

WATER USE IN WISCONSIN, 1990

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INTRODUCTION

As part of the National Water-Use Information Program, the U.S. Geological Survey (USGS) stores water-use data in standardized format for different categories of water use. The data base (Site Specific Water Use Data System) is updated annually or as more current water-use information becomes available. Information about amounts of water withdrawn, sources of water, how the water was used, and how much water was returned is available to those involved in establishing water-resource policy and to those managing water resources.

In 1978, the USGS entered into a cooperative program with the Wisconsin Department of Natural Resources (WDNR) to inventory water use in Wisconsin. Since that time, two reports that summarize water use have been published (Lawrence and Ellefson, 1982; Ellefson and others, 1987). Ellefson and others (1987) present 1985 water-use data in a map and graph format. Because water use changes with time, an update report is periodically required. This report presents 1990 data in the same format as that of the 1987 report.

DATA COLLECTION

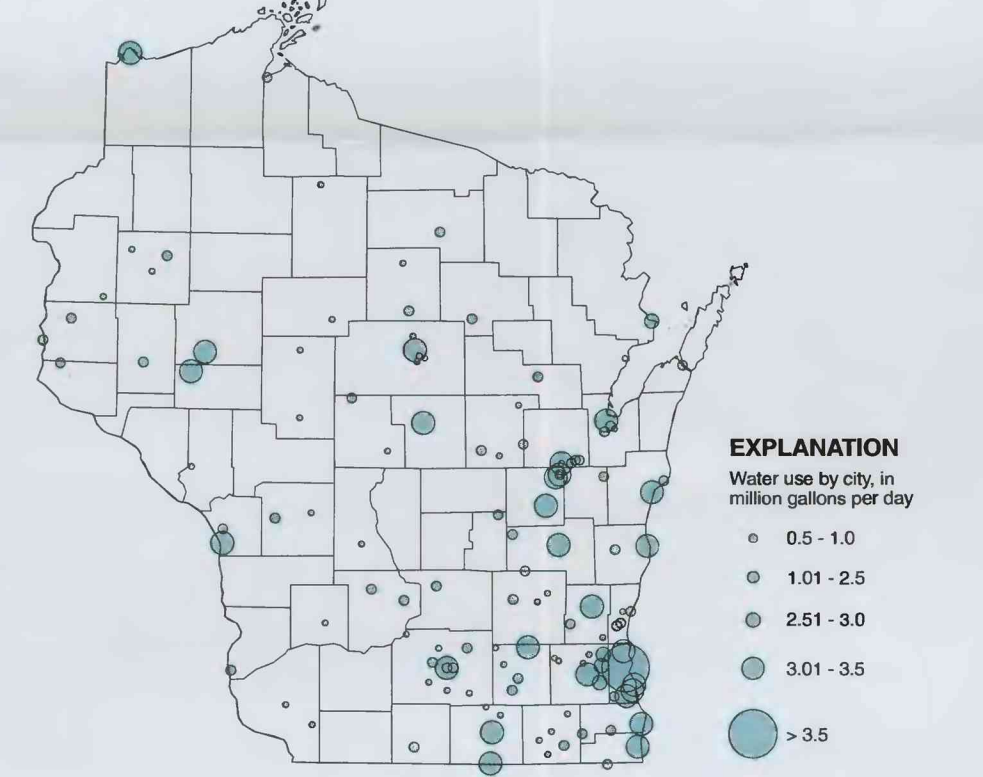
Water-use data in Wisconsin are generally reported by major users to State agencies as part of State permit requirements. The WDNR collects water-use data for public, industrial, irrigation, sewage treatment, and the amount of water used for power generation. The Wisconsin Public Service Commission collects information on how the public-supply water is used. Data in this report were obtained from these agencies. Estimates were made by the USGS based on population and average consumptive-use rates for water-use categories for which data were not reported.

Wisconsin has an abundant supply of water. Surface water is found in 33,000 mi (miles) of streams and 15,000 lakes (U.S. Geological Survey, 1985). About two quadrillion (2x10¹⁵) gallons, or about 1/3 the volume of Lake Superior, is stored in the State as ground water.

Communities located on the shores of the Great Lakes and Lake Winnebago generally use surface water for their water supply. Communities located inland use ground water. Three principal aquifers—the sand and gravel, Silurian dolomite, and sandstone aquifers—provide most of the ground water used in the State.



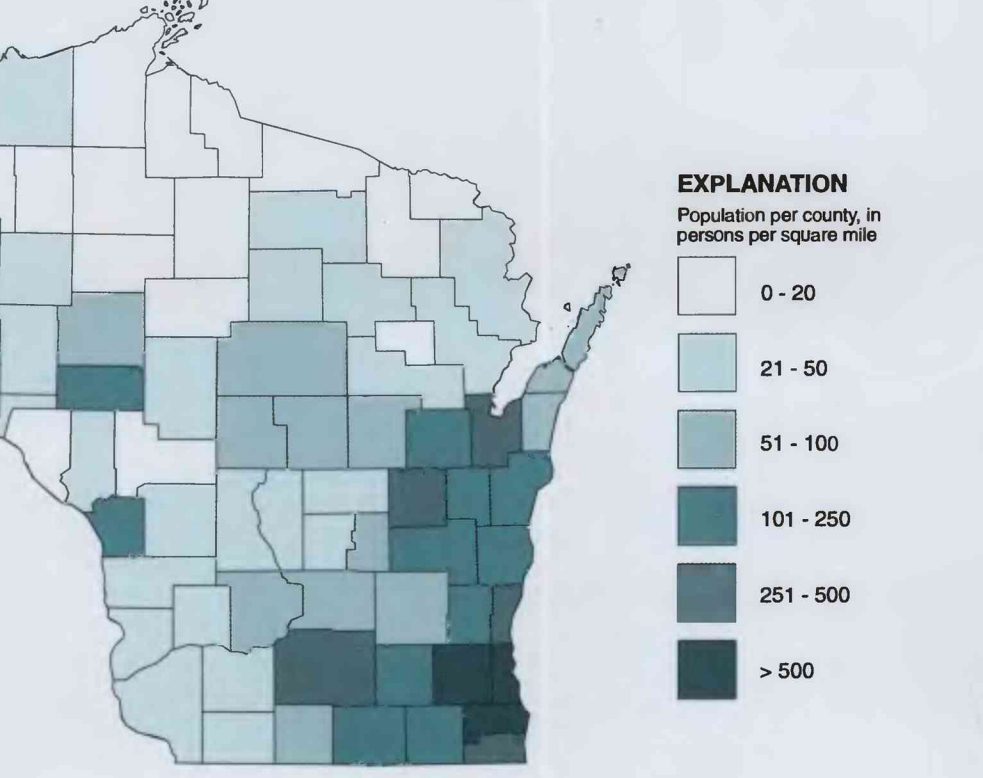
Areas of the State that use large amounts of water are coincident with population centers.



EXPLANATION

Water use by city, in million gallons per day

- 0.5 - 1.0
- 1.01 - 2.5
- 2.51 - 3.0
- 3.01 - 3.5
- > 3.5

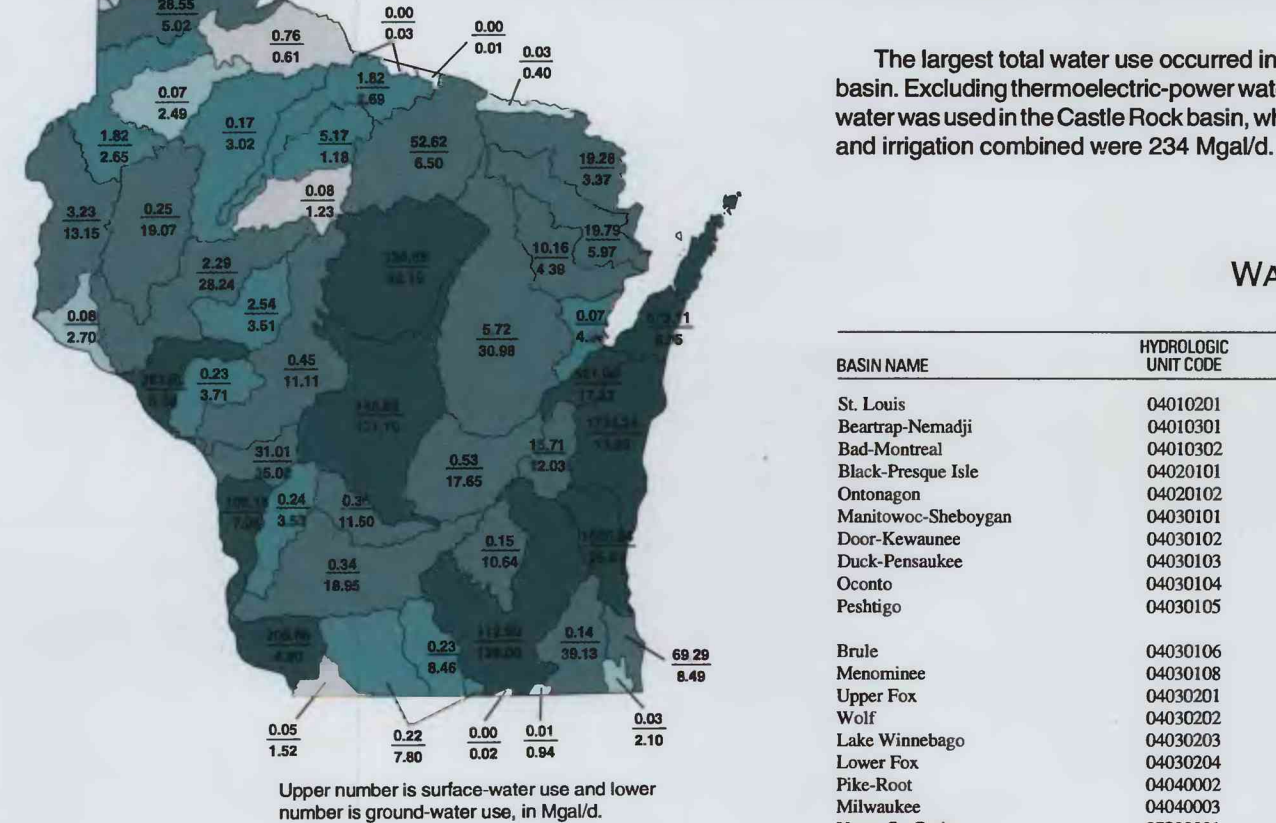


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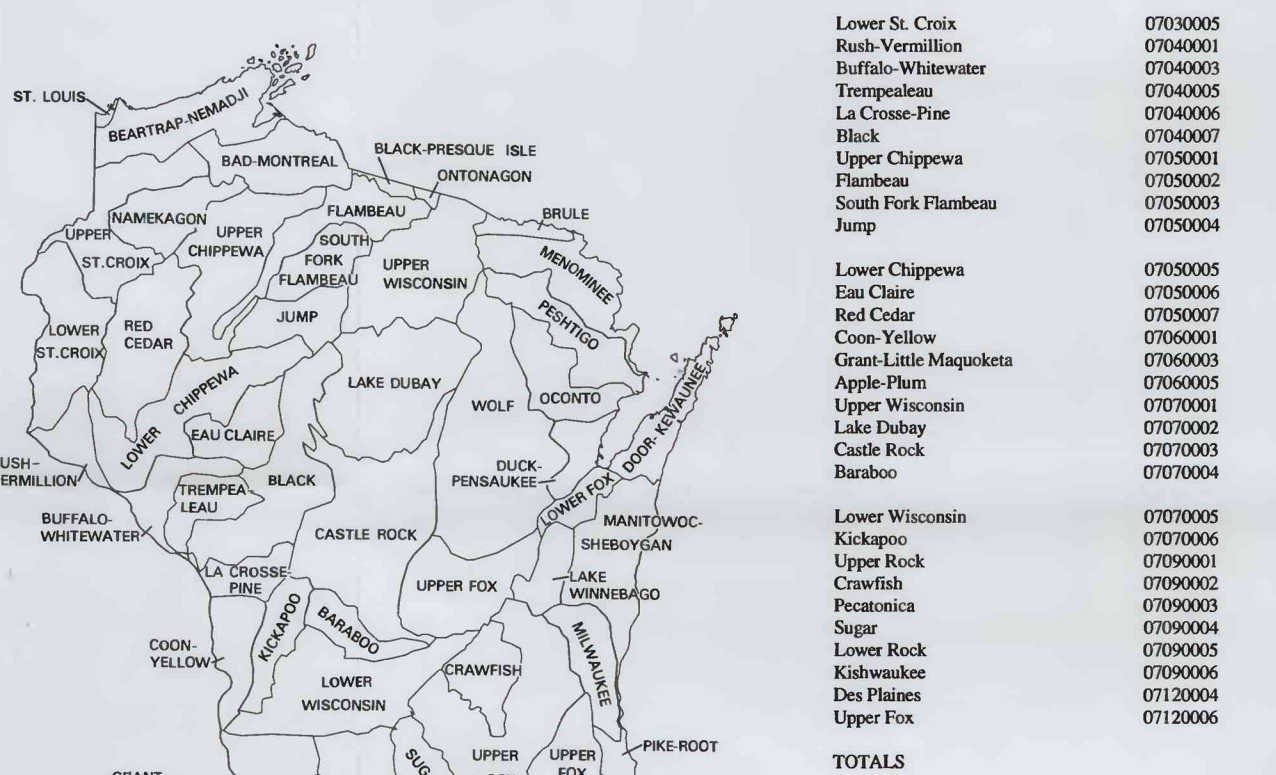
Population per square mile

- 0 - 20
- 21 - 50
- 51 - 100
- 101 - 250
- 251 - 500
- > 500

TOTAL WATER USE, BY BASIN



Upper number is surface-water use and lower number is ground-water use, in Mgal/d.



Water withdrawals from Wisconsin aquifers, 1990

AQUIFER	AGRICULTURE AND IRRIGATION	SELF-SUPPLIED DOMESTIC AND COMMERCIAL	SELF-SUPPLIED INDUSTRIAL	PUBLIC SUPPLY	TOTAL
Sand and gravel	139	51.9	16.4	112	319
Silurian Dolomite	8.80	16.9	6.71	15.1	47.5
Sandstone	72.3	79.0	37.8	166	265
Other	4.09	4.66	.02	1.41	10.2
TOTAL	224	152	60.9	205	732

PUBLIC SUPPLY

Public supply refers to water withdrawn by public or private suppliers and delivered to domestic, commercial, and industrial users who do not supply all of their own water.

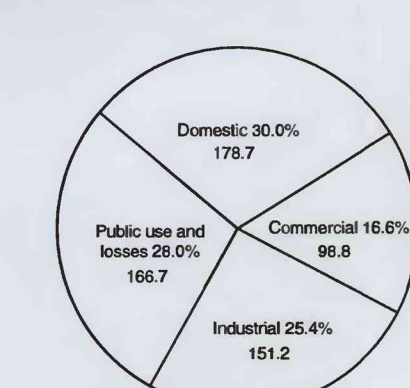
The "public use and losses" category is that use not specifically categorized, such as water use in some public parks, schools, and buildings, water used for fire control and water-main flushing, and water lost from broken water mains and from transfer and distribution systems.

Public supplies served about 3.41 million people or 70 percent of the State's population in 1990.

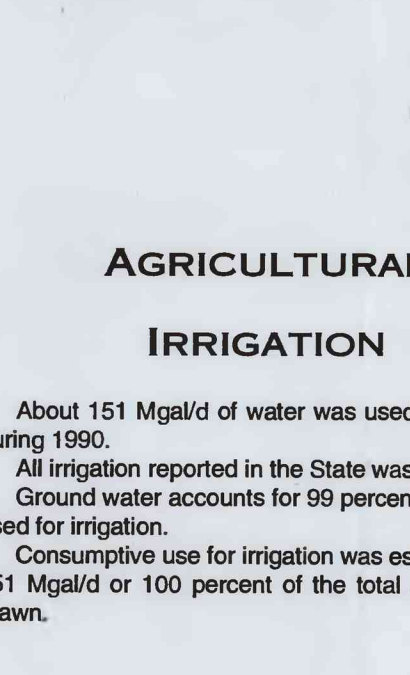
A total of 585 Mgal/d (million gallons per day) was withdrawn by Public Suppliers.

Milwaukee County is the State's largest user of public-supply surface water (182 Mgal/d).

Dane County is the State's largest user of public-supply ground water (46 Mgal/d).



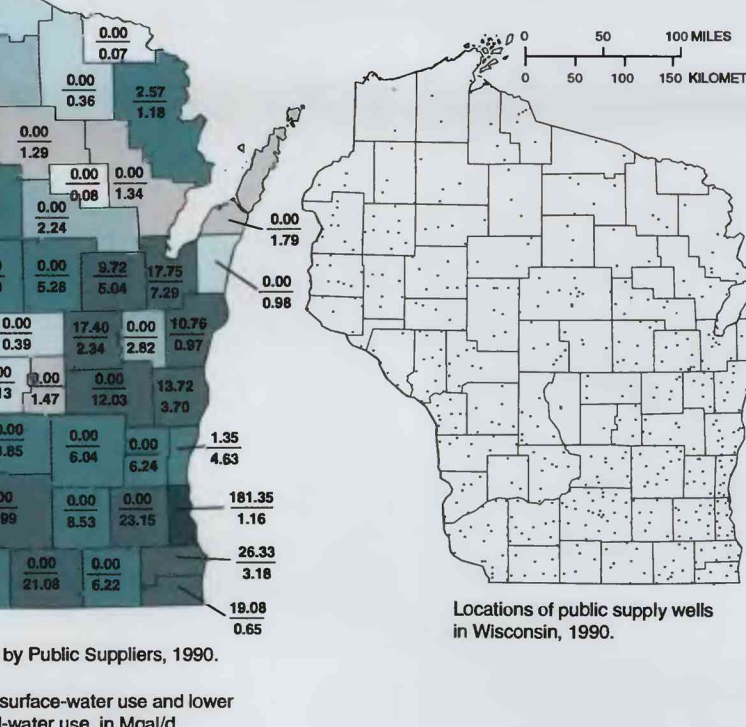
TOTAL WATER USE FROM PUBLIC SUPPLY



Locations of irrigation wells in Wisconsin, 1990.

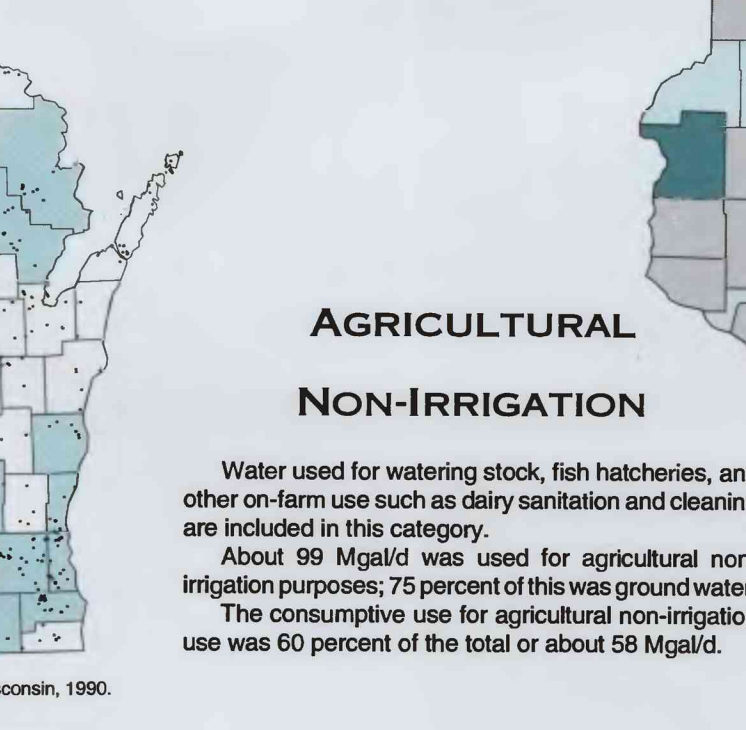
WATER USE, BY CATEGORY

The major water-use categories in Wisconsin are public supply, thermoelectric, industrial, commercial, agriculture, irrigation, and domestic.



Total withdrawals by Public Suppliers, 1990.

Upper number is surface-water use and lower number is ground-water use, in Mgal/d.



Locations of irrigation wells in Wisconsin, 1990.

AGRICULTURAL NON-IRRIGATION

Water used for watering stock, fish hatcheries, and other on-farm use such as dairy sanitation and cleaning are included in this category.

About 99 Mgal/d was used for agricultural non-irrigation purposes; 75 percent of this was ground water.

The consumptive use for agricultural non-irrigation was 60 percent of the total or about 58 Mgal/d.

POWER GENERATION

A total of 5,096 Mgal/d of surface water was withdrawn for thermoelectric-power production. This was almost 3.6 times the amount of water withdrawn for all other uses combined.

About 1 percent of water used for thermoelectric-power generation was consumed.

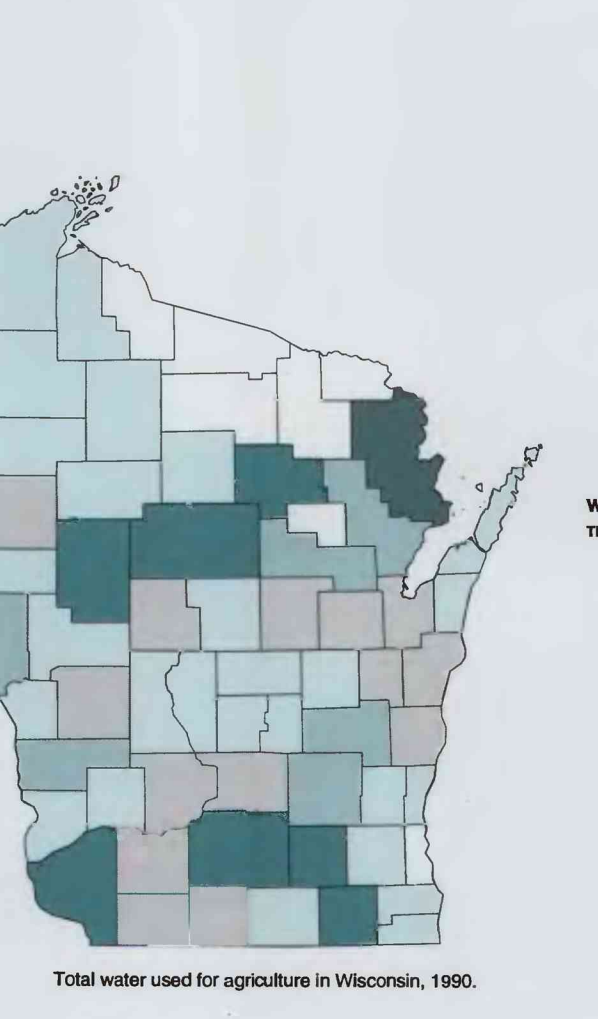
Most water used for thermoelectric power generation is for once-through cooling and the remainder is returned to the natural system, making it available for other uses.

Thermoelectric powerplants generate 97 percent of the State's electricity.

Wisconsin has 23 thermoelectric powerplants; two of these are nuclear.

About 44,000 Mgal/d of water was used by hydroelectric powerplants.

Water used for hydroelectric power generation is considered an instream use, whereby no water is consumed.



Powerplants generating more than 10,000 megawatt-hours.

WATER USE, BY CATEGORY, INCLUDING THERMOELECTRIC POWER USE

Water use, by category, including thermoelectric power use

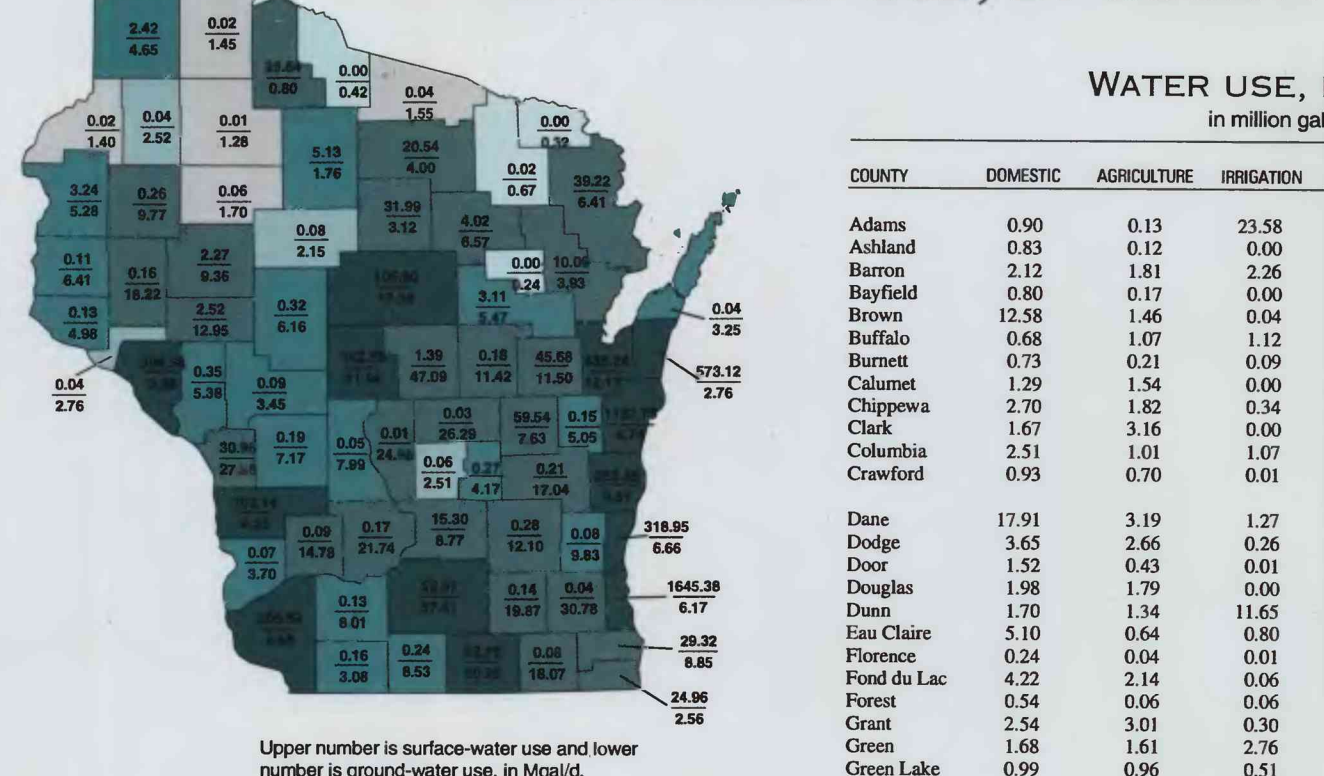
- Domestic 4.1%
- Agriculture 1.3%
- Irrigation 2.3%
- Industrial 9.5%
- Commercial 7.8%
- Public use and losses 11.8%
- Thermoelectric 78.3%

WATER USE, BY CATEGORY, EXCLUDING THERMOELECTRIC POWER USE

Water use, by category, excluding thermoelectric power use

- Domestic 19.0%
- Agriculture 7.0%
- Irrigation 10.7%
- Industrial 43.7%
- Commercial 7.8%
- Public use and losses 11.8%

TOTAL WATER USE, BY COUNTY



Upper number is surface-water use and lower number is ground-water use, in Mgal/d.

Excluding thermoelectric power water use, the largest amounts of water were used in Brown, Milwaukee, and Wood Counties. This use was attributed to large industrial users and major population centers.



Water use, by county, 1990

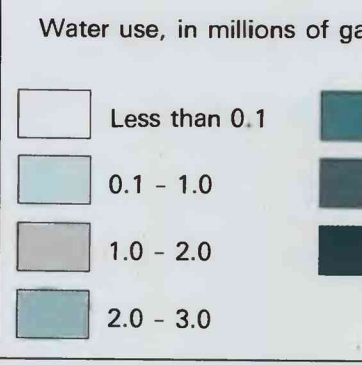
WATER USE, BY COUNTY, 1990

in million gallons per day (Mgal/d)

COUNTY	DOMESTIC	AGRICULTURE	IRRIGATION	INDUSTRIAL	COMMERCIAL	THERMOELECTRIC	PUBLIC USE AND LOSSES	TOTAL
Adams	0.90	0.13	23.58	0.20	0.12	0.00	0.06	24.99
Ashland	0.13	0.12	0.00	1.42	0.31	27.21	0.55	30.44
Barron	2.12	1.81	2.26	2.09	0.49	0.00	1.22	9.99
Bayfield	0.80	0.17	0.00	0.11	0.09	0.00	0.30	1.47
Brown	12.38	1.46	0.04	73.92	4.71	350.05	2.65	445.41
Buffalo	0.68	0.17	1.12	0.04	0.09	397.25	0.21	400.46
Burnett	0.73	0.21	0.09	0.11	0.14	0.00	0.14	1.42
Cabernet	1.29	1.54	0.00	1.48	0.18	0.00	0.71	5.20
Chippewa	2.07	1.82	0.34	4.65	0.52	0.00	1.60	11.63
Clark	1.07	0.16	0.00	0.30	0.24	0.00	1.12	6.49
Columbia	2.51	1.01	1.07	1.50	1.31	15.56	1.11	24.07
Crawford	0.93	0.70	0.01	1.05	0.51	0.00	0.57	3.77
Dane	17.91	3.19	1.27	8.61	11.93	58.46	16.11	117.48
Dodge	3.65	2.66	0.36	3.14	0.67	0.00	2.00	12.38
Door	1.52	0.43	0.01	0.52	0.30	0.00	0.32	3.30
Douglas	1.98	1.79	0.00	1.77	0.75	0.00	0.78	7.07
Dunn	1.70	1.34	11.65	0.35	0.36	0.00	0.98	16.38
Eau Claire	5.10	0.64	0.80	5.00	1.93	0.02	1.98	15.47
Florence	0.24	0.04	0.01	0.00	0.01	0.00	0.02	0.32
Fond du Lac	4.22	2.14	0.06	2.50	0.91	0.00	4.42	17.25
Forest	0.54	0.06	0.06	0.01	0.07	0.00	0.15	0.89
Grant	2.54	3.01	0.30	0.82	0.57	206.77	1.44	215.45
Green	1.68	1.61	2.76	0.76	0.91	0.00	0.15	8.77
Green Lake	0.99	0.96	0.51	1.45	0.33	0.00	0.20	4.44
Iowa	1.06	1.34	4.77	0.17	0.17	0.00	0.63	8.14
Iron	0.31	0.02	0.00	0.00	0.07	0.00	0.02	0.42
Jackson	0.91	0.57	0.31	1.29	0.18	0.00	0.93	3.54
Jefferson	3.92	3.85	1.21	7.77	1.29	0.00	1.97	20.01
Jensen	1.19	0.50	4.80	0.60	0.20	0.00	0.75	8.04
Kenosha	7.93	0.21	0.02	7.91	2.11	4.55	4.79	27.52
Kewaunee	1.05	0.99	0.04	0.31	0.14	573.08	0.27	575.88
La Crosse	6.76	0.64	0.31	8.13	5.68	31.32	6.10	58.94
Lafayette	0.90	1.61	0.00	0.20	0.12	0.00	0.41	3.24
Lambda	1.05	0.54	0.00	1.99	0.21	0.00	0.46	10.89
Lincoln	1.47	0.33	0.01	32.62	0.29	0.00	0.39	35.11
Manitowish	4.82	1.38	0.07	7.41	1.31	1110.50	2.04	1127.53
Marathon	6.40	3.09	1.13	28.01	1.53	83.51	0.61	124.28
Marquette	2.23	10.32	0.76	31.31	0.35	0.00	0.66	45.63
Menominee	0.59	0.29	0.27	0.20	1.19	0.00	0.02	2.57
Menomonie	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.24
Milwaukee	56.87	0.02	0.43	50.27	34.60	1460.42	49.92	1651.55
Monroe	2.39	1.24	0.60	1.09	1.00	0.00	1.04	7.36
Monroeville	1.52	2.14	0.73	5.08	1.09	0.00	0.36	14.02
Neenah	1.92	0.02	0.15	21.19	0.39	0.00	0.87	24.54
Outagamie	7.57	1.90	0.05	39.61	1.79	0.00	6.26	57.18
Oshkosh	3.05	0.34	0.18	2.02	0.79	317.51	1.71	325.60
Pepin	0.38	0.36	1.86	0.01	0.06	0.00	0.13	2.80
Pierce	1.64	1.26	0.25	0.69	0.42	0.00	0.85	5.11
Polk	1.82	4.34	0.11	1.33	0.42	0.00	0.50	8.52
Portage	2.96	0.57	34.56	7.48	1.75	0.00	1.16	48.48
Price	0.82	0.23	0.01	5.46	0.18	0.00	0.17	6.89
Racine	1.14	0.29	0.76	12.44	3.28	0.00	10.26	38.17
Richland	1.01	0.87	0.79	11.53	0.10	0.00	0.36	14.66
Rock	8.37	0.94	3.37	6.08	4.11	52.62	6.49	81.98
Rusk	0.77	0.56	0.00	0.08	0.17	0.00	0.18	1.76
Sauk	2.47	1.13	0.53	0.46	0.54	0.00	1.19	6.52
Sawyer	2.91	1.40	12.42	1.52	2.07	0.00	1.59	21.91
Shawano	0.77	0.11	0.07	0.06	0.17	0.00	0.11	1.25
Shawano	2.05	2.06	0.01	3.57	0.37	0.00	0.52	8.58
Sheboygan	5.79	1.24	0.60	12.23	2.16	270.00	1.14	293.16
Taylor	1.00	0.79	0.00	0.15	0.06	0.00	0.23	2.23
Trempealeau	1.35	2.08	0.63	0.54	0.02	0.00	0.88	5.71
Vernon	1.35	2.10	0.00	0.18	0.25	102.18	0.41	106.47
Vilas	1.05	0.01	0.13	0.00	0.16	0.00	0.24	1.59
Walworth	4.05	5.53	0.54	1.94	2.10	0.00	1.99	16.15
Washington	0.76	0.21	0.97	0.03	0.12	0.00	0.41	2.50
Washington	4.76	0.80	0.04	1.92	1.25	0.00	1.07	8.84
Waushara	12.38	0.40	0.87	5.38	4.82	0.00	4.97	32.89
Waupaca	2.54	1.53	3.18	3.30	0.52	0.00	0.54	11.61
Waushara	1.01	0.32	24.68	0.06	0.00	0.00	0.16	25.32
Winnebago	8.03	0.67	0.08	45.45	2.43	5.00	6.71	174.50
Wood	3.70	1.87	1.90	134.10	1.10	30.00	1.83	174.50
TOTALS	268.84	99.42	151.40	618.94	110.22	5096.01	166.60	6511.43

EXPLANATION

Water use, in millions of gallons per day



Water use, by county, 1990

EXPLANATION

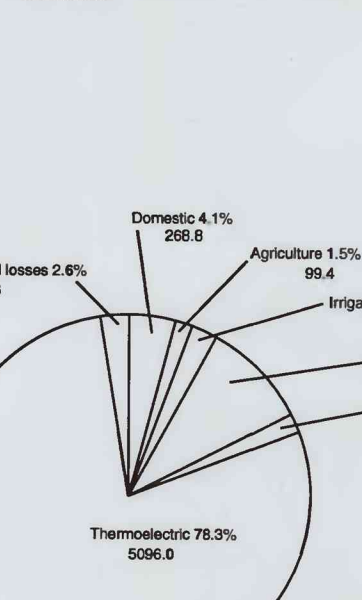
Hydroelectric powerplant
Thermoelectric powerplant
Nuclear powerplant

SELF-SUPPLIED INDUSTRIAL

About 619 Mgal/d of surface and ground water was used for industrial purposes.

About 468 Mgal/d, or 76 percent, was self-supplied.

Rates of consumptive use differ widely among industry types but were estimated to be about 20 percent of ground water and 10 percent of surface-water withdrawals.

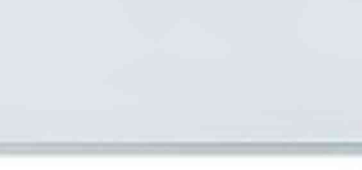


SELF-SUPPLIED DOMESTIC

An estimated 90 Mgal/d, exclusively ground water, was withdrawn for self-supplied domestic use; an estimated per capita use of about 61 gal/d (gallons per day).

About 1.48 million (or 30 percent) of the people in the State obtained their domestic water from a self-supplied source.

SELF-SUPPLIED DOMESTIC



TRENDS IN WATER USE

Water use in Wisconsin has increased steadily for most categories of use from 1950 through 1990, on the basis of data from the 5-year reports published by the U.S. Geological Survey.

Water used for thermoelectric power production shows the fastest rate of increase (81 percent). During this period, the population of the State increased by 24 percent. Industrial self-supplied surface-water use also has increased at a steady rate as more industrial development has occurred along the Wisconsin, Fox, and Chippewa Rivers. Irrigation water use increased by 44 percent from 1980 through 1990, as irrigated acreage increased.

In Dane County, which depends on ground water for its sole source, rates of withdrawal have increased much faster than population growth.

Milwaukee County uses Lake Michigan as its principal source of water. The decrease of ground-water pumpage from 1950 through 1990 in Milwaukee County is attributed to higher water cost for some publicly supplied ground water and the increased use of surface water from Lake Michigan.

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