

# WATER USE IN WISCONSIN, 2000

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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. Information about amounts of water withdrawn, sources of water, how the water was used, and how much water was returned is available to those involved in establishing water-resource policy and to those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, four reports summarizing water use have been published (Lawrence and Ellefson, 1982; Ellefson and others, 1987; Ellefson and others, 1993; Ellefson and others, 1997). Ellefson and others (1997) present 1995 water-use data in a map and graph format. Because water use changes with time, an update report is periodically required. This report presents 2000 data in the same format as the 1997 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.

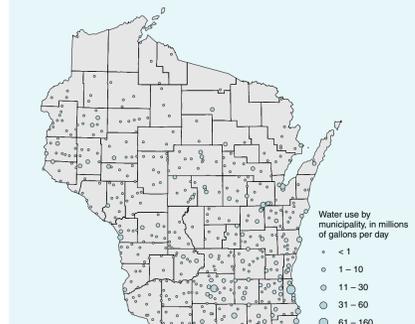
## SOURCES OF WATER

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 1.2 quadrillion (1.2 x 10<sup>15</sup>) gallons, or about one-third 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.

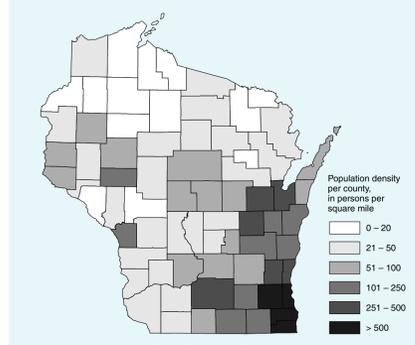
## WATER USE AND POPULATION



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

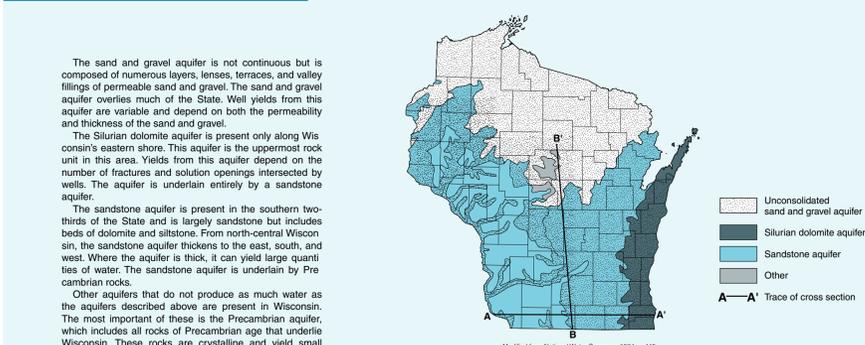


Water use by municipalities with public water-supply systems



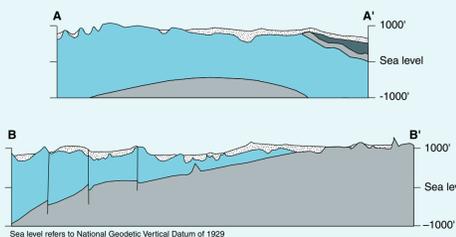
Population density by county

## TOTAL WATER USE, BY AQUIFER



Unconsolidated sand and gravel aquifer  
Silurian dolomite aquifer  
Sandstone aquifer  
Other  
A-A' Trace of cross section

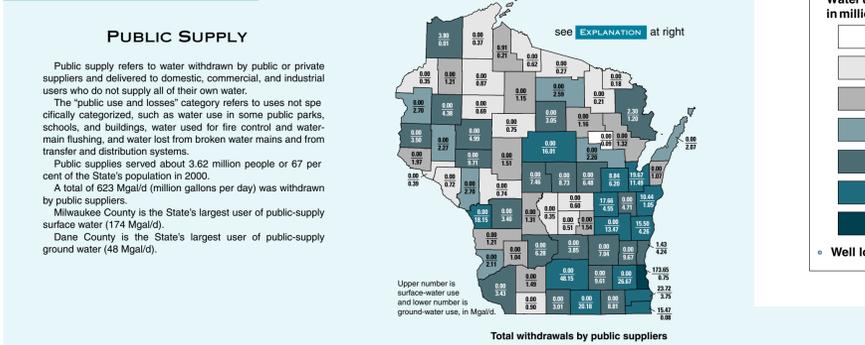
Modified from National Water Summary, 1984, p. 449



Sea level refers to National Geodetic Vertical Datum of 1929

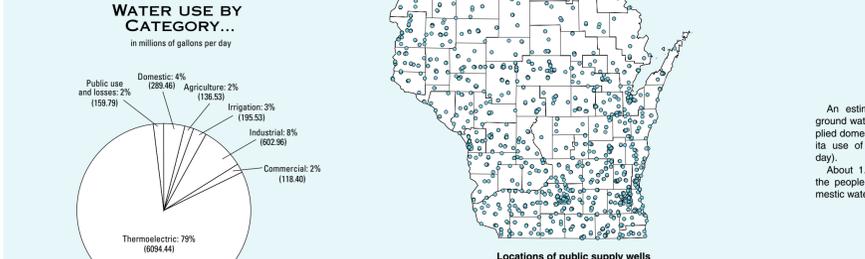
Water use by aquifer, in millions of gallons per day					
AQUIFER	AGRICULTURE AND IRRIGATION	SELF-SUPPLIED DOMESTIC AND COMMERCIAL	SELF-SUPPLIED INDUSTRIAL	PUBLIC SUPPLY	TOTAL
Sand and gravel	183	32.7	22.4	125	363
Silurian dolomite	11.8	10.6	9.12	16.5	48.02
Sandstone	94.4	50.1	50.6	185	380
Other	5.90	2.88	0.65	3.31	12.94
Total	295.10	96.28	82.97	329.81	803.96

## WATER USE, BY CATEGORY

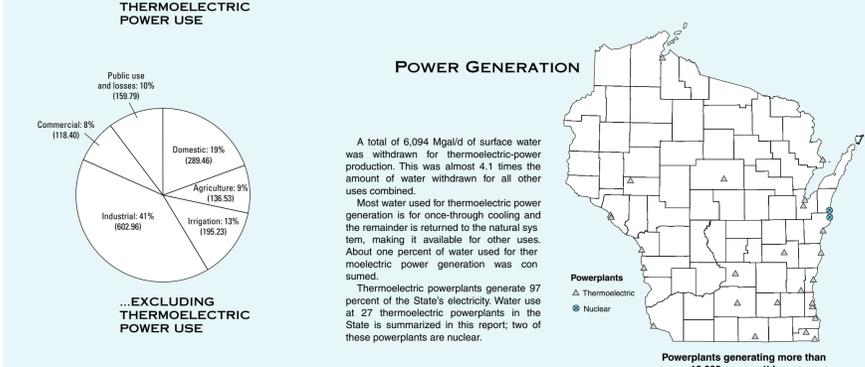


Total withdrawals by public suppliers

## WATER USE BY CATEGORY...



## ...INCLUDING THERMOELECTRIC POWER USE



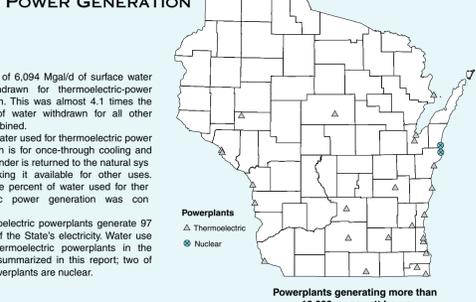
## ...EXCLUDING THERMOELECTRIC POWER USE

A total of 6,094 Mgal/d of surface water was withdrawn for thermoelectric-power production. This was almost 4.1 times the amount of water withdrawn for all other uses combined. 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. About one percent of water used for their thermoelectric power generation was consumed. Thermoelectric powerplants generate 97 percent of the State's electricity. Water use at 27 thermoelectric powerplants in the State is summarized in this report; two of these powerplants are nuclear.



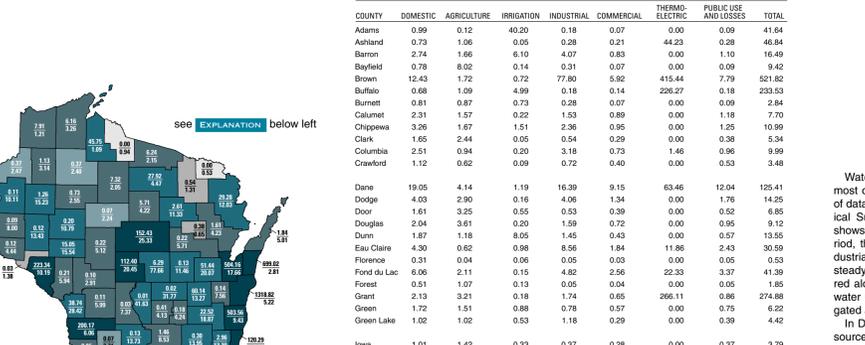
Locations of public supply wells

## POWER GENERATION



Powerplants generating more than 10,000 megawatt hours

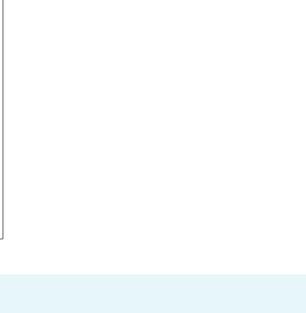
## TOTAL WATER USE, BY COUNTY



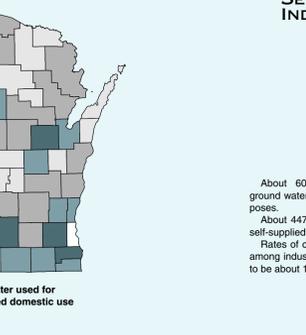
Upper number is surface-water use and lower number is ground-water use, in Mgal/d.



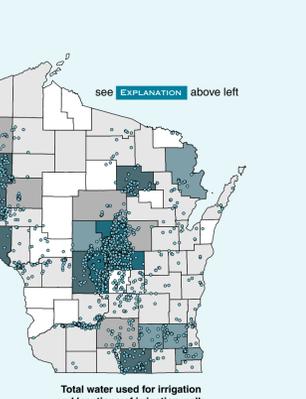
Well location



Total water used for self-supplied domestic use



Total water used for self-supplied industrial use

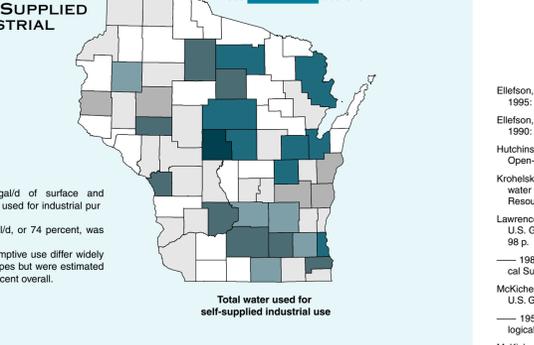


Total water used for irrigation and locations of irrigation wells

COUNTY	WATER USE BY COUNTY, 2000 in million gallons per day (Mgal/d)						TOTAL
	DOMESTIC	AGRICULTURE	IRRIGATION	INDUSTRIAL	COMMERCIAL	THERMOELECTRIC	
Adams	0.99	0.12	40.20	0.18	0.07	0.00	41.64
Ashland	0.73	1.06	0.05	0.28	0.21	44.23	46.84
Barron	2.74	1.66	6.10	4.07	0.83	0.00	15.40
Bayfield	0.78	8.02	0.14	0.31	0.07	0.00	9.42
Brown	12.43	1.72	0.72	77.80	5.82	415.44	521.82
Buffalo	0.68	1.09	4.99	0.18	0.14	226.27	233.53
Burns	0.81	0.87	0.73	0.18	0.07	0.00	2.64
Calumet	2.31	1.57	0.32	1.53	0.89	0.00	7.70
Chippewa	3.26	1.67	1.51	2.36	0.95	0.00	12.59
Clark	1.65	2.44	0.05	0.54	0.29	0.00	5.34
Columbia	2.51	0.94	0.30	3.18	0.73	1.46	9.99
Crawford	1.12	0.62	0.09	0.72	0.40	0.00	3.48
Dane	19.05	4.14	1.19	16.39	9.15	63.46	125.41
Dodge	4.03	2.90	0.16	4.06	1.34	0.00	13.76
Door	1.61	2.35	0.55	0.53	0.39	0.00	5.22
Douglas	2.04	3.61	0.20	1.59	0.72	0.00	9.12
Dunn	1.87	1.18	8.05	1.45	0.43	0.00	15.55
Eau Claire	4.30	0.62	0.98	8.56	1.84	11.86	30.59
Florence	0.31	0.04	0.06	0.05	0.03	0.00	0.53
Fond du Lac	6.06	2.11	0.15	4.82	2.56	22.33	41.39
Forest	0.51	1.07	0.13	0.05	0.04	0.00	2.85
Grant	2.13	3.21	0.18	1.74	0.85	206.11	214.88
Green	1.72	1.51	0.88	0.78	0.57	0.00	7.52
Green Lake	1.02	1.02	0.53	1.18	0.29	0.00	4.42
Iowa	1.01	1.42	0.33	0.37	0.28	0.00	3.37
Iron	0.42	0.02	0.07	0.16	0.12	0.00	0.94
Jackson	0.94	0.95	0.09	0.71	0.14	0.00	3.01
Jefferson	4.58	7.51	2.25	6.98	1.83	26.67	50.22
Juneau	1.21	0.37	4.77	0.25	0.00	0.33	7.40
Kenosha	7.02	1.18	0.25	4.44	2.95	15.21	39.94
Kewaunee	0.99	0.95	0.07	0.32	0.20	699.03	701.83
La Crosse	7.14	4.74	0.39	7.55	3.45	39.36	67.16
Lafayette	0.73	1.58	0.17	0.80	0.23	0.00	3.86
Lansdale	1.01	7.90	4.17	0.35	0.22	0.00	13.94
Lincoln	1.81	2.05	0.08	6.45	0.58	0.00	10.79
Manitowish	4.99	1.46	0.33	4.42	2.18	1307.78	2.87
Marathon	7.96	3.16	1.81	32.73	3.04	125.05	400
Marquette	2.39	4.57	2.25	14.23	0.67	16.54	41.31
Marquette	0.77	2.92	0.07	0.56	0.10	0.00	11.3
Menominee	0.23	0.02	0.02	0.02	0.02	0.00	1.03
Milwaukee	54.06	0.07	0.81	57.92	33.14	1867.56	43.60
Monroe	2.18	1.15	0.26	1.01	0.65	0.00	6.10
Oconto	1.82	1.45	0.73	1.26	0.25	0.00	5.84
Ondeca	2.40	1.10	0.31	27.44	0.49	0.00	32.39
Outagamie	7.99	1.98	0.38	23.48	2.86	1.16	37.9
Ozaukee	4.11	0.32	0.51	1.88	1.08	118.78	1.42
Pepin	0.36	0.33	0.45	0.10	0.07	0.00	1.41
Pierce	1.56	1.29	0.28	0.56	0.37	0.00	4.49
Polk	2.30	5.87	0.17	0.70	0.51	0.00	10.22
Portage	4.28	0.57	60.99	14.27	1.66	0.00	218
Price	0.96	0.20	0.13	5.58	0.22	2.01	9.37
Racine	13.00	1.80	2.16	10.82	5.22	0.00	68.7
Richland	0.93	0.79	0.06	0.54	0.20	0.00	2.78
Rock	8.35	0.87	3.49	7.49	3.83	133.54	5.05
Rusk	0.73	0.51	0.88	0.85	0.13	0.00	3.38
St. Croix	2.90	0.96	0.44	2.24	0.87	0.00	8.89
Sauk	3.18	1.44	0.84	5.84	1.19	0.00	15.7
Sawyer	1.00	0.85	0.30	0.24	0.17	0.00	2.77
Shawano	2.15	2.09	0.14	0.58	0.42	0.00	5.53
Sheboygan	8.12	2.92	0.40	6.21	3.75	487.55	4.94
Taylor	1.00	0.74	0.05	0.19	0.14	0.00	2.31
Templeton	1.58	2.13	0.19	1.07	0.51	0.00	6.15
Vernon	1.28	0.91	1.20	0.30	0.23	198.11	0.30
Vilas	1.16	5.52	0.26	0.07	0.05	1.26	0.7
Walworth	5.13	2.16	0.66	3.20	1.67	0.00	20
Waushara	0.99	1.54	1.11	0.30	0.23	0.00	3.30
Washington	5.64	0.62	2.55	1.84	2.89	2.42	16.28
Waukesha	14.12	0.27	2.88	9.10	5.07	0.00	6.67
Waupaca	3.64	1.47	1.87	1.76	1.23	0.00	1.62
Waushara	1.19	3.06	27.13	0.15	0.11	0.00	1.5
Winnebago	8.49	0.58	0.32	92.27	4.22	0.98	5.55
Wood	4.05	2.09	2.79	120.64	1.42	0.00	187
Total	289.46	136.53	196.36	602.96	118.40	6094.44	155.79

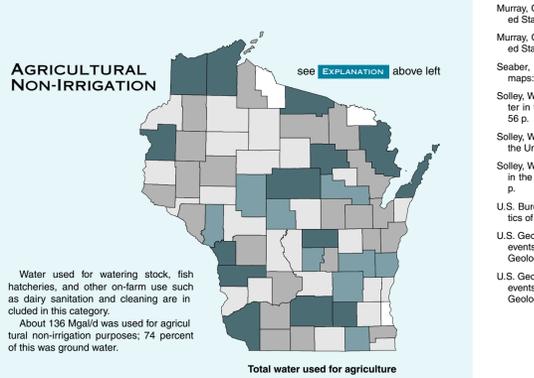
Excluding thermoelectric power water use, the largest amounts of water were used in Brown, Milwaukee, and Wood Counties. This use was attributed to large industrial users and major population centers.

## SELF-SUPPLIED DOMESTIC



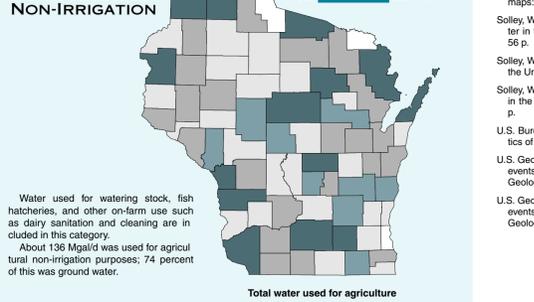
Total water used for self-supplied domestic use

## SELF-SUPPLIED INDUSTRIAL



Total water used for self-supplied industrial use

## AGRICULTURAL IRRIGATION



Total water used for irrigation and locations of irrigation wells

Water used for watering stock, fish hatcheries, and other on-farm use such as dairy sanitation and cleaning are included in this category. About 136 Mgal/d was used for agricultural non-irrigation purposes; 74 percent of this was ground water.

## U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 02-356

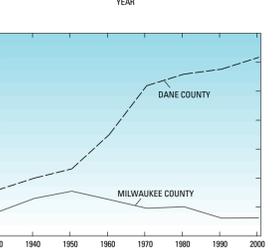
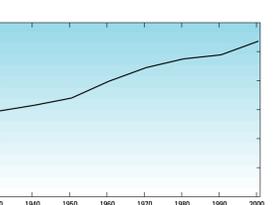
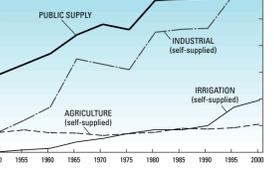
prepared by the U.S. Department of the Interior U.S. Geological Survey in cooperation with the Wisconsin Department of Natural Resources

## TRENDS IN WATER USE

Water use in Wisconsin has increased steadily overall for most categories of use from 1950 through 2000, on the basis of data from the five-year reports published by the U.S. Geological Survey. Water used for thermoelectric power production shows the fastest rate of increase (83 percent). During this period, the population of the State increased by 58 percent. In industrial self-supplied surface-water use also has increased at a steady rate overall as more industrial development has occurred along the Wisconsin, Fox, and Chippewa Rivers. Irrigation water use more than doubled from 1980 through 2000, as irrigated acreage increased.

In Dane County, which depends on ground water for its sole source, the overall increase in rates of withdrawal is much greater than that of population growth.

Milwaukee County uses Lake Michigan as its principal source of water. The decrease of ground-water pumping from 1950 through 2000 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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