Department of the Interior
United States Geological Survey

Prepared in cooperation with the
Arkansas Geological Commission
and
Arkansas Soil and Water Conservation Commission

Water-Resources Investigations Report 84-4070

## INTRODUCTION

Water is one of Arkansas' most vital and important resources. The State's economy is dependent on large quantities of good quality water. Therefore, it is essential to document water usage by categories for future planning and management of the State's existing water resources.

The total estimated water use, excluding wildlife impoundments, in the State in 1981 from both ground water and surface water was 33,000 million gallons per day (Mgal/d), as compared to 40,600 Mgal/d in 1980 (Holland and Ludwig, 1981). The decrease in total use was due to decreased usage for power generation. Figure 1 and table 1 show the 1981 total water use for all use categories by county in Mgal/d. The term "water use," as used in this report, is water withdrawn or diverted from a source for use. Water is tallied each time water is withdrawn from a source. The seven water-use categories discussed herein include public supply, rural (self-supplied), industrial (self-supplied), aquaculture, irrigation, hydroelectric power, and thermoelectric power.

Not all water withdrawn for use is consumed. Water can be used for cooling purposes and then returned to the source; this use is termed nonconsumptive. Consumptive use, however, would include water which has become part of a finished product, or has been lost to the atmosphere by transpiration or evaporation, or is ingested by humans. Consumptive use averaged 4,610 Mgal/d in 1981 as compared to 3,600 Mgal/d in 1980.

Of the total water use (33,000 Mgal/d), 87 percent (28,700 Mgal/d) was from surface-water sources and 13 percent (4,300 Mgal/d) was withdrawn from ground-water sources. The total water use for each county, from both surface- and ground-water sources is shown in figure 1. In addition, the percentages of total surface- and ground-water withdrawals for each category of use are shown in figures 2 and 3.

For all uses other than power generation, Arkansas used 5,330 Mgal/d of ground and surface water as compared with 5,110 Mgal/d in 1980 (wildlife impoundments excluded), which is about a 4 percent increase. Eighty percent, or 4,260 Mgal/d of water, was withdrawn from ground-water sources and the rest (1,070 Mgal/d) was supplied from surface water.

The following agencies and organizations have provided data for this study: Arkansas Geological Commission; Arkansas Department of Health; University of Arkansas College of Agriculture Cooperative Extension Service; Agricultural Stabilization and Conservation Service; Soil Conservation Service; and Statistical Reporting Service of the U.S. Department of Agriculture; Bureau of Mines; and U.S. Fish and Wildlife Service of the U.S. Department of the Interior; U.S. Army Corps of Engineers; Arkansas Game and Fish Commission; Arkansas Power and Light Company; Arkansas Department of Parks and Tourism; Arkansas State Highway and Transportation Department.

For readers who prefer to use metric units million gallons per day may be converted to cubic meters per day and cubic hectometers per day by multiplying by 3.785 and 0.003785, respectively.

## PUBLIC SUPPLY

The amount of water withdrawn in 1981 for public supply systems was 246 Mgal/d. Surface water use was 142 Mgal/d and ground water was 104 Mgal/d. Of the total amount withdrawn, 61 Mgal/d was consumed. The water was distributed to about 1.64 million people from 542 water systems in the State. Distribution of use is shown in figure 4. The largest public-supply use (49 Mgal/d) was in Pulaski County, which is also the most populous county in the State.

## RURAL SELF-SUPPLIED

The rural self-supplied use category includes domestic use and water consumed by livestock. Domestic use refers to use in residences, generally in rural areas, having their own private water systems. Rural self-supplied domestic use plus the water consumed by livestock is shown by county in figure 5. In 1981, rural self-supplied withdrawals were 120 Mgal/d. Of this amount, 55 Mgal/d was for domestic use and 65 Mgal/d was for livestock. Consumption of self-supplied water is considered to be 100 percent. All domestic water supplies were withdrawn from ground water sources whereas 23 Mgal/d, 35 percent, of water withdrawn for livestock use was from ground water sources. Therefore, 78 Mgal/d or about 65 percent of rural self-supplied water was withdrawn from ground water. Washington and Benton Counties were the two largest users of rural self-supplied water withdrawing 9.02 Mgal/d and 7.57 Mgal/d, respectively. Some of the largest livestock and poultry operations are located in these counties.

## INDUSTRIAL SELF-SUPPLIED

Self-supplied industrial water use for 1981 was 237 Mgal/d. Ranges of distribution by county are shown in figure 6. Of this amount, 92 Mgal/d was withdrawn from ground water and 145 Mgal/d was withdrawn from surface water. Consumption was 61 Mgal/d. The largest use of self-supplied industrial water was in Ashley, Jefferson, Little River, and Sevier Counties.

## AQUACULTURE

In 1981, aquaculture withdrawals were 353 Mgal/d, of which 233 Mgal/d was withdrawn from ground water, whereas 120 Mgal/d was withdrawn from surface water. Distribution of aquaculture water use by county is shown in figure 7. Aquaculture in Arkansas consists primarily of trout, catfish, and minnow farms. More emphasis, however, is concentrated in catfish and minnow farming. There was a 15 percent decrease in water use for aquaculture in 1981 compared to 1980, emphasizing the severity of the 1980 drought. Consumption was 197 Mgal/d which is 56 percent of the total use. The largest use of water for aquaculture was in Lonoke County.

Table 1.--Use of water in Arkansas counties, 1981 (in million gallons per day)

[Due to rounding of numbers, columns and lines may not total]

| COUNTY | PUBLIC SUPPLY | RURAL DOMESTIC AND LIVESTOCK | IRRIGATION | AQUACULTURE | HYDROELECTRIC POWER | THERMOELECTRIC POWER | INDUSTRIAL SELF-SUPPLIED | COUNTY TOTALS |
|---|---|---|---|---|---|---|---|---|
| ARKANSAS | 3.78 | 0.42 | 379.57 | 23.88 | | | 0.01 | 408 |
| ASHLEY | 2.27 | .75 | 105.29 | 10.96 | | | 45.08 | 164 |
| BAXTER | 2.07 | 1.58 | .10 | 21.01 | 1,106.71 | | .14 | 1,130 |
| BENTON | 6.58 | 7.57 | .72 | .53 | | 4.91 | .21 | 20.5 |
| BOONE | 1.69 | 2.15 | .09 | .16 | | | .05 | 4.14 |
| BRADLEY | .87 | .59 | 1.34 | .71 | | | .44 | 3.95 |
| CALHOUN | .28 | .31 | .03 | .02 | | | .53 | 1.17 |
| CARROLL | 2.57 | 2.88 | .12 | .12 | 372.59 | | .01 | 378 |
| CHICOT | 1.75 | .60 | 169.20 | 5.88 | | | .03 | 177 |
| CLARK | 1.84 | .91 | 7.22 | 1.37 | 555.12 | | 1.53 | 568 |
| CLAY | 1.15 | .99 | 202.83 | 1.19 | | | .07 | 206 |
| CLEBURNE | 1.94 | 1.59 | .04 | 11.38 | 377.87 | | .12 | 393 |
| CLEVELAND | .43 | .82 | .14 | .15 | | | .01 | 1.55 |
| COLUMBIA | .77 | 1.23 | .10 | 1.26 | | | 2.93 | 8.29 |
| CONWAY | 1.12 | 2.02 | 1.50 | .52 | | | 4.23 | 9.39 |
| CRAIGHEAD | 6.77 | .61 | 235.92 | .46 | | | .44 | 244 |
| CRAWFORD | 4.98 | 2.22 | 1.70 | .49 | | | .20 | 9.59 |
| CRITTENDEN | 5.40 | .70 | 77.57 | 4.14 | | | .16 | 88.0 |
| CROSS | 2.07 | .60 | 236.56 | 4.17 | | | .29 | 244 |
| DALLAS | .78 | .43 | .98 | .17 | | | .14 | 2.50 |
| DESHA | 1.35 | .64 | 191.73 | 13.32 | | | 12.20 | 219 |
| DREW | 2.71 | .62 | 63.19 | 1.57 | | | .01 | 68.1 |
| FAULKNER | 4.35 | 2.82 | 10.76 | .77 | | | .14 | 18.8 |
| FRANKLIN | 1.20 | 2.00 | 1.46 | .09 | 1,847.82 | 16.09 | .22 | 1,870 |
| FULTON | .34 | 1.33 | .07 | .75 | | | .03 | 2.52 |
| GARLAND | 10.19 | 1.39 | .05 | .82 | 2,035.91 | | 3.08 | 2,050 |
| GRANT | 1.31 | .44 | .04 | .40 | | | .11 | 2.30 |
| GREENE | 2.77 | 1.19 | 151.75 | 7.24 | | | .17 | 163 |
| HEMPSTEAD | 2.35 | 2.86 | 2.20 | .58 | | | .01 | 8.00 |
| HOT SPRING | 1.74 | 1.11 | 2.59 | 1.94 | 1,055.26 | 332.44 | 2.86 | 1,400 |
| HOWARD | 1.87 | 2.81 | .03 | .80 | | | .77 | 6.28 |
| INDEPENDENCE | 3.79 | 2.26 | 23.28 | .42 | | | .13 | 29.9 |
| IZARD | 1.13 | 1.33 | .11 | .04 | | | 1.03 | 3.64 |
| JACKSON | 1.56 | .50 | 246.79 | 3.51 | | | .77 | 253 |
| JEFFERSON | 11.07 | .70 | 186.78 | 8.29 | | 1.97 | 43.74 | 253 |
| JOHNSON | 1.85 | 1.71 | 2.85 | .95 | | | .10 | 7.46 |
| LAFAYETTE | .80 | 1.06 | 19.90 | 1.04 | | 1.29 | .44 | 24.5 |
| LAWRENCE | 1.35 | 1.10 | 174.98 | 1.27 | | | .23 | 179 |
| LEE | 1.51 | .85 | 121.74 | 2.70 | | | .01 | 127 |
| LINCOLN | .85 | .56 | 126.53 | 3.61 | | | .39 | 132 |
| LITTLE RIVER | .87 | 1.13 | 3.85 | .21 | | | 41.05 | 47.1 |
| LOGAN | 1.49 | 2.80 | 1.21 | .17 | | | .05 | 5.72 |
| LONOKE | 2.08 | 1.93 | 286.96 | 101.56 | | | 1.24 | 394 |
| MADISON | .56 | 3.79 | .15 | .13 | | | .01 | 4.64 |
| MARION | .51 | 1.16 | .01 | 3.21 | | | .27 | 5.16 |
| MILLER | 2.63 | 2.02 | 15.42 | .38 | | | .46 | 20.9 |
| MISSISSIPPI | 4.72 | .87 | 54.73 | 2.02 | | | 5.10 | 67.4 |
| MONROE | 1.25 | .27 | 152.72 | 32.88 | | | .02 | 187 |
| MONTGOMERY | .16 | 1.12 | .14 | .12 | | | .14 | 1.68 |
| NEVADA | .61 | 1.51 | .02 | .00 | | | .04 | 2.18 |
| NEWTON | .09 | .96 | .04 | .00 | | | .17 | 1.26 |
| OUACHITA | 2.86 | .60 | .60 | .06 | | 23.20 | 10.37 | 37.7 |
| PERRY | .29 | .90 | 5.00 | .24 | | | .02 | 6.45 |
| PHILLIPS | 3.52 | .64 | 74.46 | .13 | | 245.45 | 2.36 | 327 |
| PIKE | 1.35 | 1.55 | .23 | .00 | 286.48 | | .59 | 291 |
| POINSETT | 2.55 | .49 | 355.69 | 6.32 | | | .37 | 365 |
| POLK | .67 | 2.78 | .20 | .24 | | | .09 | 3.98 |
| POPE | 4.70 | 3.55 | 1.65 | .11 | | 9,638.36 | .45 | 9,650 |
| PRAIRIE | .86 | 1.12 | 203.29 | 46.26 | | | .00 | 252 |
| PULASKI | 49.44 | 3.62 | 27.21 | 2.64 | | .44 | 2.25 | 85.6 |
| RANDOLPH | .66 | 1.38 | 51.44 | .57 | | | .01 | 54.1 |
| ST. FRANCIS | 2.60 | .56 | 143.98 | 2.02 | | .44 | .30 | 150 |
| SALINE | 3.93 | 2.03 | .52 | .34 | | | 1.71 | 8.53 |
| SCOTT | .77 | 1.66 | .01 | .05 | | | .01 | 2.50 |
| SEARCY | .23 | 1.37 | .01 | .00 | | | .01 | 1.62 |
| SEBASTIAN | 18.54 | 1.57 | .20 | .88 | | | .27 | 21.5 |
| SEVIER | 2.01 | 2.32 | 1.38 | .00 | | | 31.87 | 37.6 |
| SHARP | 1.22 | .91 | .12 | .50 | | | .01 | 2.76 |
| STONE | .48 | 1.73 | .21 | .06 | | | .05 | 2.53 |
| UNION | 7.39 | 1.11 | .08 | .10 | | | 13.48 | 22.2 |
| VAN BUREN | .76 | 1.36 | .08 | .12 | | | .01 | 2.33 |
| WASHINGTON | 14.83 | 9.02 | .47 | 3.35 | | | .09 | 27.8 |
| WHITE | 4.41 | 2.51 | 48.72 | 4.21 | | | .04 | 59.9 |
| WOODRUFF | .73 | .37 | 188.47 | 4.46 | | 22.46 | .02 | 216 |
| YELL | 1.64 | 2.79 | 6.72 | .44 | 9,715.78 | | 1.46 | 9,730 |
| TOTALS | 246 | 120 | 4,370 | 353 | 17,400 | 10,300 | 237 | 33,000 |

## IRRIGATION

Withdrawals for irrigation during 1981 were estimated to be 4,370 Mgal/d. Of this amount, 3,760 Mgal/d (86 percent) was withdrawn from ground water and 618 Mgal/d (14 percent) was from surface water. Distribution of irrigation water use by county is shown in figure 8. Arkansas and Poinsett Counties were the largest users of irrigation water, 380 Mgal/d and 356 Mgal/d, respectively.

Eighty-eight percent (3,840 Mgal/d) of the total irrigation withdrawal was used for irrigation of 1.4 million acres of rice on the Coastal Plain in eastern Arkansas. This represents about a 12 percent increase in both usage and acres compared to 1980. Approximately 3,300 Mgal/d was withdrawn from ground water; chiefly from the shallow deposits of Quaternary age.

Consumption was estimated to be 75 percent of use for rice and 70 percent for other crops. Therefore, 3,250 Mgal/d was consumed for irrigation.

## HYDROELECTRIC POWER

In Arkansas, water from rivers and reservoirs for hydroelectric power generation in 1981 totaled about 17,400 Mgal/d, down about 33 percent from 25,800 Mgal/d in 1980. Distribution of water use to produce hydroelectric power is shown in figure 9. Dardanelle Dam on the Arkansas River in Yell County was the largest user totaling about 9,720 Mgal/d.

## THERMOELECTRIC POWER

In 1981, water withdrawn for thermoelectric power generation totaled about 10,300 Mgal/d, up slightly from 9,680 Mgal/d in 1980. Distribution of water use to produce thermoelectric power is shown in figure 10. Surface water used for cooling purposes at Arkansas Power and Light Company's nuclear-fueled powerplant in Pope County amounted to 9,640 Mgal/d (94 percent of the total). The remaining 660 Mgal/d of surface water was used at powerplants using fossil fuels in which a total of 2.37 Mgal/d of ground water was also used.

The amount of water consumed by thermoelectric power generation, as it evaporated in the form of steam, was estimated to be 913 Mgal/d.

## WILDLIFE IMPOUNDMENTS

Wildlife impoundments are low-lying areas reserved mainly as waterfowl refuges. The total impounded water use in 1981 was 142 Mgal/d, of which, 96 percent was from surface water sources.

Wildlife impoundments are not recognized as a water-use category in the National Water-Use Data System (NWUDS). Therefore, its use is omitted from the State's total water use in this report.

NWUDS is the U.S. Geological Survey's computer storage system for water-use data from each state where water-use data is being collected.

## SELECTED REFERENCES

Callahan, J. A., 1983, Water use in Mississippi, 1980: U.S. Geological Survey Open-File Report 83-224, map (1 sheet).

Halberg, H. N., 1977, Use of water in Arkansas, 1975: Arkansas Geological Commission Water Resources Summary 9, 28 p.

Holland, T. W., and Ludwig, A. H., 1981, Use of Water in Arkansas, 1980: Arkansas Geological Commission Water Resources Summary 14, 30 p.

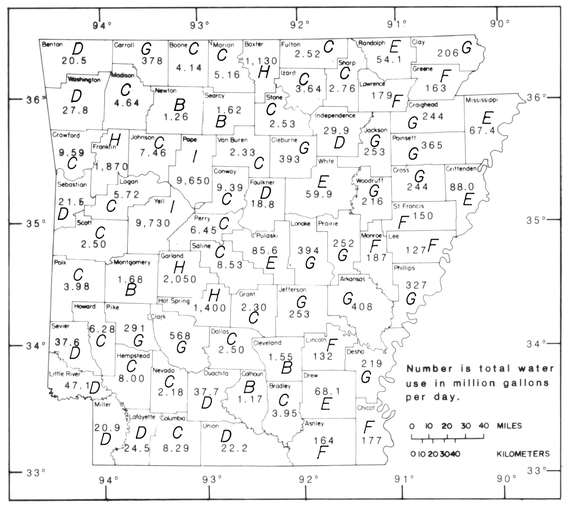


Figure 1.--Total water use in Arkansas, 1981.

## EXPLANATION

WATER USE IN MILLION GALLONS PER DAY (MGAL/D)
(For maps only)

| | | | |
|---|---|---|---|
| A | 0-1 | F | 100-200 |
| B | 1-2 | G | 200-1000 |
| C | 2-10 | H | 1000-5000 |
| D | 10-50 | I | MORE THAN 5000 |
| E | 50-100 | | |

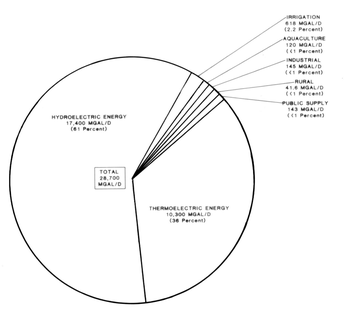


Figure 2.--Surface-water use in million gallons per day and percent of total surface-water use.

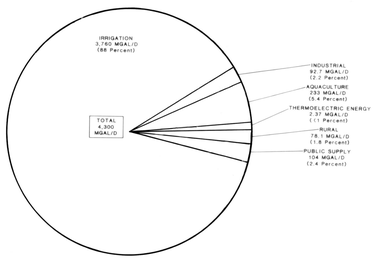


Figure 3.--Ground-water use in million gallons per day and percent of total ground-water use.

(Due to rounding, sum of categories of water use will not equal total water use.)

Figure 4.--Public supply.

Figure 5.--Rural (self-supplied).

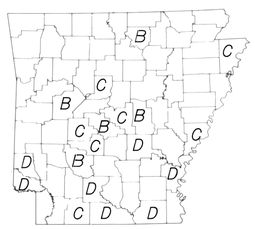

Figure 6.--Industrial (self-supplied).

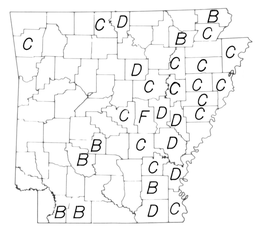

Figure 7.--Aquaculture.

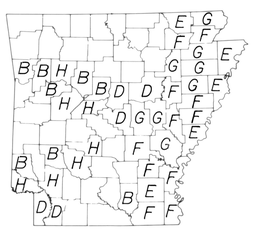

Figure 8.--Irrigation.

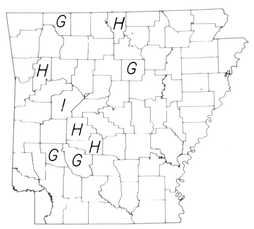

Figure 9.--Hydroelectric power.

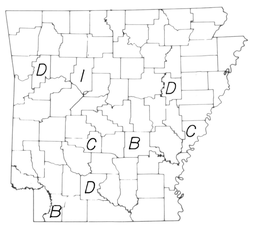

Figure 10.--Thermoelectric power.

# WATER USE IN ARKANSAS, 1981

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1984