



# Wisconsin Water Use

## 2023 Water Withdrawal Report

Water supply systems in Wisconsin capable of withdrawing 100,000 gallons or more per day are required to register and report water withdrawals annually. The state has over 14,000 registered sources that have withdrawn from wells, ponds, streams, rivers and lakes. The 1.8 trillion gallons withdrawn in 2023 is equivalent to 600,000 two-liter sodas per person in Wisconsin.

### How, when and where water is withdrawn varies

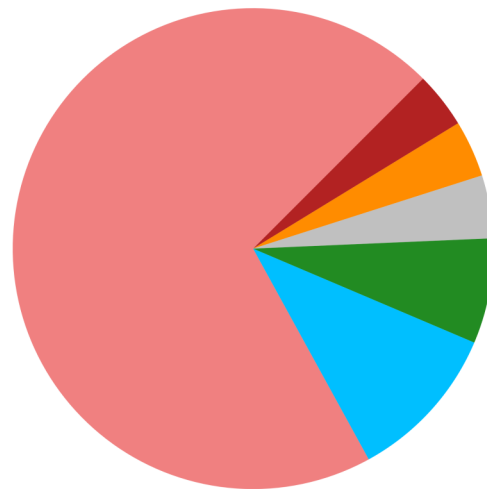
seasonally throughout the state. Yearly withdrawal volumes vary with precipitation trends. Comparing 2023 to the 30-year average:

- Wisconsin received 30 inches of precipitation, 4 inches less than the average (34 inches between 1990 and 2020).<sup>1</sup>
- 2023 was the No. 5 hottest year on record.
- Winter and spring precipitation was the highest of any year.
- May through August was the No. 4 driest recorded.
- Southern Wisconsin and the south shore of Lake Superior experienced more severe drought conditions than northern Wisconsin as a whole.

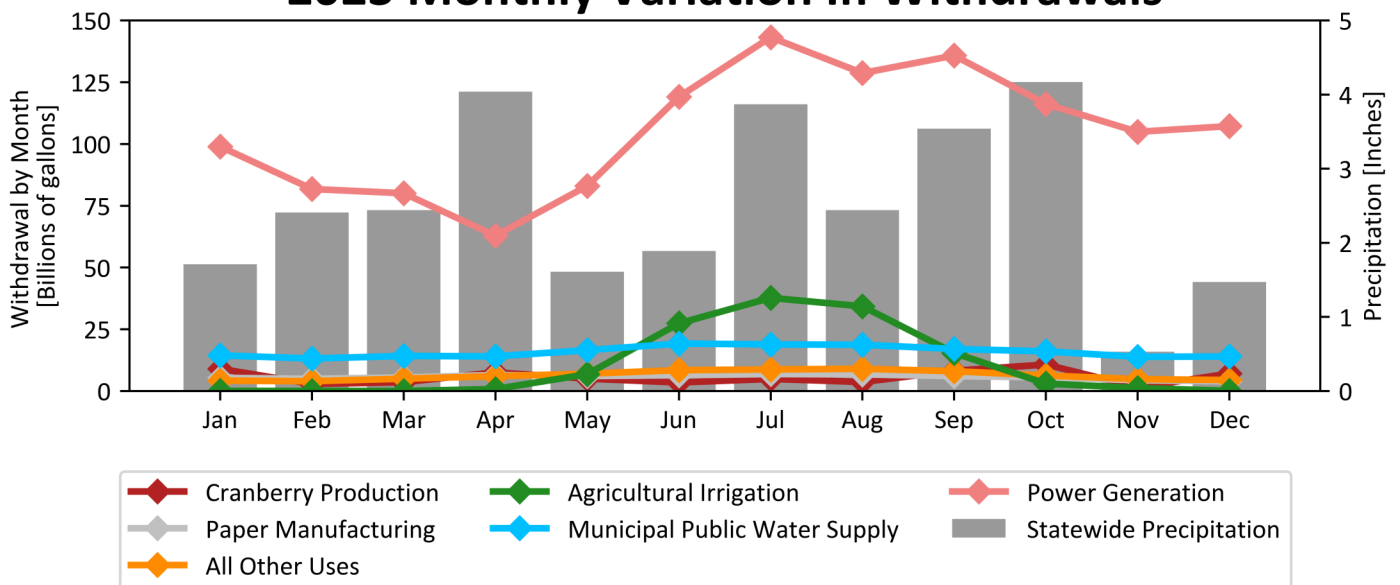
Total water withdrawals for 2023 were within 1% of the average annual water use for the period of 2012 – 2023. Similar to previous years' data, power generation and agricultural irrigation varied the most by season.

### 2023 Withdrawals By Use

Total Withdrawals = 1.79 Trillion Gallons

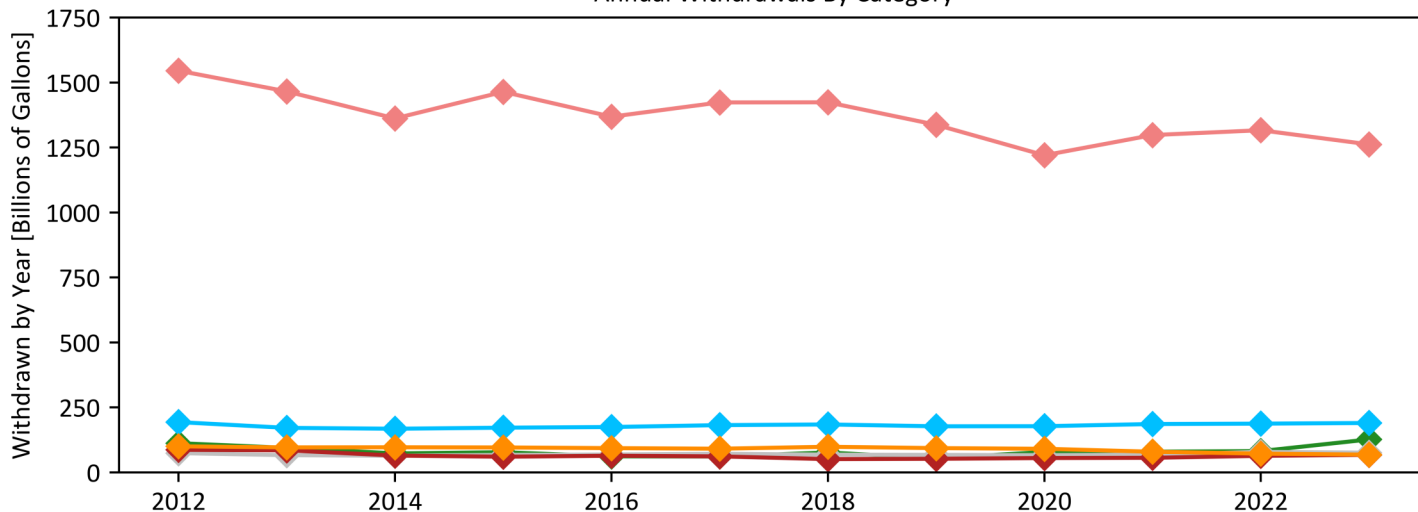


### 2023 Monthly Variation In Withdrawals

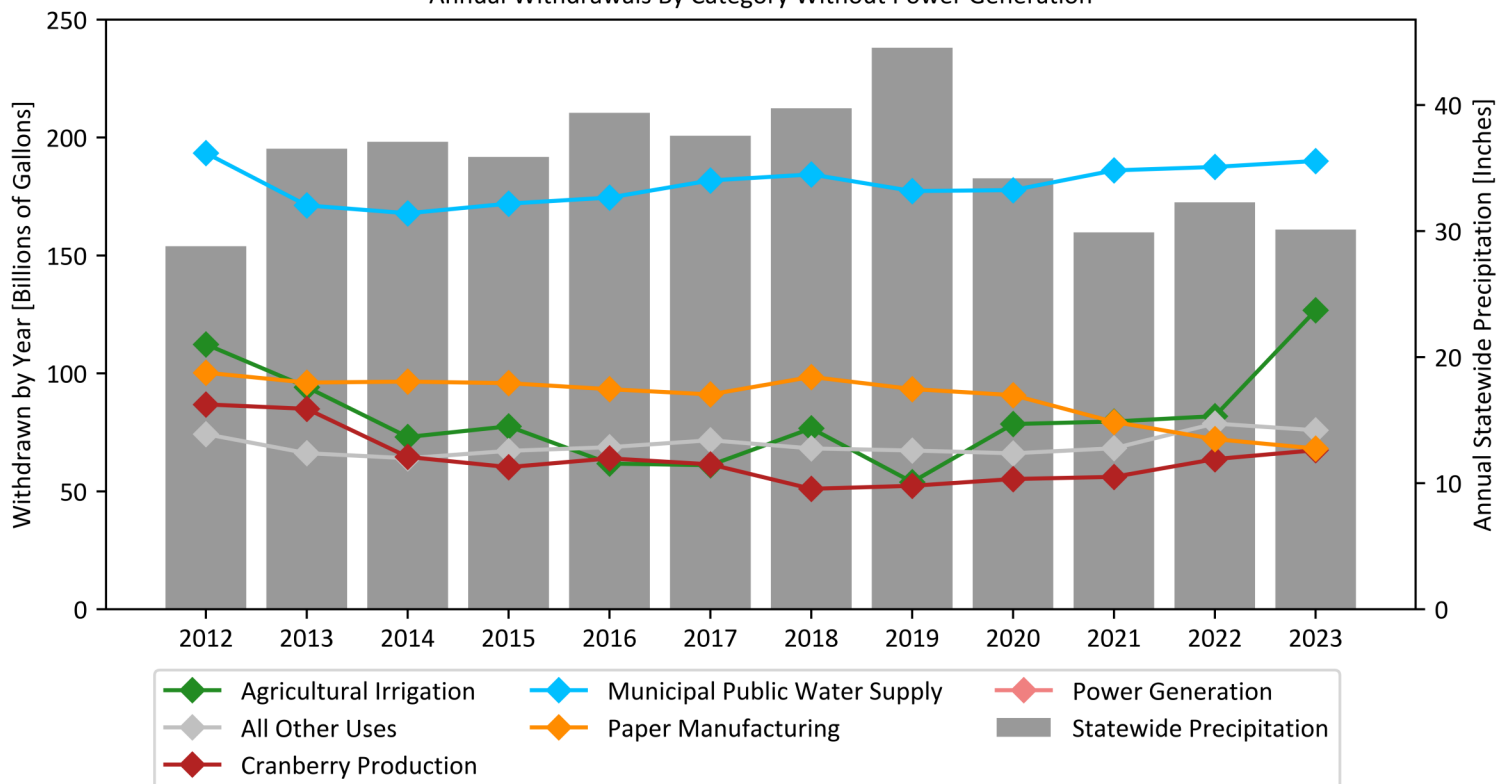


# Annual Total Withdrawals By Category, 2012 To 2023

Annual Withdrawals By Category



Annual Withdrawals By Category Without Power Generation



Power generation is the **primary** use for water withdrawal in Wisconsin. It has generally decreased since 2012, but this trend may not necessarily continue. Improved process efficiency and power plant closures have driven the decreasing trend. Water withdrawals are highest in years with higher temperatures and/or lower precipitation due to increased need for power generation cooling and increased demand for agricultural irrigation and municipal public water supply. Seasonality of precipitation also affects withdrawals. For instance, while 2012 experienced slightly less annual precipitation than 2023, total irrigation volume for 2023 was higher. This is likely because of significantly drier conditions during the growing season, which increased the need for irrigation.

## 2023 Water Withdrawals By Category And Source

Water Use	Total Active Sources	Total 2023 Withdrawals (Bgal)	Total Active Groundwater Sources	2023 Groundwater Withdrawals (Bgal)	Total Active Surface Water Sources	2023 Surface Water Withdrawals (Bgal)
Agricultural Irrigation	3912	126.7	3777	125.0	135	1.7
All Other Uses	1487	11.9	1376	7.8	111	4.1
Non-Municipal Public Supply	1591	3.7	1588	2.6	3	1.1
Municipal Public Water Supply	1562	190.1	1538	92.8	24	97.3
Cranberry Production	384	67.4	131	3.8	253	63.6
Commercial	456	3.3	446	1.0	10	2.2
Dairy Production	858	7.3	857	7.3	1	0.0
Industrial (non-mining)	505	14.2	491	11.0	14	3.2
Golf Course Irrigation	390	5.9	336	4.9	54	0.9
Non-Metallic Mining	136	16.5	63	1.8	73	14.7
Aquaculture	147	13.1	129	7.0	18	6.1
Power Generation	53	1261.9	34	2.1	19	1259.8
Paper Manufacturing	35	68.2	9	1.5	26	66.7
<b>Total</b>	<b>11516</b>	<b>1790.2</b>	<b>10775</b>	<b>268.7</b>	<b>741</b>	<b>1521.5</b>

### Compared to water withdrawals since 2012, in 2023:

- Power generation withdrawal volume was the second lowest, with 2020 being the lowest year on record.
- Agricultural irrigation withdrawal volume was the highest ever, with 2012 and 2013 in second and third place.
- Municipal withdrawal volume was the second greatest, only less than 2012 withdrawals.
- Paper manufacturing withdrawal volume was the lowest of any year.

Water users measure withdrawals using one of several methods. For groundwater, these methods include totalizing flow meters, hour meters, horizontal pipe discharge measurements and other methods approved by the DNR on a case-by-case basis. For surface water, these methods include measurement from a rectangular or V-notch weir, horizontal pipe discharge measurement, estimation from flooding events based on area and other methods approved by the DNR on a case-by-case basis. For the roughly 11,000 who reported in 2023, 74% measured with flow or hour meters versus 26% who estimated their withdrawals. An additional 3,000 sources did not withdraw water in 2023 but are registered with the Wisconsin DNR.

# Surface Water Withdrawals

In 2023, surface water withdrawals accounted for **85% of total water use**. This ranks 2023 as the second lowest year from 2012 – 2023 for surface water withdrawals, continuing a general trend of decreasing surface water withdrawals for power generation.

While most water withdrawals in Wisconsin are from surface water, water loss is minimal relative to the amount withdrawn because water is used and discharged near the point of withdrawal.

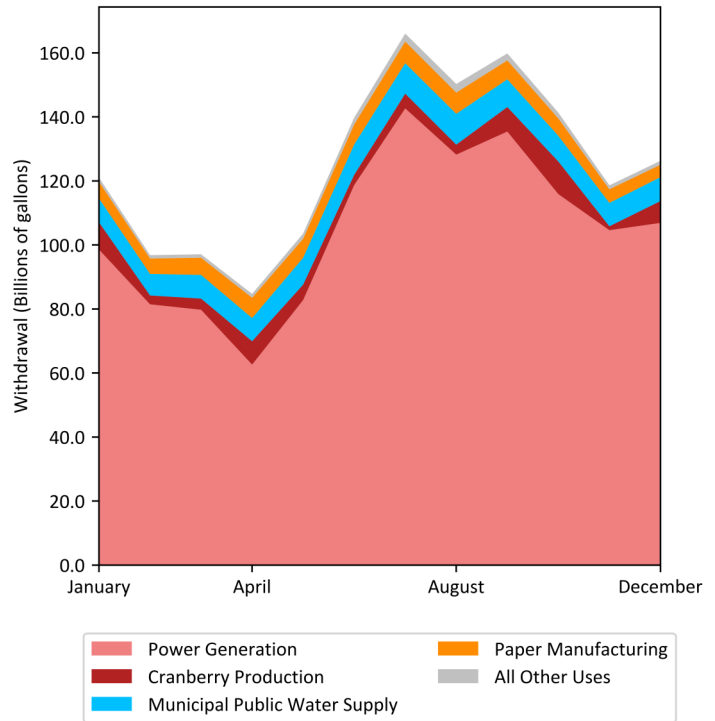
Power generation facilities withdrew the largest volume of surface water in the state (1.26 trillion gallons). These facilities are concentrated along Lake Michigan and the Wisconsin and Mississippi Rivers.

Municipal public water supply was the next highest use for surface water (0.064 trillion gallons) and was concentrated in counties with large populations

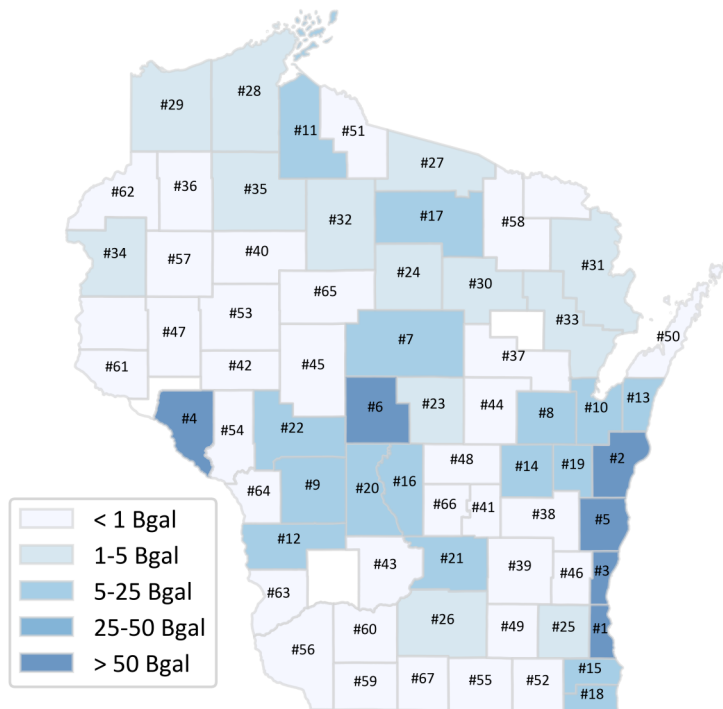
bordering Lake Michigan. The ‘All Other Uses’ category includes mining, industry, commercial uses, other-than-municipal water systems, non-transient, non-community water systems, schools, fire protection, remediation and other uses.

## 2023 Surface Water Withdrawals By Use

Annual Total Surface Water Withdrawals = 1.52 Billion Gallons



## 2023 Surface Water Withdrawals By County

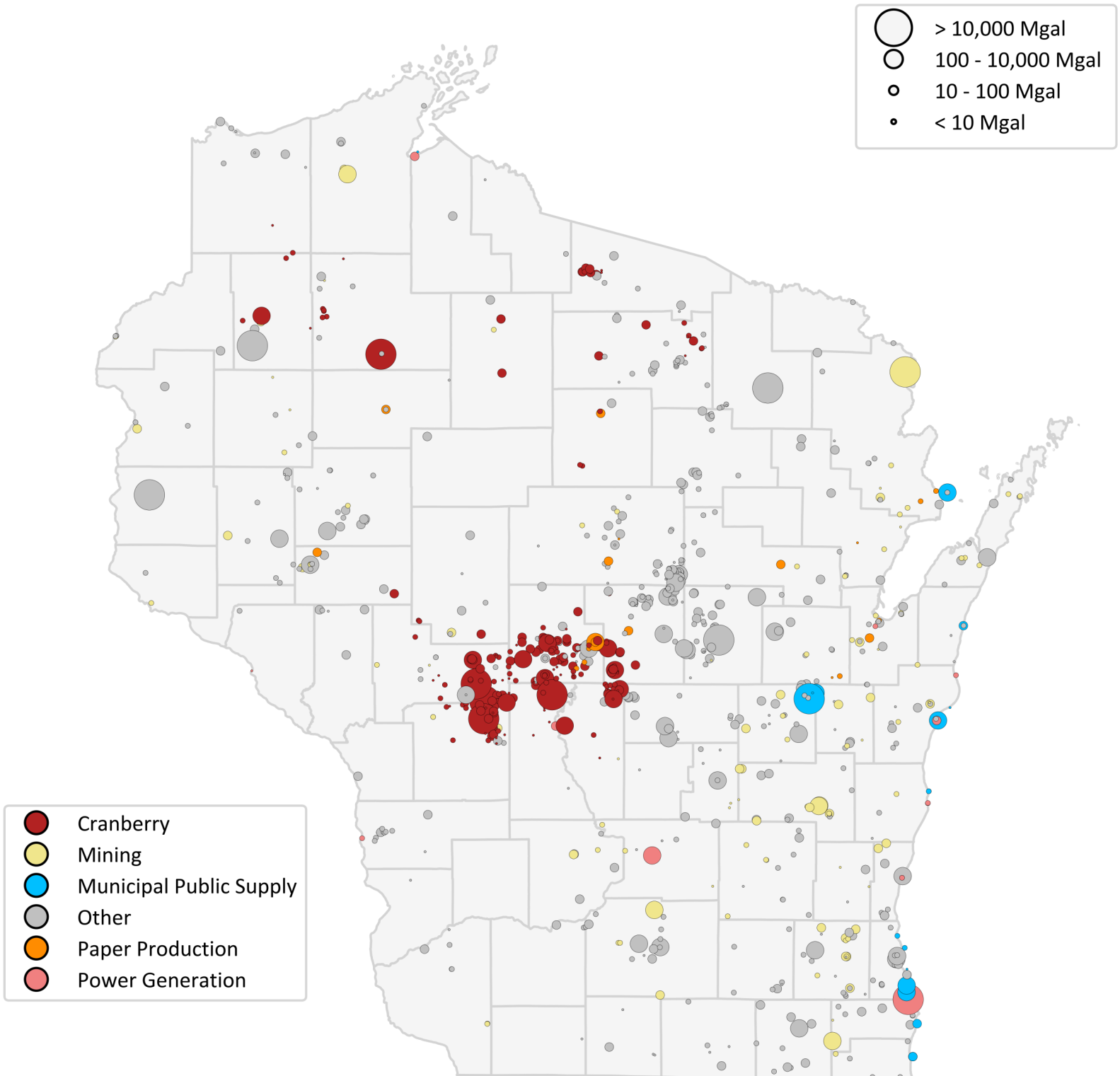


Surface water withdrawals from the top five ranked counties made up 85% of total surface water withdrawals in 2023.

The top 10 counties used surface water for power generation or paper manufacturing. Milwaukee (#1), Manitowoc (#2), Ozaukee (#3), Buffalo (#4), Sheboygan (#5), Marathon (#7) and Brown (#10) used most of their surface water for power generation. Wood (#6) and Outagamie (#8) primarily used surface water for paper manufacturing and Monroe (#9) for mining.

Counties with no surface water withdrawals in 2023 are not ranked.

# 2023 Surface Water Withdrawals



The size of the dot corresponds to the scale of surface water withdrawal, with the smallest dot indicating less than 10 million gallons annually and the largest over 10 billion gallons annually. Municipal public supply and power generation surface water withdrawals consist of fewer large-volume withdrawal sites, while cranberry production consists of numerous lower volume withdrawals. Water users withdraw water at different times of the year, based on need. For example, withdrawals for power generation peak in late summer when cooling needs are highest. Cranberry growers' peak use for withdrawals is in late spring and again in late fall.

# Groundwater Withdrawals

Groundwater withdrawals accounted for 15% of all statewide withdrawals. These withdrawals totaled 271 billion gallons from just over 10,000 high-capacity wells in 2023.

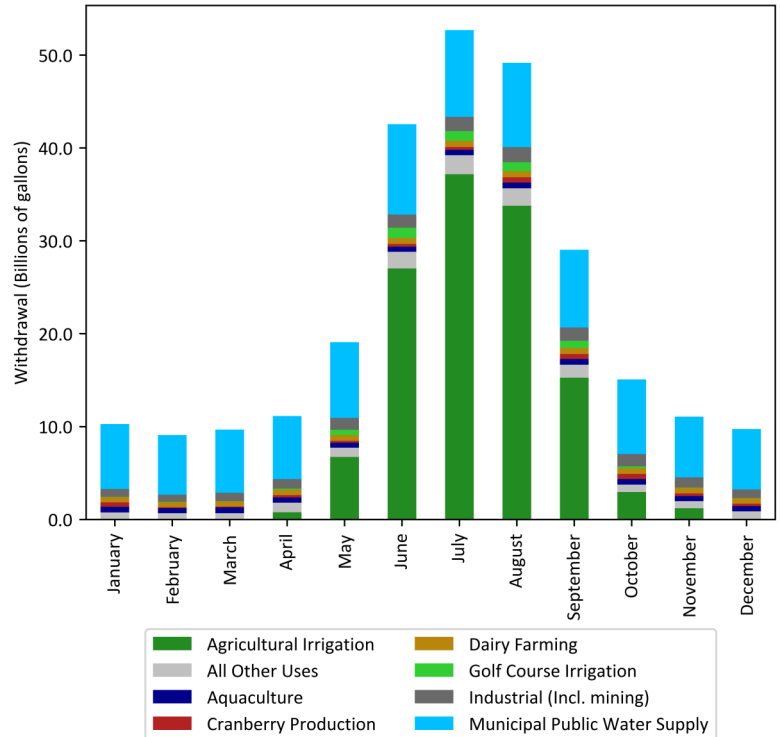
Municipal public water systems were the second largest user of groundwater, withdrawing nearly 95 billion gallons of groundwater in 2023. These wells are typically owned by cities and supply water for residential, commercial, institutional and industrial uses. Municipal suppliers provide drinking water to more than two-thirds of Wisconsin residents.

Agricultural irrigation used the most groundwater at 125 billion gallons.

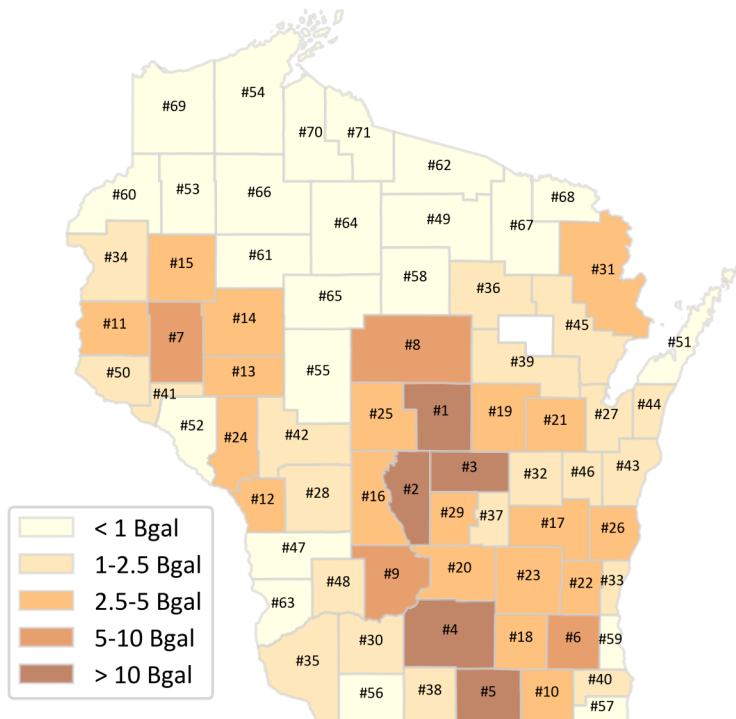
The category 'All Other Uses' includes silviculture, commercial, non-dairy livestock, paper manufacturing, power generation, other-than-municipal water supply, non-transient non-community water supply, transient non-community water supply and schools.

## 2023 Groundwater Withdrawals By Use

Annual Total Groundwater Withdrawals = 269 Billion Gallons



## 2023 Groundwater Withdrawals By County

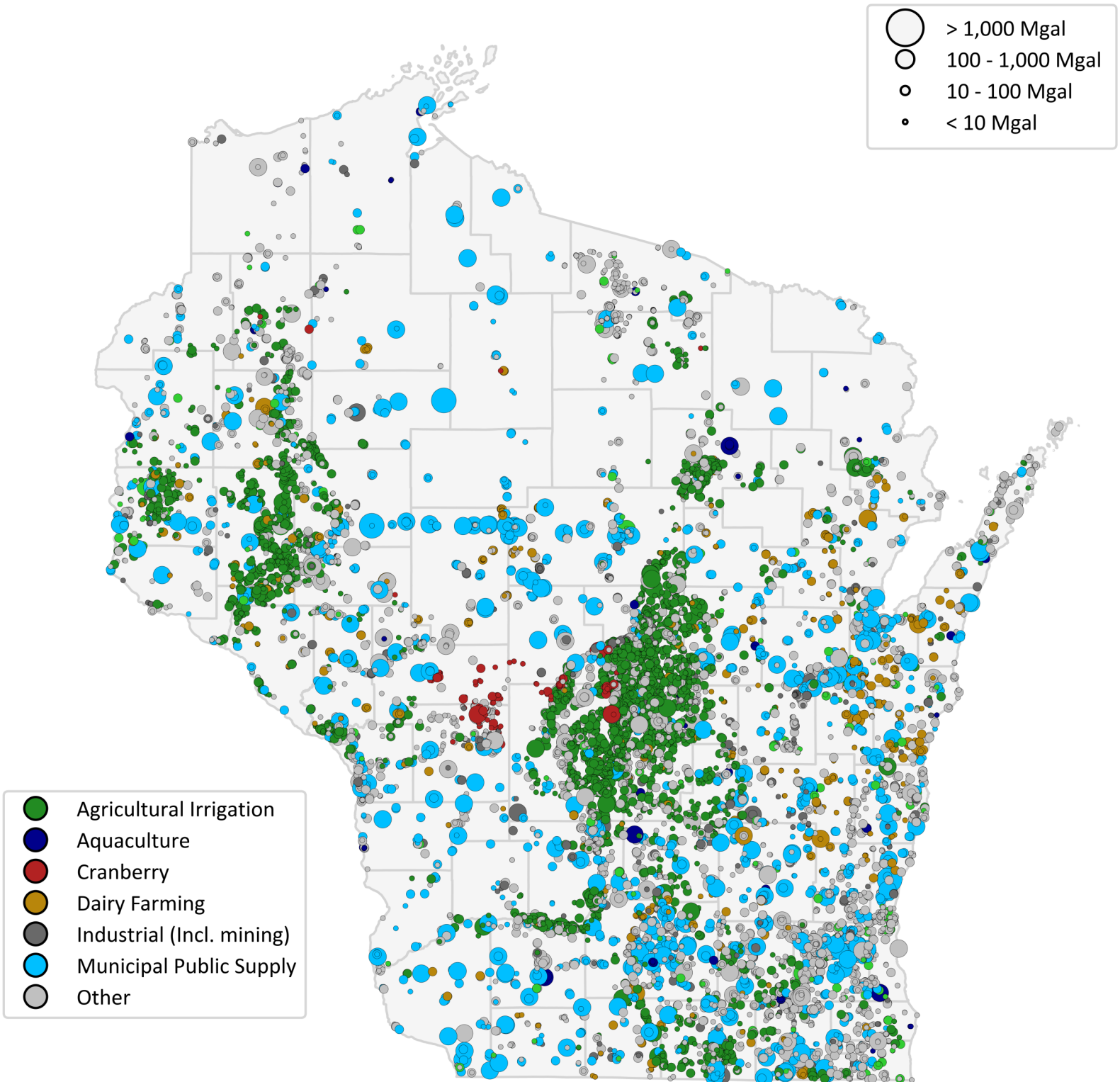


The top five ranked counties for groundwater withdrawal made up almost 39% of total groundwater withdrawals.

Groundwater users in the top 10 ranked counties primarily used withdrawals for agricultural irrigation and municipal public water supply. Portage (#1), Adams (#2), Waushara (#3), Dunn (#7) and Sauk (#10) counties used more water for agricultural irrigation, while Dane (#4), Rock (#5), Waukesha (#6), Marathon (#8) and La Crosse (#9) counties used more water for municipal supply.



# 2023 Groundwater Withdrawals



Each dot on this map represents a groundwater withdrawal site. The size of the dot corresponds to the scale of groundwater withdrawal, with the smallest representing less than 10 million gallons annually and the largest representing over 1 billion gallons annually. Groundwater withdrawals for municipal public supply are highest in areas where large surface water sources are unavailable. While agricultural irrigation made up a similar share of total groundwater withdrawals as municipal public supply, agricultural irrigation withdrawals occur almost exclusively during the growing season from May to September.

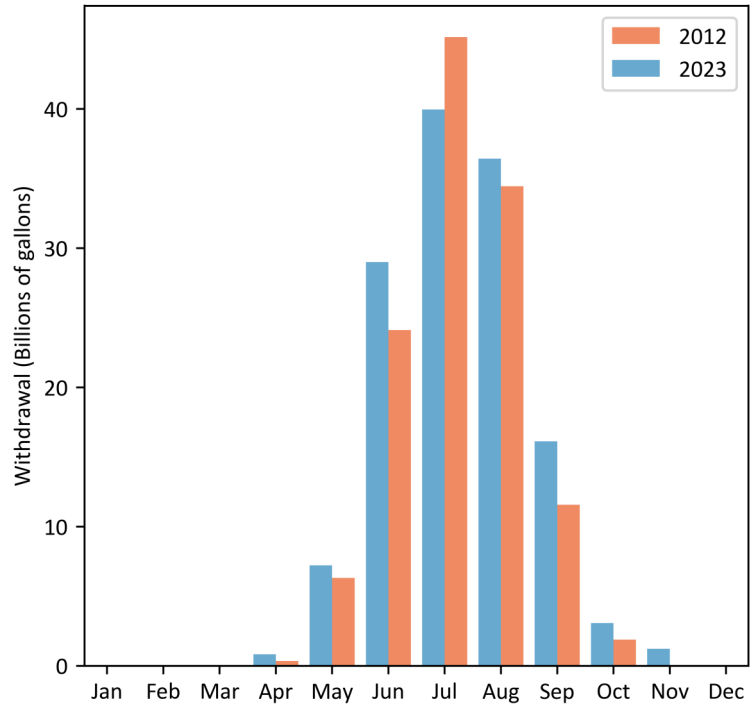
# 2012 And 2023 Droughts

Both 2012 and 2023 were significant drought years for Wisconsin. Within the last 15 years, both years saw the highest agricultural and municipal public supply water use. The following focuses on agricultural use.

Pumping in 2023 was higher, potentially due to the nearly 700 high capacity wells that have been approved since 2012 and additional water use due to the prolonged period of dry weather between May and September.

Compared to 2012, surface water resources were less impacted by the increased pumping and decreased precipitation due to the preceding 2017-2022 period of extremely wet weather that elevated water tables across the state. 2023 was cooler during the growing season months as well, and 2012 is the hottest year on record as of the publishing of this report. Despite this, 2023 still outpaced 2012 in terms of pumping volume.

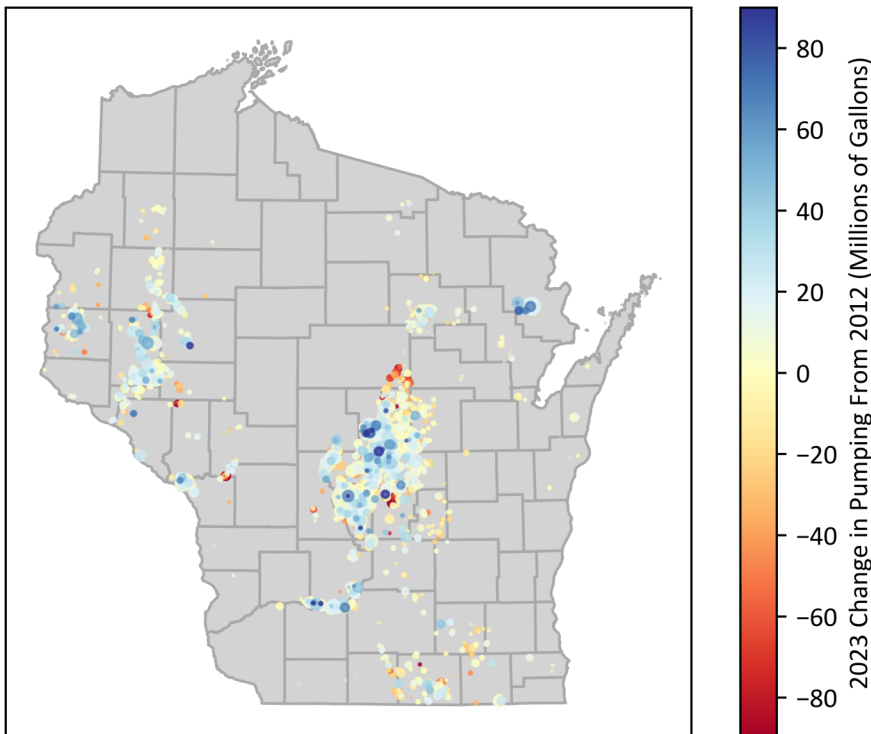
## Statewide Total Irrigation - 2012 and 2023



Agricultural water use, excluding cranberry related water use. 2012 pumping shows a higher peak pumping volume, but 2023 had higher pumping in the shoulder seasons.

## Comparison of Irrigation Withdrawals

Change In Total Annual Irrigation Pumping In 2023 Versus 2012



The map to the left shows each irrigation high capacity well that was active in both 2012 and 2023.

The size of the dot indicates the amount of pumping in 2023 relative to the median value. The color of the dot indicates the difference between 2012 and 2023 annual water use. The dots in dark blue dots mean there was more pumping in 2023, dark red dots mean more in 2012 and yellow dots indicate roughly equivalent pumping in both years. Northwestern Wisconsin also saw increases in 2023.



# Wisconsin Water Use Key Findings

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- **11,516 active sources** withdrew water throughout the year. Wisconsin had 10,775 high-capacity wells and 741 surface water withdrawals active during 2023.
- In 2023, Wisconsin water users withdrew **1.8 trillion gallons** from surface water and groundwater.
- **2023 ranked as the No. 4 lowest year** for total withdrawals since 2012, and the **highest** year for groundwater withdrawals since 2012.
- Surface water withdrawals accounted for **85% (1,521 billion gallons)** of the annual water withdrawal volume.
- Power generation and municipal water supply users withdrew **81% (1,454 billion gallons)** of the annual withdrawal volume.
- **Water withdrawals peaked in the summer** when power generation increased withdrawals to cool power plants and agricultural irrigation to supplement rainfall.
- Groundwater withdrawals accounted for **15% (271 billion gallons)** of the annual withdrawal volume, with the majority used for municipal water supply and agricultural irrigation.
- **Power plants and municipalities** were the primary users of Lake Michigan water in southeastern Wisconsin.
- **Agricultural irrigation and municipalities** primarily used high amounts of groundwater in the Central Sands and south-central Wisconsin.
- **Groundwater levels fell** in 2023 but remained within normal ranges due to the previously exceptionally wet period over the last several years.

## Works Cited

- <sup>1,2</sup> Klister, E. (2024, January 30). *Wisconsin year-end Climate Synopsis for 2023*. Wisconsin State Climatology Office. <https://climatology.nelson.wisc.edu/wisconsin-year-end-climate-synopsis-for-2023/>