DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS
REPORT 86-4182

WATER USE IN THE UNITED STATES 1980

by Wayne B. Solley, Nancy L. Barber[1], and Charles F. Merk

INTRODUCTION

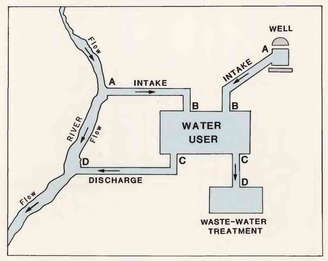
National estimates of water use have been compiled by the U.S. Geological Survey every 5 years since 1950 (MacKichan, 1951, 1957; MacKichan and Kammerer, 1961; Murray, 1968; Murray and Reeves, 1972, 1977; and Solley and others, 1983). The 1980 estimates and trends in water withdrawals from 1950 to 1980, which are documented in Solley and others (1983), are presented graphically here for total withdrawal estimates and withdrawals for the following categories of use:

- Public supply
- Rural
- Irrigation
- Self-supplied industrial
- Thermoelectric power
- Other industries

Data for instream uses, such as recreation, navigation, and hydroelectric power generation are not discussed. However, hydroelectric power generation, which used an estimated 3,300 billion gallons per day (bgd) in 1980, is documented by State and water-resources region in Solley and others (1983).

Withdrawal water use includes water withdrawn or diverted from a ground- or surface-water source for uses such as public supply, rural, irrigation, and industrial. "Withdrawal use" is equivalent to the term "offstream use" in some previous publications. To determine the amount of water used, three factors are involved as explained below and shown in the sketch.

1. Withdrawals--the amount of water withdrawn or diverted from a ground- or surface-water source ("A" in sketch).
2. Delivery/Release--the amount of water delivered at the point of use ("B") and the amount released after use ("C"). The difference between these amounts of flow will in some instances be the consumptive use, which is defined as the amount of water that is not returned directly to any water body.
3. Return flow--the amount of water that reaches a ground- or surface-water source ("D") after release from the point of use and thus becomes available for immediate reuse.



Withdrawal estimates as presented here are summarized as average daily quantities withdrawn. The average is derived from annual withdrawal estimates and is reported in billion gallons per day.

NATIONAL WATER-USE INFORMATION PROGRAM

In 1977, the Congress of the United States recognized the need for uniform, current, and reliable information on water use and directed the U.S. Geological Survey to establish a National Water-Use Information Program to complement the Survey's data on the availability and quality of the Nation's water resources. Thus, the National Water-Use Information Program became part of the U.S. Geological Survey's Federal-State Cooperative Program.

Many State and local agencies collect site-specific water-use data. These data, which are then compiled and aggregated according to major categories of use for all States and 222 water-resources subregions by the U.S. Geological Survey's District Offices in consultation with cooperators, are the basis for the illustrations in this report.

ACKNOWLEDGMENTS

This report was prepared by the Georgia District office under the direction of Robert R. Pierce. The graphics were generated by Jacqueline A. Nolting. The graphics were drafted by Willis G. Hester. The design and layout of the report were prepared by Joan M. Rubin.

REFERENCES CITED

MacKichan, K. A., 1951, Estimated use of water in the United States, 1950: U.S. Geological Survey Circular 115, 13 p.

_____ 1957, Estimated use of water in the United States, 1955: U.S. Geological Survey Circular 398, 18 p.

MacKichan, K. A., and Kammerer, J. C., 1961, Estimated use of water in the United States, 1960: U.S. Geological Survey Circular 456, 26 p.

Murray, C. R., 1968, Estimated use of water in the United States, 1965: U.S. Geological Survey Circular 556, 53 p.

Murray, C. R., and Reeves, E. B., 1972, Estimated use of water in the United States in 1970: U.S. Geological Survey Circular 676, 37 p.

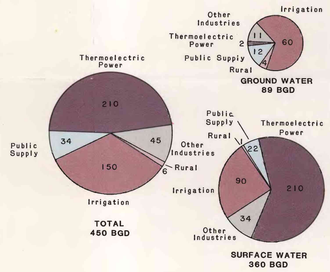
_____ 1977, Estimated use of water in the United States in 1975: U.S. Geological Survey Circular 765, 37 p.

Solley, W. B., Chase, E. B., and Mann W. B., IV, 1983, Estimated use of water in the United States in 1980: U.S. Geological Survey Circular 1001, 56 p.

[1]Georgia Geological Survey

TOTAL WATER USE, 1980

- Total withdrawals increased 8 percent from 1975 to 1980.
- Surface water accounted for 80 percent of the total.
- Thermoelectric power is the largest user of surface water.
- Irrigation is the dominant use of ground water.
- Ground water is the domestic supply for over 50 percent of the population.

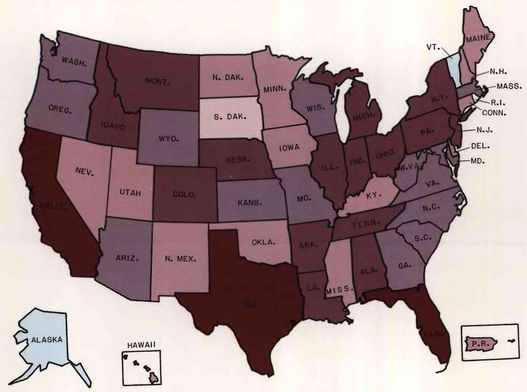


Water withdrawals by categories of use in the United States for 1980. (Figures in diagrams are in billion gallons per day.)

TOTAL WITHDRAWALS BY SOURCE

- Fresh surface-water withdrawals exceeded ground-water withdrawals in all but nine States.
- Fresh ground-water withdrawals exceeded surface-water withdrawals in Arizona, Kansas, Nebraska, Oklahoma, Delaware, Florida, Mississippi, Texas, and Hawaii.
- In the Northeast, surface-water withdrawals accounted for 94 percent of total withdrawals.
- In the Western States, ground-water withdrawals accounted for about one-third of total withdrawals.

Ground-water and surface-water withdrawals in billion gallons per day by geographic region, 1980.



Total water withdrawals for all withdrawal-use categories by State, 1980.

TOTAL WITHDRAWALS BY STATE

- California is by far the largest user of water, 54 bgd in 1980.
- Texas and Florida are the next largest users.
- Western States are dominated by irrigation use.
- Eastern States are dominated by public-supply and industrial use.

WITHDRAWALS AND DISPOSITION OF WATER

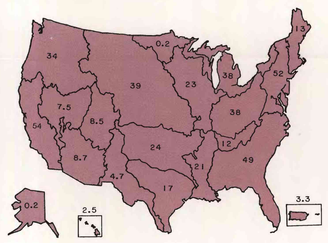
- Consumptive use is estimated to be 23 percent of withdrawals.
- Irrigation is the major consumptive-use category.
- About 80 percent of the Nation's consumptive use is in the West.
- Thermoelectric power returns about 98 percent of withdrawals.

Withdrawals and disposition of water in the United States, 1980. (Figures in diagram are in billion gallons per day and percent.)

TOTAL WITHDRAWALS BY WATER-RESOURCES REGION

When water-use statistics are aggregated by water-resources region (major natural drainage basins), rather than by State:

- California Region remains a major water-using region
- Mid-Atlantic Region becomes prominent
- None of the three regions which include parts of Texas, one of the top States in withdrawals, are among the top regions in withdrawals.



Total water withdrawals by water-resources regions,1980. (Figures in diagram are in billion gallons per day.)

WATER USE IN THE UNITED STATES, 1980

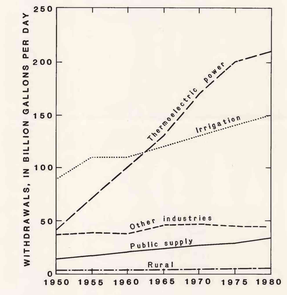
TRENDS IN WATER USE, 1950-80

- Water withdrawals for all categories have increased steadily.
- Rate of increase slackened from 1970 to 1975 and from 1975 to 1980.
- Thermoelectric power use shows the fastest rate of increase.
- Other industrial uses have remained relatively constant since 1965.
- Total withdrawals have increased faster than total population.

Estimated water use in billion gallons per day

	1950[1]	1955[1]	1960[2]	1965[2]	1970[3]	1975[4]	1980[4]
Population, in millions	150.7	164.0	179.3	193.8	205.9	216.4	229.6
Withdrawal use:							
Total withdrawals	[5]180	240	270	310	370	420	450
Public supply	14	17	21	24	27	29	34
Rural domestic and livestock	3.6	3.6	3.6	4.0	4.5	4.9	5.6
Irrigation	[6]89	110	110	120	130	140	150
Self-supplied industrial:							
Thermoelectric power use	40	72	100	130	170	200	210
Other industrial uses	37	39	38	46	47	45	45
Source of withdrawals:							
Ground water	34	48	50	60	69	83	89
Surface water	[5]150	200	220	250	300	330	360
Consumptive use	(7)	(7)	61	77	[8]87	[8]96	[8]100

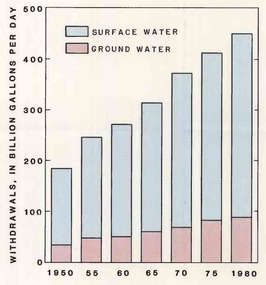
[1]48 States and District of Columbia.
[2]50 States and District of Columbia.
[3]50 States, District of Columbia, and Puerto Rico.
[4]50 States, District of Columbia, Puerto Rico, and Virgin Islands.
[5]Corrected from published report
[6]Data not available
[7]Freshwater only



Total water withdrawals for public supply, rural, irrigation, thermoelectric power, and other industries, 1950-80.

TRENDS BY SOURCE OF WATER

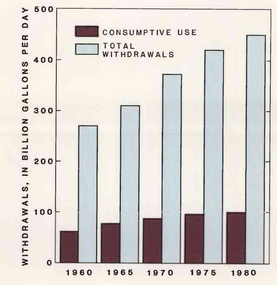
- Ground- and surface-water withdrawals increased each 5-year period.
- Ground-water withdrawals increased 22 percent between 1970 and 1975, compared with only a 5-percent increase in fresh surface-water withdrawals.
- Between 1975 and 1980, fresh surface-water withdrawals increased 10 percent, whereas fresh ground-water withdrawals showed a 7-percent increase.



Total water withdrawals from ground- and surface-water sources, 1950-80.

TRENDS IN CONSUMPTIVE WATER USE

- The rate of increase of consumptive use has slackened from 13 percent for 1965-70, to 10 percent for 1970-75, to 7 percent for 1975-80.
- Consumptive use as a percentage of total withdrawals has declined slightly for each 5-year period from 1965 to 1980.



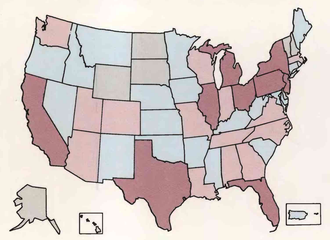
Comparison of total withdrawals and consumptive use, 1960-80.

WATER USE BY CATEGORY

PUBLIC SUPPLY

Public supply refers to water withdrawn by public and private water suppliers for delivery to a variety of users, such as domestic and commercial users, some industries, and public services such as firefighting. Water lost in the distribution system also is included in this category.

- Public suppliers served about 186 million people in 1980.
- Withdrawals were estimated at 34 bgd, with 21 percent of this consumed.
- Surface water accounted for nearly two-thirds of withdrawals.
- California, New York, and Texas, the three most populated States, withdrew the most water for public supply.
- California and Florida were the largest users of ground water.

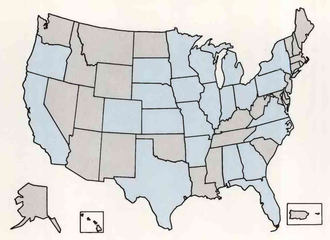


Total water withdrawals for public supply by State, 1980.

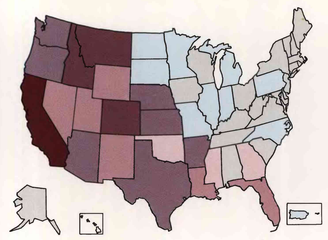
RURAL USE

Water for rural use includes self-supplied domestic use, drinking water for livestock, and other on-farm uses such as dairy sanitation, evaporation from stock watering ponds, and cleaning and waste disposal.

- About 44 million people were served by their own water supply.
- Total rural withdrawals were estimated at 5.6 bgd, a 14-percent increase from 1975, with 69 percent of this consumed.
- Rural domestic per capita use averaged 79 gallons per day.
- Ground water accounted for about 95 percent of rural domestic use.
- Surface water accounted for 45 percent of rural livestock use.
- Rural uses are fairly evenly distributed among the States.



Total water withdrawals for rural domestic and livestock use by State, 1980.



IRRIGATION

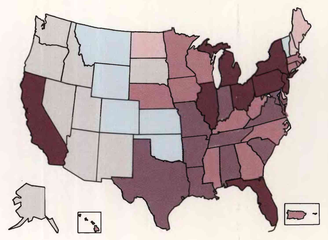
Irrigation is used to raise crops and to maintain recreational lands, such as parks and golf courses. In the arid West, irrigation generally is needed to raise any crops, whereas in the humid East, irrigation is used to supplement rainfall.

- Withdrawals were estimated at 150 bgd or 170 million acre-feet, a 7-percent increase from 1975.
- About 58 million acres of farmland were irrigated in 1980.
- Surface water was the source of 60 percent of irrigation water.
- Consumptive use was 83 bgd or 93 million acre-feet.
- Conveyance losses were about 24 bgd or 26 million acre-feet.
- California accounted for 25 percent of the Nation's withdrawals.
- Idaho and Colorado were the next largest irrigation users.
- California and Nebraska were the largest users of ground-water.

Total water withdrawals for irrigation by State, 1980.

THERMOELECTRIC POWER

- Thermoelectric power plants withdrew about 210 bgd or 83 percent of all industrial withdrawals, an increase of 9 percent from 1975.
- Surface water accounted for 98 percent of total thermoelectric power withdrawals, and included 65 bgd of saline water.
- Only about 2 percent of the water withdrawn was consumed.
- Thermoelectric power is the largest water-use category, withdrawing 1.4 times the amount of water withdrawn for irrigation.
- The major water users for thermoelectric power generation are located in the East--Florida is the largest user.
- California is the largest user of ground water for this category.



Total water withdrawals for thermoelectric power generation by State, 1980.

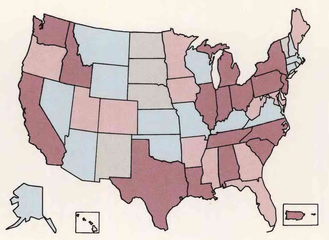
SELF-SUPPLIED INDUSTRIAL

The self-supplied industrial water-use category in this report includes water used for thermoelectric power generation and water used by all other industry types. Thermoelectric power plants can be powered by fossil fuel, geothermal, or nuclear energy.

OTHER INDUSTRIES

Other self-supplied water-using industries include, but are not limited to, steel, chemical products, paper, mining, and petroleum refining.

- Withdrawals were estimated at 45 bgd, about the same as in 1975.
- Surface water was the source for three-quarters of the withdrawals.
- Consumptive use varies widely among industry types, and was about 13 percent of freshwater withdrawals and 15 percent of saline water withdrawals.
- Pennsylvania, Louisiana, and Indiana withdrew the most water.
- Idaho was the largest user of ground water for this category.



Total water withdrawals for other self-supplied industrial use by State, 1980.

INTERIOR--GEOLOGICAL SURVEY, RESTON, VIRGINIA--1987