

Prepared in cooperation with the
KANSAS WATER OFFICE

Public Water-Supply Use in Kansas, 1987–97

—Joan F. Kenny

Annual State reporting requirements yield data on public water-supply use in Kansas. Quality assurance of reported data is essential for responsible and effective use of the information by various State agencies. This fact sheet describes water-use data evaluation, illustrates variations in public-supply water use from 1987 through 1997, and documents improvements in water conservation efforts among Kansas public water suppliers. This fact sheet is part of an ongoing study conducted by the U.S. Geological Survey in cooperation with the Kansas Water Office and is supported in part by the Kansas State Water Plan Fund.

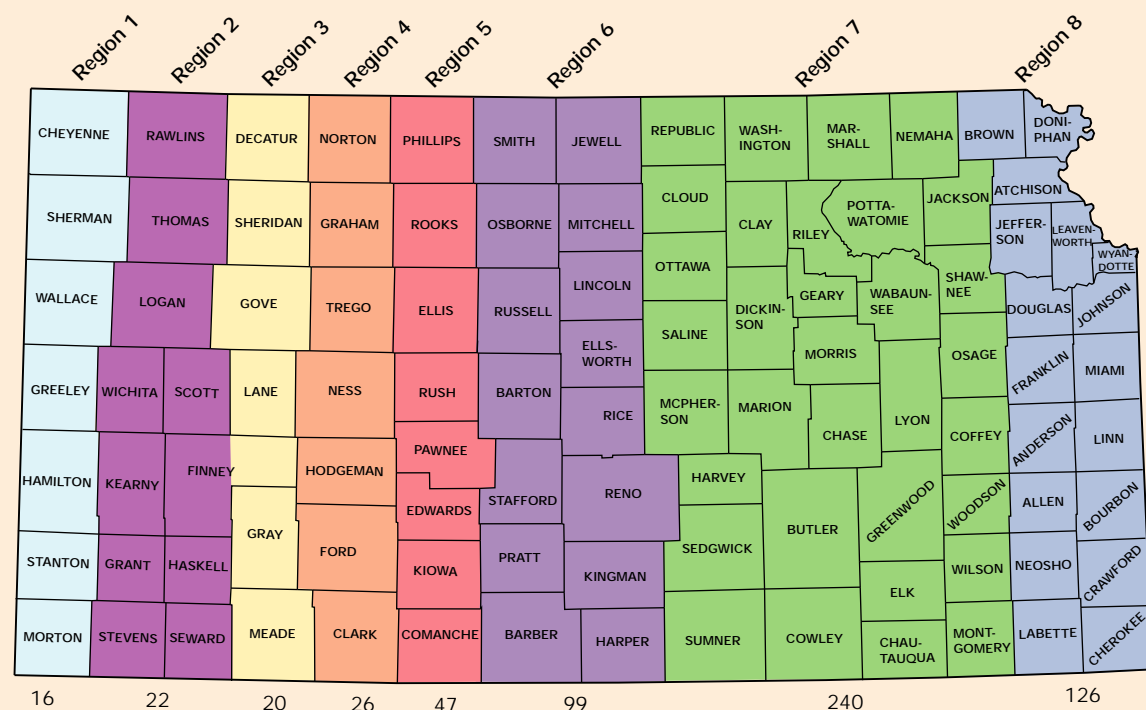
Introduction

Two State agencies collect annual water-use data in Kansas. The Kansas Department of Agriculture-Division of Water Resources (DWR) requires annual reporting as a condition of maintaining water rights for various uses, including public supply. The Kansas Water Office (KWO) requires annual reporting of all public water-supply use from State-owned storage in Federal reservoirs. The Kansas Water Office uses public water-supply data for population and water-demand projections as well as its Water Marketing, Water Assurance, Technical Assistance to Water Users, and Multipurpose

Small Lakes programs. Of the nearly 900 public water-supply systems in Kansas (including cities, rural water districts, mobile home parks, and subdivisions), about 625 have active water rights to withdraw water from surface or ground sources. These entities report their annual water use to DWR. About half of the 24 public water-supply systems with marketing contracts do not have any active water rights with DWR and report their annual water use to KWO. The U.S. Geological Survey (USGS), as part of its National Water-Use Information Program, works with State agencies to develop methods for acquiring the data, maintains data bases of water-use information, and publishes this information. Collection, evaluation, and publication of annual data on public

water-supply use in Kansas is accomplished through a cooperative program funded by the USGS and KWO.

Prior to 1987, water-use information reported to the State was limited due to the brevity of the report form and the low response rate. After the passage of State laws in 1986 establishing penalties for nonreporting, KWO and USGS began evaluating detailed water-use data submitted annually by public water suppliers. In addition to reporting total withdrawals by point of diversion for each year, public water suppliers provide monthly information on raw (untreated) water diverted, water purchased from and sold to other public water suppliers, retail sales for industrial, residential,



Number of public water suppliers (excluding mobile home parks) completing water-use reports in each region during 1997

Figure 1. Regions in Kansas used for analysis of water use by public water suppliers and number of public water suppliers (excluding mobile home parks) completing water-use reports in 1997.

and commercial uses, and metered free water. Also requested on the annual water-use report is information on population served, numbers of active service connections by type, and current water rates. Follow-up efforts consisting of telephone calls, letters, and site visits to individual public water suppliers ensure that the data on water use and population served are as complete and accurate as possible.

Information from the water-use reports is used to calculate usage in gallons per capita per day (gpcd) and the percentages of water that are metered free and unaccounted for. Per capita usage is a useful measure of comparative water use among public suppliers in various regions of Kansas (fig. 1). Percentages of unaccounted for and metered free water indicate individual system efficiencies and possible needs for technical assistance to reduce amounts of unsold water. Per capita water usage and unsold water percentages, along with information on current water rates charged by each supplier, are published annually in the "Kansas Municipal Water Use" report, prepared cooperatively by KWO, DWR, and USGS.

Per Capita Water Usage

Per capita water usage by Kansas public water suppliers is calculated using retail residential and commercial sales, metered free water, and unaccounted for water, along with figures for population served. Industrial, livestock, and bulk use are excluded from per-capita-usage calculations, as are sales to other public water suppliers. Many rural water districts were not included in annual publications until 1990 when more information on amounts of water used for livestock was requested on water-use reports.

Per capita water usage is affected by perceived need for outdoor watering and retail cost of water. Average gpcd usage is highest in western Kansas and lowest in eastern Kansas because both average annual rainfall and cost of water generally increase across the

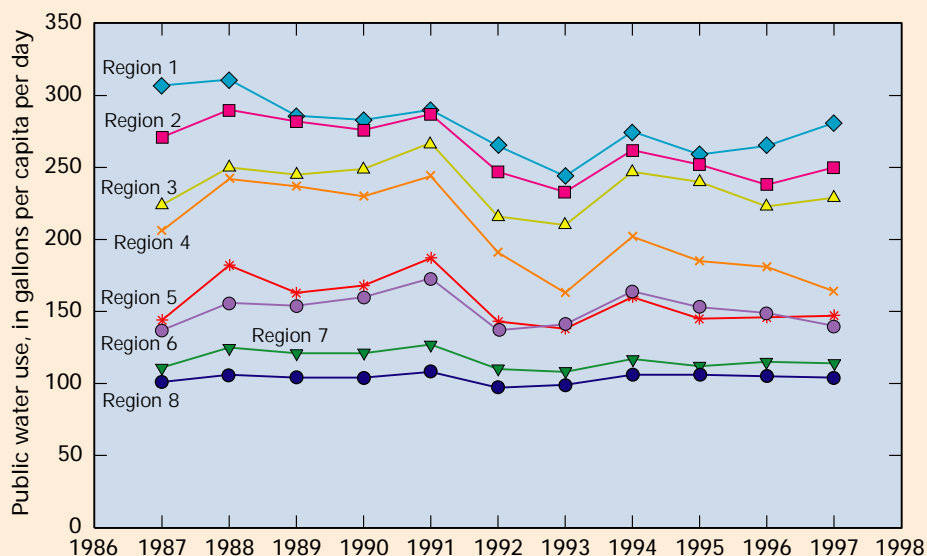


Figure 2. Average annual per capita public water usage by region for 1987–97. Regions shown in figure 1. Data from Kansas Department of Agriculture–Division of Water Resources and Kansas Water Office (Topeka, Kansas).

State from west to east. Public water suppliers are grouped by eight regions in Kansas (fig. 1) so that usage for individual suppliers may be compared to average usage for similar areas. Regions 1–5 in western Kansas are relatively narrow in width because per capita usage increases greatly from central Kansas to the western border. Regions 6–8 in central and eastern Kansas are wider because there is less variation in usage. There are fewer public water suppliers in western Kansas than in the more populated central and eastern parts of the State. Numbers of public water suppliers

(excluding mobile home parks) that completed water-use reports for 1997 are indicated for each region in figure 1.

Average annual per capita usage by region for 1987–97 is shown in figure 2. The highest usage occurred in 1988 in regions 1 and 2 and in 1991 for regions 3 through 8. These 2 years were exceptionally hot and dry. The lowest per capita usage in most regions occurred in 1993 when statewide average June–September precipitation was 9 inches above the 1961–90 normal rainfall for these months (fig. 3).

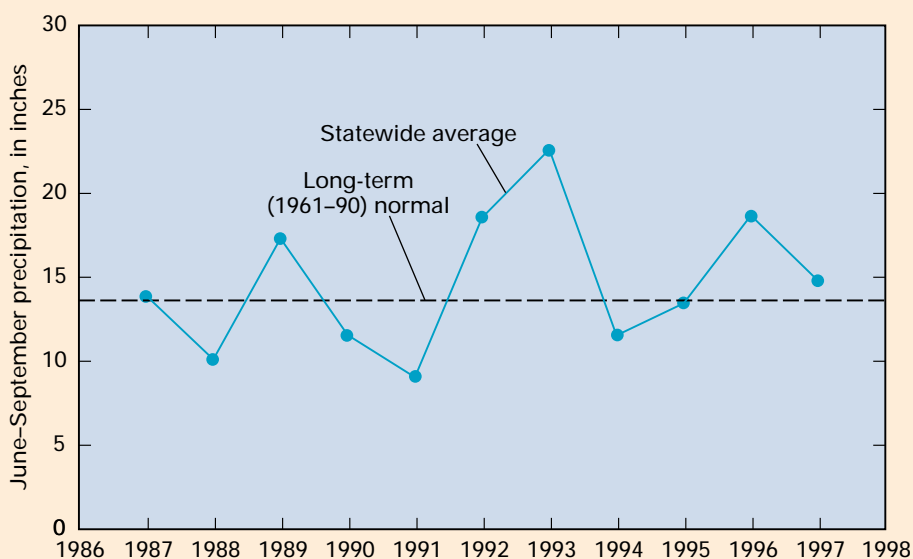


Figure 3. Statewide average June–September precipitation, 1987–97, and long-term (1961–90) normal June–September precipitation. Data from National Oceanic and Atmospheric Administration (1987–97).

Average annual water usage in regions 7 and 8 fluctuated very little during 1987–97. Large differences among average annual per capita usages are more common in the western Kansas regions, especially region 4. This region includes several cities that do not meter customer water use, which contributes to higher per capita usage values than if customers are charged for amounts of water used.

Average annual water usage for Kansas was 147 gpcd from 1987–92 and 136 gpcd from 1993–97. This overall reduction in average per capita usage is attributed primarily to weather conditions but also reflects individual public water suppliers' efforts to reduce usage through conservation measures. These measures include reduction in unaccounted for water, as well as reduction in customer use through higher water rates or by metering customer use in systems that previously had flat rates.

Unaccounted for Water

Unaccounted for water is the difference between the total amount of water produced and the sum of all metered uses, including customer sales and free water such as that used for metered public services and water-treatment processes. Using data from State water-use reports, unaccounted for water is expressed as a percentage of the total amount of water withdrawn from a source or purchased from other suppliers. The percentage of unaccounted for water for public water systems filing water-use reports has ranged from less than 3 percent to more than 65 percent; the average in 1997 was 15 percent of the total. The most common reasons for large amounts of unaccounted for water are leaks, underregistering customer meters, failure to account for significant amounts of free water, bookkeeping errors, and overregistering master meters. Verification of percentages of unaccounted for water documented on annual water-use reports is important for several reasons. Public water-supply systems with large quantities of unaccounted for water lose revenue by

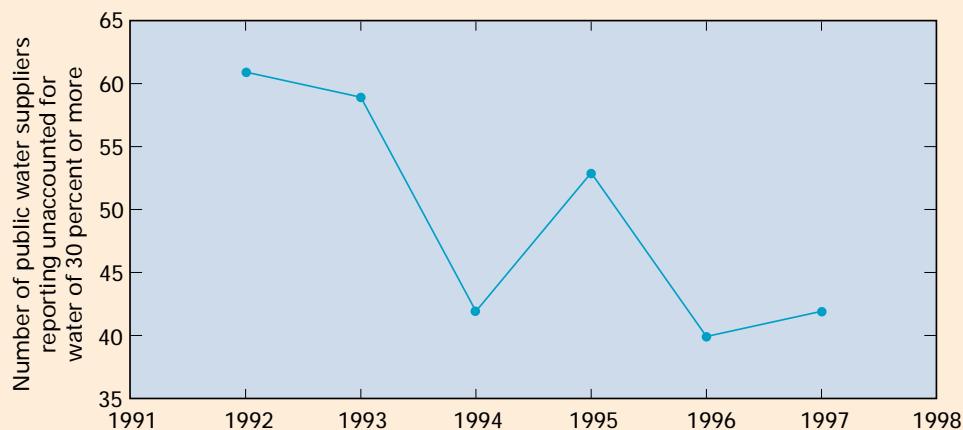


Figure 4. Number of public-water suppliers reporting unaccounted for water of 30 percent or more, Kansas, 1992–97. Data from Kansas Water Office (Topeka, Kansas).

producing or purchasing water that is not sold. Accurate information about unaccounted for water helps a supplier identify problems that need to be addressed. In some cases, curbing large water losses may serve to postpone expansion of water-supply sources.

Percentages of unsold water were first determined from annual water-use reports in 1989; beginning in 1992 the total amount of unsold water was identified further as either metered free or unaccounted for water. The number of public water suppliers in Kansas with unaccounted for water of 30 percent or more varies each year but overall has decreased from 61 in 1992 to 42 in 1997 (fig. 4). This improved efficiency can be attributed to increased awareness of water loss by public water suppliers, who have decreased their percentages of unaccounted for water by metering free uses, implementing service-meter changeout programs, monitoring accuracy of master meters, and repairing leaks.

Information on unaccounted for water is useful to the KWO in administering the Technical Assistance to Water Users program. As part of this program, the KWO helps public water suppliers develop conservation plans that focus on improved efficiency through reduction in unaccounted for water and per capita usage. Through the Technical Assistance to Water Users program, the KWO also refers public water suppliers with high percentages

of unaccounted for water to the Kansas Rural Water Association for free technical assistance that includes meter testing, leak detection, and identification of unmetered uses.

Water Rates

The cost of water to customers of public supply systems is a powerful tool in encouraging water conservation. Water-rate structures used in Kansas include flat rates, increasing block rates, decreasing block rates, and uniform block rates. Public water-supply systems with flat rates do not meter customer usage; each customer is charged a fixed amount per month regardless of how much water is used. Approximately 15 systems in Kansas charge flat rates and tend to use more water per capita than systems that meter customer use. These systems, along with mobile home parks and small housing developments that do not charge separately for water, cannot determine a percentage of unaccounted for water.

Many public water systems in Kansas use increasing block rates, in which the unit cost of water increases as usage increases. Increasing block rates are considered an effective way to encourage conservation among high-volume users while keeping the cost of moderate use affordable. Other public water suppliers in Kansas use decreasing block rates, in which the unit cost of water decreases as usage increases. Decreasing block rates are

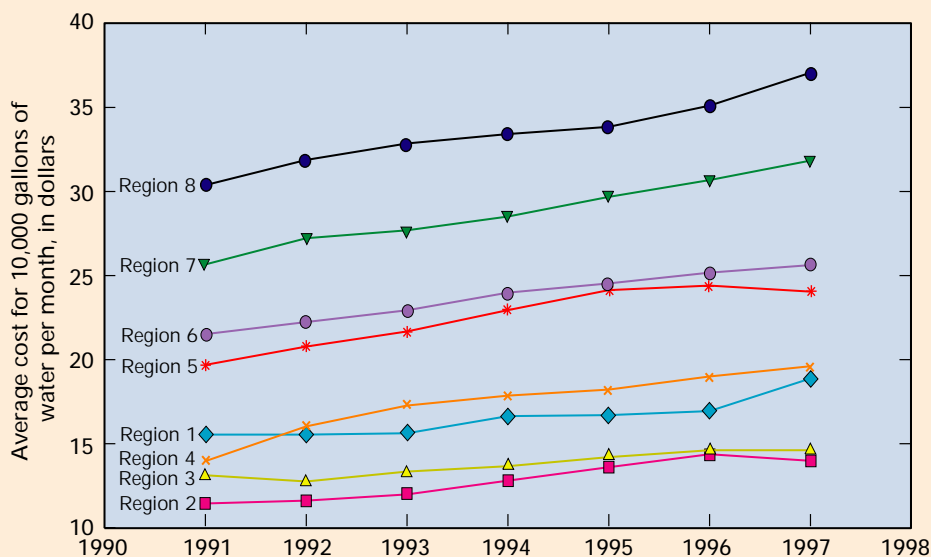


Figure 5. Average cost for 10,000 gallons of water per month by region in Kansas, 1991–97. Regions shown in figure 1. Data from Kansas Water Office (Topeka, Kansas).

assumed to discourage conservation because customers are charged lower rates for high-volume usage. The majority of public water-supply systems in Kansas have implemented uniform block rates in which the unit cost of water is the same for all levels of usage.

Annual water-usage analysis has shown that the highest per capita usage occurs among suppliers utilizing flat rates. For those systems that meter customer use, it is not the type of rate structure used but the total cost of water that most affects customer use. Customers are more likely to adopt water-conserving practices if their total cost is considered high.

Information on water rates has been collected in conjunction with annual water-use reports since 1991. Regional average costs for 10,000 gallons of water per month for 1991 through 1997 are shown in figure 5. Water rates have increased in every region during these years but are always less in western Kansas than in eastern Kansas. Ground water is the predominant source of supply in western Kansas and is less expensive to produce than surface water, which is the predominant source of supply in eastern Kansas. Average water rates are higher in eastern Kansas due to treatment costs associated with

surface-water supplies. Many suppliers in eastern Kansas purchase water from other systems or regional water-supply districts, which also tends to increase the cost.

Summary

The USGS State-Federal cooperative program to collect, evaluate, and publish data on public water-supply use has many benefits for State and Federal agencies as well as for individual public water-supply systems and consulting engineers. The Kansas Department of Agriculture-Division of Water Resources needs accurate water-use data to administer water rights in Kansas. The Kansas Water Office uses public water-supply data for population and water-demand projections as well as its Water Marketing, Water Assurance, and Multi-Purpose Small Lakes programs. Information on individual water-supply systems as well as on regional average rates of consumption and water loss is important for directing State-funded technical assistance to public water suppliers for leak detection, meter testing, and water conservation plan development. The success of State conservation goals can be determined through improvements in system efficiency as measured by reductions in per capita water usage and percentages of unaccounted for water. The USGS

maintains national and State data bases on water use, develops methods for acquiring the data, and publishes water-use information. Kansas public water suppliers can benefit from information on comparative water use, unaccounted for water, and water rates in operating their systems, implementing conservation measures, and planning for improvements.

References

- Kansas Water Office, 1999, The Kansas Water Plan—fiscal year 2001: Topeka, Kansas, 101 p.
- National Oceanic and Atmospheric Administration, 1987–97, Climatological data, Kansas (published monthly): Asheville, North Carolina, National Climatic Data Center, various pages.

Additional Reading on Water Use in Kansas

- Kansas Water Office, Kansas Department of Agriculture-Division of Water Resources, and U.S. Geological Survey, 1999, 1997 Kansas municipal water use: Topeka, Kansas, 80 p. (published annually since 1987).
- Kenny, 1999a, Water loss determination—for what it's worth: Seneca, Kansas, The Kansas Lifeline, July 1999, p. 68–70.
- , 1999b, Water use in Kansas, 1990 and 1995: U.S. Geological Survey Fact Sheet FS-090-99, 4 p.
- Solley, W.B., Pierce, R.R., and Perlman, H.A., 1998, Estimated use of water in the United States in 1995: U.S. Geological Survey Circular 1200, 71 p.

For more information contact:

District Chief
U.S. Geological Survey
4821 Quail Crest Place
Lawrence, Kansas 66049–3839
(785) 842–9909
email: waucott@usgs.gov