of the water applied).

Table 3.--INDUSTRIAL AND COMMERCIAL USE OF WATER IN ARKANSAS COUNTIES, 1965  
(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	0.41	0	0.41	0	0	0	0.41	0	0.41
Ashley	.12	0	.12	7.47	26.00	33.47	7.59	26.00	33.59
Baxter	0	0	0	.07	0	.07	.07	0	.07
Benton	1.36	1.06	2.42	.11	0	.10	1.47	1.06	2.53
Boone	0	.03	.03	.01	0	.01	.01	.03	.04
Bradley	.14	0	.14	.38	0	.38	.52	0	.52
Calhoun	0	0	0	.03	.46	.49	.03	.46	.49
Carroll	.27	.24	.51	0	0	0	.27	.24	.51
Chicot	0	0	0	.02	0	.02	.02	0	.02
Clark	0	.20	.20	.05	1.60	1.65	.05	1.80	1.85
Clay	0	0	0	0	0	0	0	0	0
Cleburne	0	0	0	.04	0	.04	.04	0	.04
Cleveland	0	0	0	0	.01	.01	0	.01	.01
Columbia	.61	0	.61	1.12	.03	1.15	1.73	.03	1.76
Conway	.49	0	.49	.02	0	.02	.51	0	.51
Craighead	.55	0	.55	.19	0	.19	.74	0	.74
Crawford	0	.22	.22	0	.59	.59	0	.81	.81
Crittenden	.60	0	.60	.07	0	.07	.67	0	.67
Cross	0	0	0	0	0	0	0	0	0
Dallas	0	0	0	0	0	0	0	0	0
Desha	0	0	0	0	0	0	0	0	0
Drew	.46	0	.46	.13	0	.13	.59	0	.59
Faulkner	0	.79	.79	0	0	0	0	.79	.79
Franklin	.12	.18	.30	0	.03	.03	.12	.21	.33
Fulton	.02	0	.02	0	0	0	.02	0	.02
Garland	0	1.81	1.81	.34	0	.34	.34	1.81	2.15
Grant	.10	0	.10	0	0	0	.10	0	.10
Greene	.21	0	.21	.12	0	.12	.33	0	.33
Hempstead	.40	0	.40	.01	0	.01	.41	0	.41
Hot Spring	0	.03	.03	.08	5.57	5.65	.08	5.60	5.68
Howard	.29	.05	.34	.27	0	.27	.56	.05	.61
Independence	0	.50	.50	0	0	0	0	.50	.50
Izard	0	0	0	0	.86	.86	0	.86	.86
Jackson	.01	0	.01	1.01	0	1.01	1.02	0	1.02
Jefferson	.24	0	.24	38.96	.01	38.97	39.20	.01	39.21
Johnson	0	.28	.28	.01	0	.01	.01	.28	.29
Lafayette	0	0	0	.56	.17	.73	.56	.17	.73
Lawrence	.24	0	.24	0	0	0	.24	0	.24
Lee	.23	0	.23	.02	0	.02	.25	0	.25
Lincoln	0	0	0	.03	0	.03	.03	0	.03
Little River	0	0	0	.34	0	.34	.34	0	.34
Logan	0	.15	.15	.01	.04	.05	.01	.19	.20
Lonoke	0	0	0	0	0	0	0	0	0
Madison	0	0	0	0	0	0	0	0	0
Marion	0	0	0	.07	0	.07	.07	0	.07
Miller	0	.71	.71	.08	.11	.19	.08	.82	.90
Mississippi	1.18	0	1.18	2.88	0	2.88	4.06	0	4.06
Monroe	.25	0	.25	.01	0	.01	.26	0	.26
Montgomery	0	0	0	.05	0	.05	.05	0	.05
Nevada	0	0	0	0	.01	.01	0	.01	.01
Newton	0	0	0	0	0	0	0	0	0
Ouachita	0	.20	.20	1.75	13.81	15.56	1.75	14.01	15.76
Perry	0	0	0	0	0	0	0	0	0
Phillips	.85	0	.85	1.19	0	1.19	2.04	0	2.04
Pike	.25	0	.25	.07	.03	.10	.32	.03	.35
Poinsett	.30	0	.30	0	0	0	.30	0	.30
Polk	0	.10	.10	.33	0	.33	.33	.10	.43
Pope	.11	.82	.93	.05	.01	.06	.16	.83	.99
Prairie	.01	0	.01	0	0	0	.01	0	.01
Pulaski	1.81	9.01	10.82	0	1.19	1.19	1.81	10.20	12.01
Randolph	0	.12	.12	.02	0	.02	.02	.12	.14
St. Francis	.48	0	.48	.68	0	.68	1.16	0	1.16
Saline	0	.54	.54	.01	4.88	4.89	.01	5.42	5.43
Scott	0	.36	.36	0	.01	.01	0	.37	.37
Searcy	0	0	0	0	0	0	0	0	0
Sebastian	0	7.51	7.51	0	.03	.03	0	7.54	7.54
Sevier	.57	0	.57	0	0	0	.57	0	.57
Sharp	0	0	0	0	0	0	0	0	0
Stone	0	0	0	.01	0	.01	.01	0	.01
Union	.82	0	.82	15.12	.16	15.28	15.94	.16	16.10
Van Buren	0	.17	.17	0	0	0	0	.17	.17
Washington	.15	3.43	3.58	0	.16	.16	.15	3.59	3.74
White	.01	.58	.59	.04	.03	.07	.05	.61	.66
Woodruff	.06	0	.06	.02	0	.02	.08	0	.08
Yell	.50	.28	.78	.03	0	.03	.53	.28	.81
STATE TOTAL	14.22	29.37	43.59	73.88	55.80	129.68	88.10	85.17	173.27

### Fish and Minnow Farms

Raising fish for food and minnows for bait is an important and fast-growing activity, which uses large quantities of water. In 1965, 179 mgd, 8 percent of the State's total, was used for this purpose (table 2), 58 percent of which was drawn from wells. The fish and minnows are raised in large leveed ponds, most of which are in the Grand Prairie region. About 3 feet of water was applied to 33,000 acres of fish ponds during the year and about 6 feet was applied to 17,000 acres of minnow ponds.

### Wildlife Impoundments and Fish Hatcheries

The approximately 22 mgd of surface water in this category used in Baxter and Fulton Counties is water diverted at national trout hatcheries and returned to the streams. The other 40 mgd of surface water is diverted from streams and held in impoundments for the use of migrating and wintering ducks and geese. (See table 2.)

### Fuel-Electric Power

Most of the water used in the production of fuel-electric power is river water that is used once for cooling and then is returned to the stream. The only degradation of the water is an increase of its temperature, which is dissipated a few miles downstream. Ground water used for cooling is recirculated; hence, comparatively little is used. The total of 423 mgd (table 2) used in 1965 is 58 percent more than the 1960 figure. New plants built since 1960 at Helena and Ozark account for the increase.

### GROUND-WATER WITHDRAWALS

To assist future studies of ground water in relation to possible depletion of the supply in the water-bearing formations, table 4 shows withdrawals from each aquifer in each county. More than 97 percent of the water was withdrawn in the Coastal Plain, practically all from alluvium of Quaternary age and the Sparta Sand, of Tertiary age. The Quaternary deposits supplied most of the ground water used for irrigation and fish farming; the Sparta Sand furnished much of the water used by industry.

Very little of the water withdrawn is returned to the ground to recharge the ground-water reservoirs. In 1965, less than 1 mgd was returned to the ground for this purpose.

Table 4.--WITHDRAWALS OF GROUND WATER FROM AQUIFERS IN ARKANSAS, 1965  
(Million gallons per day)

County	Deposits of Quaternary age	Jackson Group	Cockfield Formation	Sparta Sand	Memphis Aquifer	Cane River Formation	Carrizo Sand	Wilcox Group	Clayton Formation	Nacatoch Sand	Ozan Formation	Tokio Formation	Woodbine Formation	Trinity Group	Rocks of Paleozoic age	County Total
Arkansas	113.45			17.39												130.84
Ashley	22.80		0.83												0.78	23.63
Baxter															5.11	5.11
Benton															.54	.54
Boone																
Bradley	.34	0.01	.29	1.14												1.78
Calhoun			.18	.17											1.06	.35
Carroll																1.06
Chicot	12.19		.85												.03	13.04
Clark	.12							0.07		0.44	0.13					.79
Clay	22.13				0.20			.26		.25					.48	22.84
Cleburne																.48
Cleveland	.04	.04	.10	.26												.44
Columbia			.14	3.03		0.06										3.23
Conway	2.10														.55	2.65
Craighead	48.82				3.26			.38							.60	52.46
Crawford	1.18															1.78
Crittenden	26.37				.07			2.25								28.69
Cross	67.96				.71			.05								68.72
Dallas			.02	.67		.06										.75
Desha	45.11		.40	.83												46.34
Drew	8.51	.12	.12	1.12												9.87
Faulkner															.90	.90
Franklin	.76														.49	1.25
Fulton															.38	.38
Garland															1.05	1.05
Grant	.11	.06	.08	.50												.75
Greene	15.75				.22			1.20								17.17
Hempstead	.26									1.12						2.05
Hot Spring	.04			.06		.02	0.02	.43	0.02			0.67			.23	.82
Howard															.69	1.08
Independence	2.17												0.04	0.13	.22	2.80
Izard															.63	.38
Jackson	56.87														.38	56.93
Jefferson	42.01	.21	.31	44.36											.06	86.89
Johnson	.60														.40	1.00
Lafayette	4.61			2.63		.32										7.56
Lawrence	17.72														.17	17.89
Lee	25.44		.02	.09												25.55
Lincoln	25.88	.27	.08	.34												26.57
Little River	1.42									.20						1.62
Logan	.31														.65	.96
Lonoke	155.46			.15	.09			.17								155.87
Madison															.81	.81
Marion															.43	.43
Miller	1.71					.14	.09	.14		.14						2.22
Mississippi	5.19							6.83								12.02
Monroe	56.08			.24												56.32
Montgomery															.38	.38
Nevada						.05		.08		.21				.37		.71
Newton															.31	.31
Ouachita				2.27		.17	.05									2.49
Perry															.29	.29
Phillips	14.44		.03	4.57												19.04
Pike	.42											.12			.25	.79
Poinsett	86.18				.08			1.37								87.63
Polk															.99	.99
Pope	1.02														.54	1.56
Prairie	69.90			6.75												76.65
Pulaski	12.78							.05							.16	12.99
Randolph	3.16														.20	3.36
St. Francis	32.79				.76			.15	.23						.43	33.70
Saline				.57				.63							.42	1.86
Scott															.42	.42
Searcy															.44	.44
Sebastian	.21														.70	.91
Sevier	.17											.15		.99	.07	1.38
Sharp															.29	.29
Stone															.36	.36
Union	.05		.55	19.07												19.67
Van Buren															.32	.32
Washington															2.44	2.44
White	3.55							.12							.65	4.32
Woodruff	58.00				.13											58.13
Yell	.47														1.39	1.86
TOTALS:																
STATE	1,066.65	0.71	4.00	106.21	5.52	0.82	0.16	14.18	0.25	2.36	0.13	2.00	0.04	1.12	26.58	1,230.73
Coastal Plain	1,062.86	0.71	4.00	106.21	5.52	0.82	0.16	14.18	0.25	2.36	0.13	2.00	0.04	1.12	0.22	1,200.58
Interior Highlands	3.79														26.36	30.15

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