

## REPORTED WATER USE IN OKLAHOMA, 1985

### INTRODUCTION

The quantity of water available for use within Oklahoma remains fairly constant from year-to-year. However, seasonal and geographical variations may affect short-term availability. The long-term trend in the use of water in Oklahoma has been increasing due to greater demands for irrigation, industrial and municipal supplies. Accurate analyses of water needs depend on the efficient collection and reporting of information on the water resources available and trends in water use. Information contained in this report is compiled from reports supplied by the holders of approximately 12,000 water rights/permits on file with the Oklahoma Water Resources Board (OWRB). It does not include domestic water use, which Oklahoma Statutes exempt from permitting requirements.

### NATIONAL WATER USE PROGRAM

The National Water Use Program is a program designed to collect, store and disseminate water-use data. These data complement those on the availability and quality of the nation's

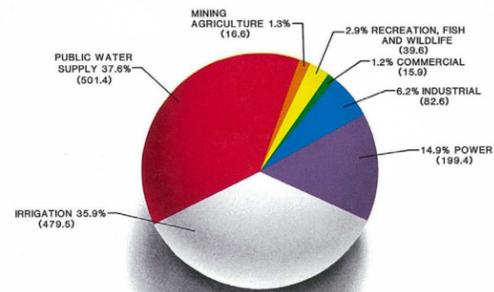


Figure 2. Distribution of Total Water Use in Percent and (Mgal/d)

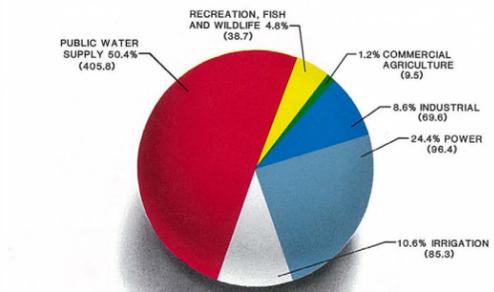


Figure 3. Distribution of Surface Water Use in Percent and (Mgal/d)

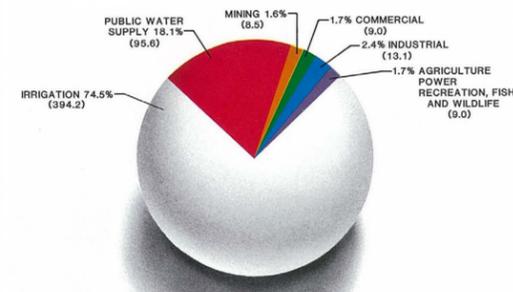


Figure 4. Distribution of Groundwater Use in Percent and (Mgal/d)

water resources available from a variety of sources including the U.S. Geological Survey (USGS), the U.S. Environmental Protection Agency and other federal and private sources.

Program sponsors at the USGS have long believed that adequate data are needed on water use so water resources planners and managers can resolve critical problems concerning water quality, environmental impact, energy development and resource allocations.

In 1977, the Congress of the United States recognized the need for uniform, current and reliable information on water use and directed the USGS to establish a National Water Use Program. Thus, it officially became a part of the Federal-State Cooperative Program. By early 1983, 47 states were participating in the program at various levels of involvement (Solley et al., 1983).

Since Oklahoma's participation in the program began in 1979, the development of the Oklahoma Water Use Data System (OWUDS) has been a nearly continuous process. Maintained on the University Computer Center's IBM 3081 computing system at Oklahoma State University, the data system is accessed and maintained using MODEL 204, a data base management system. Water use and related information is entered, edited and retrieved daily from OWUDS.

The National Water Use Information Program improved the accuracy of this report by providing funds to support data processing activities and more comprehensive data collection.

### DATA COLLECTION

This report presents the results of the OWRB's annual water-use survey completed in the Spring of 1986. This study is the sixth to present information collected since the OWRB became involved in the Survey's National Water Use Information Program and reflects more data than had been collected in reports published from 1966 to 1979. The water-use data—actually representing the quantity of water diverted or withdrawn for use—were obtained primarily from reports provided by water users on record with the OWRB in the following categories: Public Water Supply, Irrigation, Industrial Self-supplied, Thermoelectric Power Generation, Agriculture (non-irrigated), Mining, Commercial, and Recreation, Fish and Wildlife.

### REPORTED WATER USE

On the average, just over 1.3 billion gallons of fresh water per day were withdrawn for use in Oklahoma in 1985—a slight decrease from that withdrawn during 1984, according to annual reports filed with the Oklahoma Water Resources Board. Approximately 60 percent of reported withdrawals were from surface water sources.

The largest use of fresh water in Oklahoma during 1985 was for public water supply; however, response to the annual survey by state irrigators was low. The remaining use of fresh water amounted to 479 million gallons per day (Mgal/d) for irrigation; 83 Mgal/d for industrial use; 199 Mgal/d for power generation; and 72 Mgal/d were distributed among other uses including commercial, recreation, fish and wildlife, mining and agriculture (non-irrigated).

Water use by county is shown in Figure 1. The largest total use occurred in Texas County (171.2 Mgal/d) where high irrigation accounts for most water usage. Other counties with large total uses were those with large public water supply, thermoelectric power generation and industrial use. Extraordinarily large quantities of water are used for once-through cooling thermoelectric-generating stations, in comparison to the other identified categories of water use. Counties with the largest total water use (other than Texas) are Oklahoma (166.7 Mgal/d), Tulsa (123.3 Mgal/d) and Muskogee (121.5 Mgal/d).

The distribution of the total water use among the eight categories selected for this report is shown in Figure 2. The distribution for surface water use is shown in Figure 3 and that for groundwater use in Figure 4. Surface water sources accounted for about 60.3 percent of all water used.

### PUBLIC WATER SUPPLY

Water use for public supply is defined for the purpose of this study as the water used by cities, towns and rural water districts. Public suppliers in Oklahoma served 2.67 million residents in 1982 (Stoner, 1983).

Total use for public water supply during 1985 was approximately 500 Mgal/d. Of this quantity, 80.9 percent, or about 405 Mgal/d, was from surface water sources. Public water supply use by county is shown in Figure 5. Municipal water systems supplied approximately 88 percent of Oklahoma's population with potable water. The average daily per capita water use during 1985 for all municipal water users in Oklahoma was about 187 gallons.

Oklahoma County reported the greatest water use in the public water category with about 145.2 Mgal/d. Tulsa County was second with 102.9 Mgal/d. The largest municipal water user during 1985 was the City of Oklahoma City.

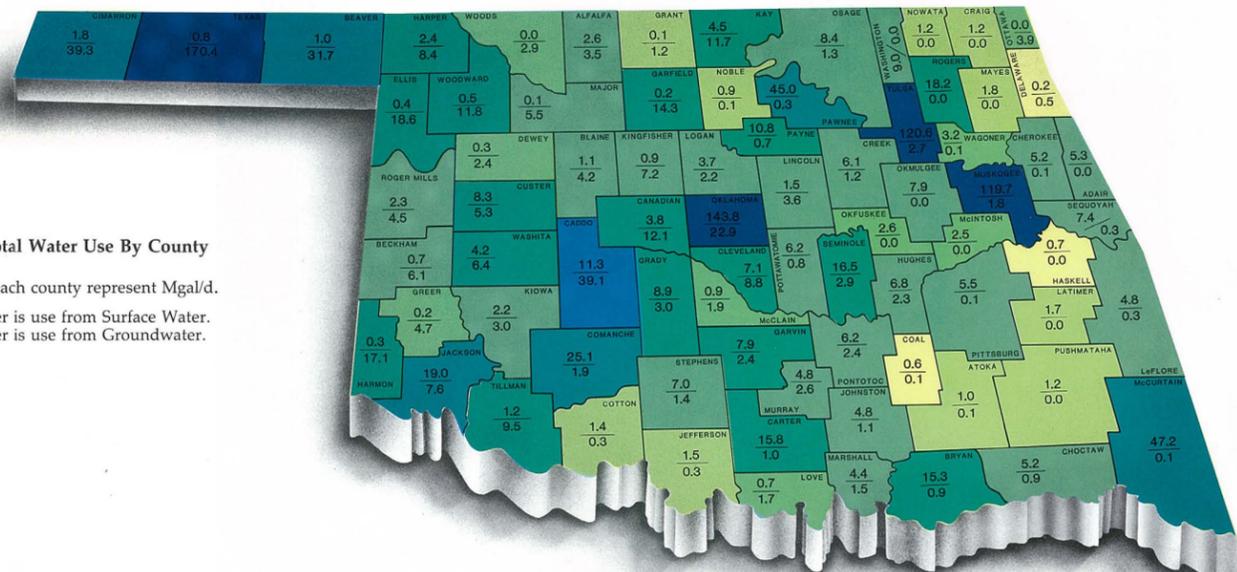


Figure 1. Total Water Use By County

Numbers in each county represent Mgal/d. Upper number is use from Surface Water. Lower number is use from Groundwater.

### SELF-SUPPLIED INDUSTRIAL AND THERMOELECTRIC POWER

Because of the magnitude of water required for the generation of thermoelectric power, these estimates of use are discussed here as part of the total self-supplied industrial use. More detailed figures are available from the Oklahoma Water Resources Board. Self-supplied industrial water systems are often metered, so estimates of water withdrawn and consumed generally are reliable.

Nationally, more water is withdrawn for self-supplied industrial use and thermoelectric power generation than for any other category (Solley, 1983). However, in Oklahoma, industrial water use ranks third behind irrigation and public water supply. Nearly all (94.2 percent) of the water withdrawn for industrial purposes comes from surface sources of supply.

As shown in Figure 6, Muskogee County (111.4 Mgal/d) ranks first in the state for self-supplied industrial withdrawals, primarily due to the location of two large generating stations there. McCurtain County (33.6 Mgal/d), home of the state's large paper and timber industries, ranks a distant second. Tulsa and Oklahoma Counties have many industries, but the bulk of industrial water used is purchased from Tulsa and Oklahoma City, so their water use is included under the public supply category.

Water reported used for industrial purposes is substantially less than that actually used, since surface water figures in the northeastern part of the state are not included. The Grand-Neosho River basin is excluded by statute from the jurisdiction of the OWRB. It is hoped data from this region of the state can be included in future reports. Largest water users in the Grand River Dam Authority area include the Mid-America Industrial District at Pryor and the GRDA coal-fired generating station near Chouteau.

### IRRIGATION

Since the early 1960's, irrigation has been the state's leading water use. Irrigated acreage in the state climbed steadily from the early sixties to just under a million acres in 1975. The number of acres under irrigation remained fairly steady from 1977 to 1981, then decreased by more than 197,000 acres from 1981 to 1985, according to biennial surveys compiled by the OSU Extension Service (Schwab, 1982-1983; Kizer, 1985).

Estimates of withdrawals for irrigation vary greatly. Oklahoma Water Resources Board estimates are based on annual water-use reports completed by irrigators and compiled by the Board. Reports ask the number of acres irrigated by crop, the number of applications, and an estimate of the number of inches applied at each watering.

Irrigation water use estimates for the state acreage covered by the OWRB are fairly accurate. However, OWRB irrigated acreage reported is significantly lower than the total acreage estimated by irrigation specialists at Oklahoma State University in 1981, 1983 (Schwab, 1982, 1983) and 1985 (Kizer, 1986). According to the OSU survey, total acreage irrigated in the state was 710,876, down by almost 22 percent from the 908,070 acres irrigated in 1981. However, even the lowest of these figures exceeds by more than 25 percent the 520,867 reported to the OWRB.

The discrepancy between the figures reported by the OWRB and OSU are attributable to several factors. Some irrigators do not have permits and some with permits fail to return their

### EXPLANATION FOR MAPS

Water use in Mgal/d

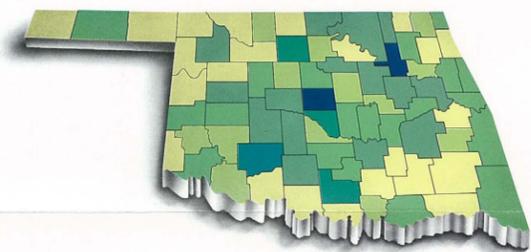
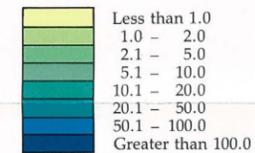


Figure 5. Water Use for Public Supply by County

annual water-use reports. There has been no attempt to account for double-cropping, which in some cases may be reported to OWRB as the same acreage irrigated.

Texas County led all counties in the state with irrigation water use, reporting 133,608 acres watered at a rate of 164.9 Mgal/d as shown in Figure 7. However, the acreage reported to OWRB is just over 75 percent of that reported in 1985 by OSU (Kizer, 1985). Texas County has more acreage under irrigation than that of the counties which rank second (Caddo), third (Jackson) and fourth (Cimarron) combined (or Cimarron, Caddo and Jackson, according to OSU).

### SELECTED REFERENCES

- Kizer, Michael A. 1985 *Irrigation Survey*. Oklahoma State University, Cooperative Extension Service, 1986. Stillwater.
- Oklahoma Employment Security Commission. *Oklahoma Population Reports, Special Studies: April 1, 1980 Census Enumerations*, 1981. Oklahoma City.
- Oklahoma Water Resources Board. *1982 Reported Water Use*, Publication 124, February 1985. Oklahoma City.
- Oklahoma Water Resources Board. *1983 Reported Water Use*, Publication 125, December 1985. Oklahoma City.
- Schwab, Delbert. 1981 *Irrigation Survey*, Oklahoma State University, Cooperative Extension Service, 1982. Stillwater.
- Schwab, Delbert. 1983 *Irrigation Survey*, Oklahoma State University, Cooperative Extension Service, 1984. Stillwater.
- Solley, Wayne B., Edith B. Chase and William B. Mann IV. *Estimated Water Use in the United States in 1980*: Geological Survey Circular 1001. Alexandria: Distribution Branch, 1983.
- Stoner, Jerry D. *Estimate of Self-Supplied Domestic Water Use in Oklahoma During 1980*: U.S. Geological Survey, Oklahoma District Water Resources Investigations Report 83-4223, 1983. Oklahoma City.

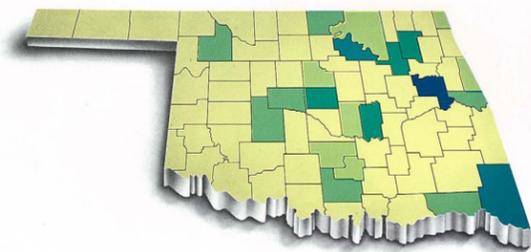


Figure 6. Water Use for Self-Supplied Industrial and Thermoelectric Power by County

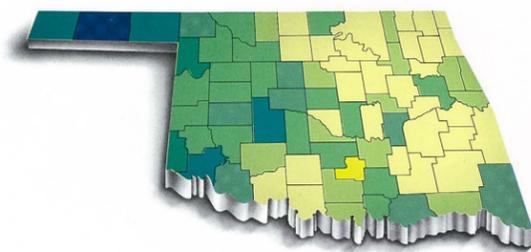


Figure 7. Water Use for Irrigation by County

This publication, printed by the University of Oklahoma Printing Services, Norman, Oklahoma, is issued and published by the Oklahoma Water Resources Board as authorized by Title 82 O.S. 1981, § 1085.2 and 1085.11. Two hundred fifty copies have been prepared at a cost of \$1,290.00.