

Freshwater Use in Mississippi 1985

by J. A. Callahan and Nancy L. Barber

INTRODUCTION

The Mississippi Water-Use Program is designed to quantify and document many facets of water use in the State. The Program began in 1972 as a cooperative program between the Mississippi Board of Water Commissioners and the Mississippi District of the U.S. Geological Survey. The Program has continued with the Board's successor, the Mississippi Department of Environmental Quality, Bureau of Land and Water Resources, and now includes the following categories of water use: public supply, domestic, commercial, agriculture, irrigation, industrial, mining, thermoelectric power generation, and sewage treatment.

Information on water use is collected from many sources. Data on the quantity of water withdrawn are routinely reported by many of the larger public-supply systems and self-supplied industrial users. For other public supply and industrial withdrawals, water-use data are collected by telephone surveys. Other data are estimated from files and publications of agencies such as the U.S. Department of Agriculture Soil Conservation Service and Statistical Reporting Service, the Mississippi State Department of Health, the Mississippi Department of Agriculture and Commerce, and the Mississippi Cooperative Extension Service. Water-use estimates for aquaculture and irrigation are calculated based on reported acreages, using water application rates determined by field investigations by the U.S. Geological Survey and the Soil Conservation Service. The water-use data, with associated data items such as Bureau of the Census population data and U.S. Department of Energy power generation data, are stored in the U.S. Geological Survey National Water-Data Storage and Retrieval System (WATSTORE).

This report is one of a continuing series that presents an overview of water use in Mississippi (Callahan, 1976, 1983). The series was begun in 1975 and was designed to coincide with the national estimates of water use that have been completed by the U.S. Geological Survey every 5 years since 1950 (MacKichan, 1951, 1957; MacKichan and Kammerer, 1961; Murray, 1968; Murray and Reeves, 1972, 1977; and Solley and others, 1983, 1988). For this report, the user categories are presented differently than in the 1985 national report. Because little water is used for mining in Mississippi, the user categories of industrial and mining have been combined. Most of the water used by domestic and commercial users is from public suppliers, therefore these categories are not discussed separately. Because agricultural water use (excluding irrigation) in Mississippi is dominated by aquaculture, primarily catfish farming, the remainder of agricultural water use (livestock water) is not discussed in this report. The Water-Use Program estimates sewage-treatment discharges, not withdrawals; these also are not discussed in this report.

Water-use data were rounded independently to three significant digits; because of this rounding, numbers may not add to the totals given. Percentages were calculated from unrounded data, and are given as integers.

Selected References

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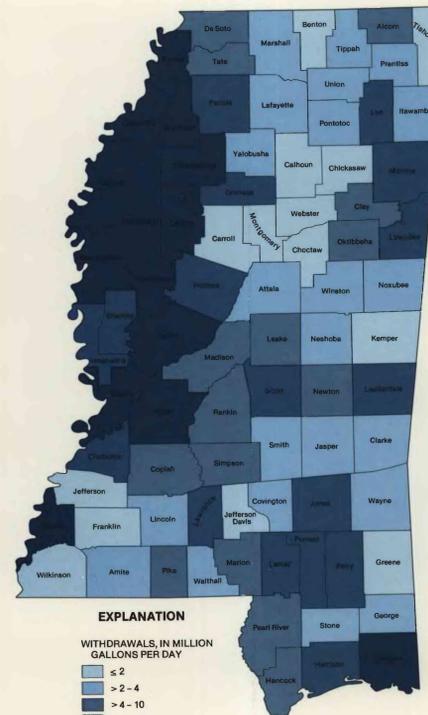
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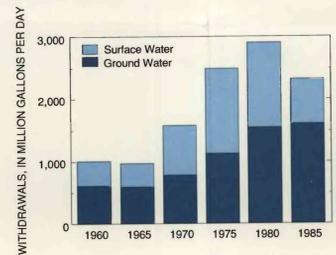
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EXPLANATION
WITHDRAWALS, IN MILLION GALLONS PER DAY

≤ 2
> 2 - 4
> 4 - 10
> 10 - 40
> 40 - 400



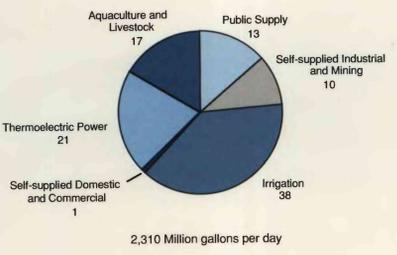
Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for all categories.

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TOTAL WATER USE

- In 1985, an average of 2,310 Mgal/d (million gallons per day) of freshwater was withdrawn from rivers, streams, and aquifers in Mississippi. This is about 885 gal/d (gallons per day) of freshwater per person.
- About 661 Mgal/d of freshwater was consumed and 1,490 Mgal/d was returned to surface sources for further use: consumptive use was about 253 gal/d per person. About 10 percent of water withdrawn for irrigation (92 Mgal/d) is lost to seepage or evaporation before reaching the fields. An average of 20 percent of public-supply withdrawals (71 Mgal/d) is lost in the distribution system or is used for municipal services such as fire-fighting and recreation.
- Irrigation was the largest water use in the State (38 percent), almost twice the amount of the next largest use, thermoelectric power generation (21 percent).
- The estimated 1985 water use in Mississippi was about 21 percent less than the estimated use in 1980. Surface-water use declined 47 percent (primarily because of a decrease in thermoelectric power generation). Ground-water use increased 2 percent.



Total water withdrawals in Mississippi by category of use, 1985. (Figures in diagram are in percent.)

PUBLIC SUPPLY

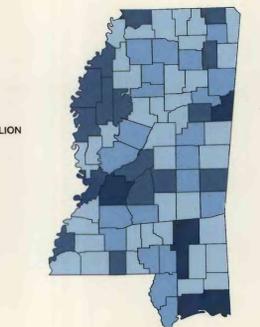
Public supply refers to public and private systems that deliver water for domestic and commercial users, some industries, and fire-fighting. A growing number of rural water associations are extending services to smaller towns and to unincorporated areas, contributing to the increase in water withdrawn for public supply.

Almost 14 percent of Mississippi's population supply their own water for domestic use, usually from small-diameter wells. Because the total withdrawal by these users is small (16 Mgal/d) and occurs across much of the State, it has been omitted from this report.

- Mississippi has about 1,400 public water-supply systems that withdrew 312 Mgal/d in 1985.
- Of the water withdrawn for public supply, 88 percent was from ground-water sources.
- Jackson (Hinds County), Columbus (Lowndes County), and Meridian (Lauderdale County) use both surface and ground water as sources for water supply. All other public suppliers in the State pump from ground-water sources, exclusively.
- Rural water associations are making a reliable water supply available in almost all parts of the State.
- Water withdrawals for public supply have increased 171 percent since 1960, while population has increased 20 percent. Public-supply systems delivered water to 86 percent of the population during 1985, compared to 47 percent during 1960. In addition, the average per capita use has increased from 113 gal/d to 138 gal/d.

EXPLANATION
WITHDRAWALS, IN MILLION GALLONS PER DAY

≤ 2
> 2 - 4
> 4 - 10
> 10 - 40
> 40 - 400



Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for public supply.

IRRIGATION

Irrigation is used to raise crops and to maintain recreational lands, such as parks and golf courses. For most crops, irrigation is used to supplement rainfall. For rice, fields must be flooded periodically for weed control.

- Irrigation is the largest use of water in Mississippi, averaging 886 Mgal/d in 1985. Approximately 98 percent of this irrigation occurs in the Mississippi River valley alluvial plain in the northwestern part of the State (the Delta).
- About 725 Mgal/d of ground water was used for irrigation.
- Water used for growing rice accounted for 80 percent of the irrigation use. A total of 190,000 acres were planted in rice in 1985. Almost all rice irrigation is in the Delta.
- After the removal of restrictions on rice acreage in 1975 and 1976, rice acreage and the water used for irrigation increased dramatically. Water use for rice irrigation decreased 17 percent between 1980 and 1985 as the acreage planted in rice decreased.



Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for irrigation.

AQUACULTURE

Aquaculture is the farming of aquatic animals, such as fish and shellfish. The major form of aquaculture in Mississippi is catfish farming. Catfish are grown commercially in ponds that are typically 4 to 6 feet deep and 10 to 20 acres in area. Water is pumped into catfish ponds intermittently to replace evaporation and seepage losses, to oxygenate the water in the ponds, and to dilute waste materials. Ground water is preferred because of its relatively uniform temperature and purity.

- In 1985, about 8,760 acres of new catfish ponds were built, making a total of 73,600 acres of ponds on 397 catfish farms in the State. About 96 percent of the commercial ponds are in the Delta.
- An average of 342 Mgal/d was withdrawn for aquaculture. Ground water is the only source of water used for catfish farming in the Delta.
- Mississippi has more than 60 percent of the Nation's catfish-pond acreage. Humphreys County leads the State in catfish production.
- An average of 5 feet per acre of water was applied to catfish ponds during 1985.
- Increased use of mechanical aerators for oxygenating the water in catfish ponds is reducing the demand for ground water.



Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for aquaculture.

SELF-SUPPLIED INDUSTRIAL AND MINING

Freshwater withdrawals for industrial and mining use were 231 Mgal/d, 58 percent from ground water. An additional 28 Mgal/d was delivered to industries by public-supply systems.

- Production of pulp, paper, agricultural chemicals and fertilizers, and petroleum refining are the major water-using industries in Mississippi.
- Mining withdrawals were 3.7 Mgal/d, mostly for the production of clay, agricultural lime, sand, and gravel.
- Water withdrawals for industrial and mining use fluctuate with economic conditions, reflecting the number of industries in the State and production levels in the major water-using industries. Withdrawals in 1985 were about 89 percent of the 1980 withdrawals.

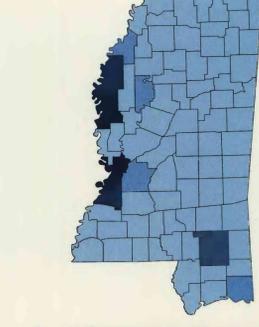


Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for industrial and mining use.

THERMOELECTRIC POWER GENERATION

Freshwater withdrawals for thermoelectric power generation were 479 Mgal/d in 1985, about 89 percent from surface water. In addition, withdrawals of saline surface water averaged 191 Mgal/d.

- The 12 fossil fuel (coal, oil, or gas) powerplants and one nuclear powerplant in Mississippi produced a total of 30,200 gigawatt hours of electricity in 1985.
- Generating plants are commonly located near major streams and water is used for cooling on a one-time-through basis. Most of the large plants use surface water for cooling and ground water for boiler make-up water and for sanitary facilities.
- Water withdrawals for thermoelectric power generation decreased 58 percent from 1960 to 1985, as Mississippi utilities purchased more electricity from facilities in neighboring States.



Total water withdrawals for 1985 by county and surface- and ground-water withdrawals 1960-85, for thermoelectric power generation.

SURFACE-WATER USE BY RIVER BASINS

Water-use data are commonly analyzed by hydrologic regions (such as river basins) as well as by county. The basins in this figure are hydrologic cataloging units and are referred to by 8-digit numbers. The pairs of digits define successively smaller units:

- 08 - Lower Mississippi region
- 0803 - Lower Mississippi-Yazoo subregion
- 080302 - Yazoo accounting unit
- 08030202 - Tallahatchie cataloging unit

Cataloging units for the United States average 700 square miles in area, and are listed in Seaber and others (1987).

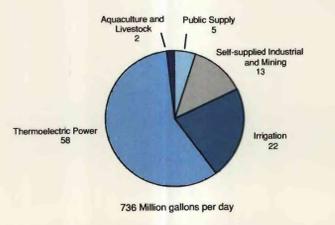


EXPLANATION
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Surface-water withdrawals by hydrologic unit, 1985.

- Surface-water withdrawals were 736 Mgal/d (about 32 percent of the total withdrawals from all sources) in 1985. Of this total, 430 Mgal/d was withdrawn for cooling in thermoelectric power generation.
- Surface-water withdrawals exceeded 100 Mgal/d in the Big Sunflower (08030207), Lower Yazoo (08030208), and Deer-Steele (08030209) basins. The primary water uses in these basins were irrigation and thermoelectric power generation.
- Withdrawals in the Tallahatchie (08030202), Coldwater (08030204), and Upper Yazoo (08030206) basins were primarily for irrigation.
- The City of Jackson withdrew 31 Mgal/d from the Middle Pearl-Strong basin (03180002).
- Withdrawals in the Middle Pearl-Silver (03180003), Lower Leaf (03170005), and Pascagoula (03170006) basins were primarily for the pulp and paper and petrochemical industries, and for thermoelectric power generation.

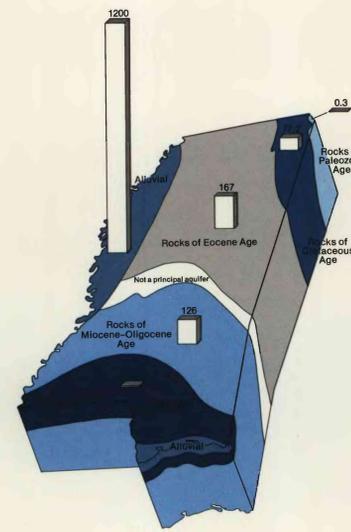


Surface-water withdrawals in Mississippi by category of use, 1985. (Figures in diagram are in percent.)

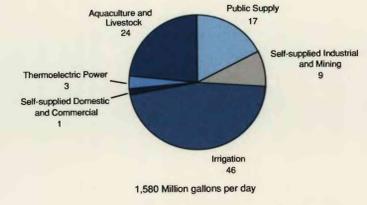
GROUND-WATER USE BY PRINCIPAL AQUIFERS

Ground-water use data can be further analyzed by examining withdrawals from the various aquifers (water-bearing geologic units). Freshwater aquifers in Mississippi range in geologic age from Paleozoic (oldest) to Holocene (youngest). One or more aquifers containing water acceptable for most uses underlie most of the State.

- Ground-water withdrawals accounted for about 68 percent of the total withdrawals from all sources in 1985. Of the 1,580 Mgal/d of ground water withdrawn, 725 Mgal/d was used for irrigation.
- The Mississippi River alluvial aquifer furnished more than 75 percent of the total ground water pumped. Most of the water from the alluvial aquifer was used for irrigation (61 percent) and for aquaculture (21 percent).
- Public-supply systems withdrew 275 Mgal/d (17 percent of total ground-water pumping) in 1985.



Ground-water withdrawals by principal aquifer, 1985. (Figures in diagram are in million gallons per day; aquifer outcrop areas modified from Boswell, 1985; water-use data from U.S. Geological Survey Water-Data Storage and Retrieval System (WATSTORE).)



Ground-water withdrawals in Mississippi by category of use, 1985. (Figures in diagram are in percent.)