Wisconsin Water Use

2016 Withdrawal Summary

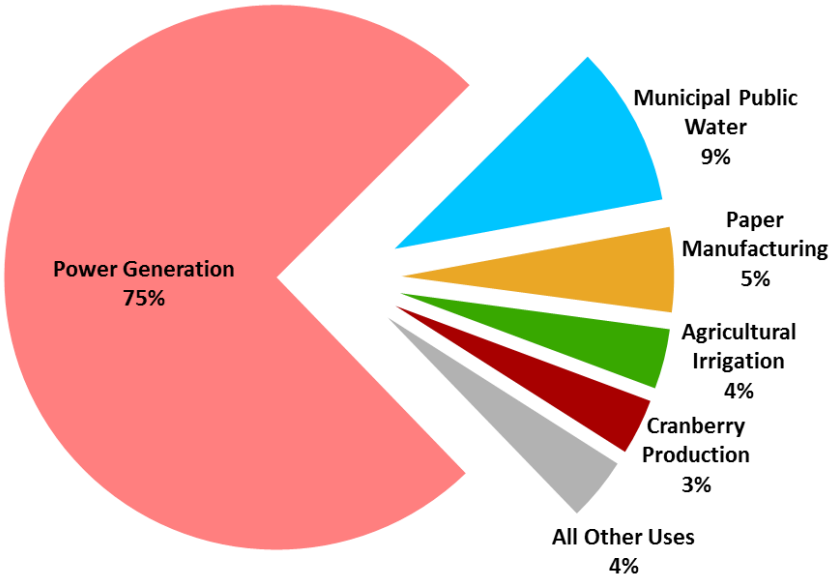
Water supply systems in Wisconsin capable of withdrawing 100,000 gallons or more per day are required to register and report withdrawals annually. The state currently has over 12,000 registered active sources that include wells, ponds, streams, rivers and lakes. In 2016, total statewide water withdrawals exceeded 1.88 trillion gallons, a decrease of about 6% compared to 2015. The 1.88 trillion gallons is roughly equal to 3 times the volume of water in Lake Winnebago or enough water to cover the surface area of Wisconsin in nearly 1.7 inches of water.

How and when water is withdrawn varies seasonally. Withdrawal volumes typically vary throughout the year with seasonal temperature and precipitation patterns. Wisconsin, excluding the southeastern counties of the state, saw increased precipitation in 2016, especially during the peak water use months of summer. As a result water use decreased even though annual average temperatures were higher.

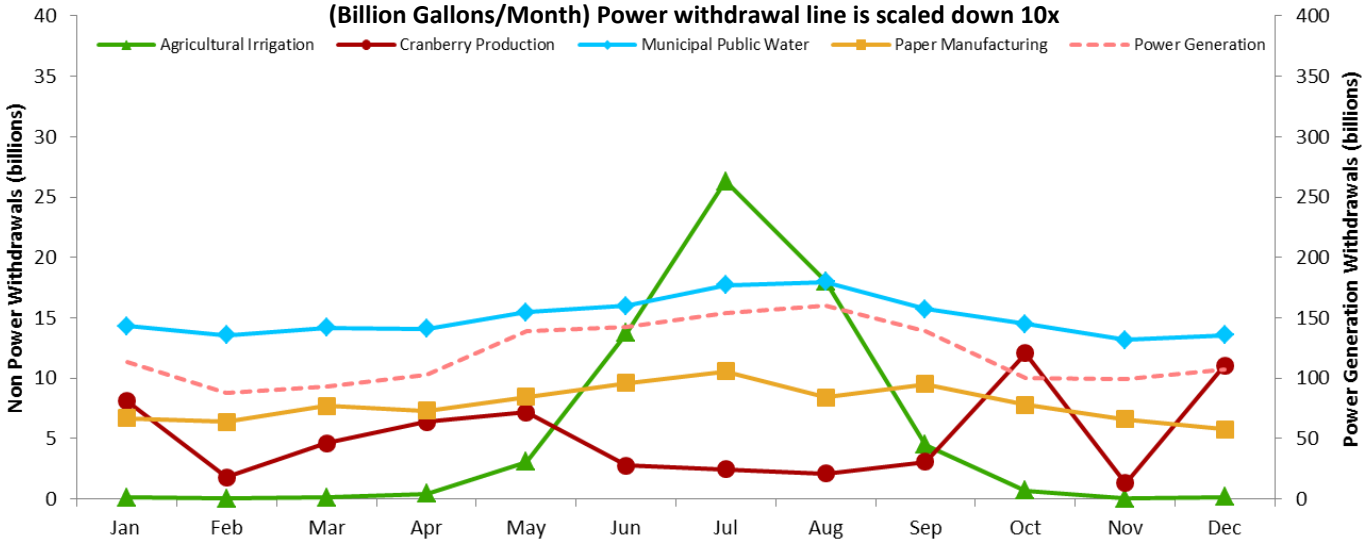
- Agricultural Irrigation water use decreased nearly 20% from 2015, driven largely by increased rainfall during the growing season.
- Water demand for Power Generation was down 57 billion gallons or 4% from the recent low in 2014. With additional facilities slated to close in the coming years the sector may continue to see reduced water demands.
- Municipal Public Water use increased 1% in 2016 driven by municipal surface water withdrawals, largely the result of increased industrial sales.

2016 Withdrawals by Use

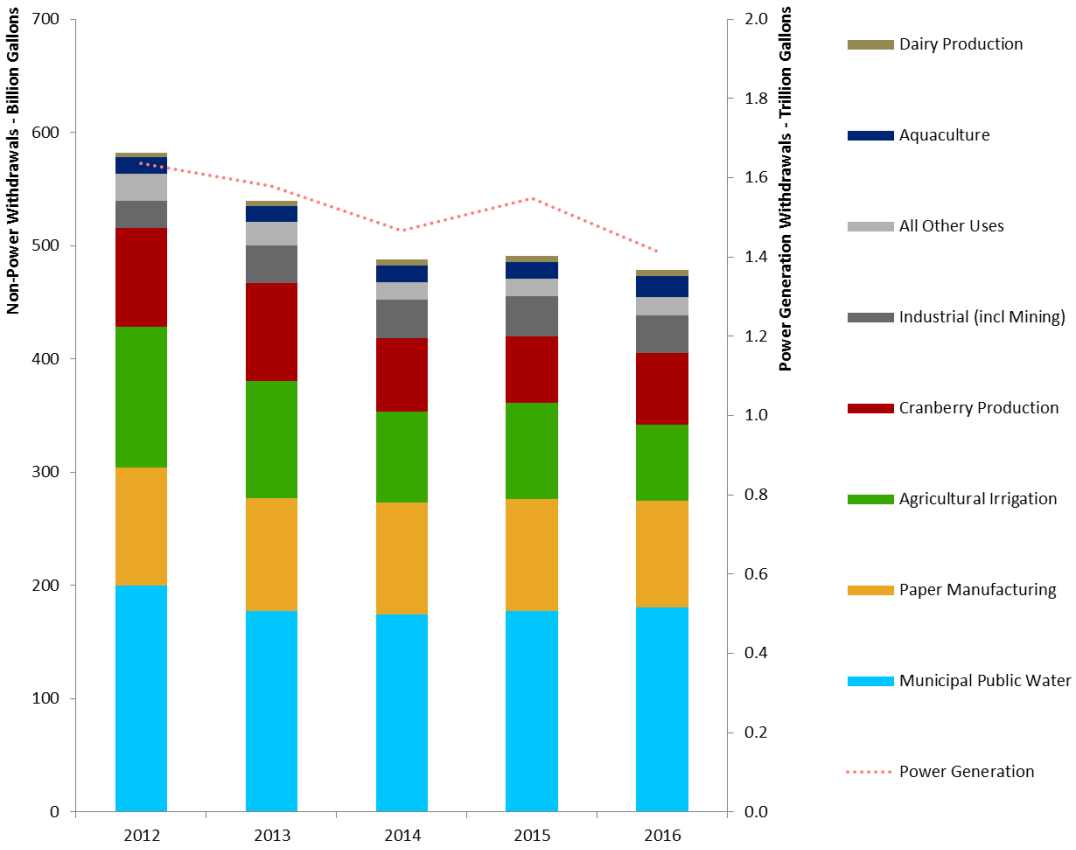
Total Withdrawals = 1.88 Trillion Gallons



2016 Monthly Variation in Top 5 Withdrawals



Annual Withdrawals by Category 2012 to 2016



- Total withdrawals in Wisconsin decreased in 2016 continuing a downward trend from the highs in 2012.
- Withdrawals for Cranberry Production increased slightly, but remained down a total of 30% since 2012.
- Dairy Production (+33%) and Industrial (+43%) withdrawers were two sectors that increased withdrawals from 2012 to 2016.
- Paper Production and Municipal Public withdrawals continue to remain relatively steady since 2012.

2016 Wisconsin Withdrawal Reporting Facts

- High capacity sources are any wells or surface water intakes on a property with the capacity to withdraw at least 100,000 gallons per day or 70 gallons per minute.
- There were 12,329 registered withdrawal sources in the state in 2016: 11,552 wells and 1,023 surface water sources.
- Owners supplied reports for 98% of the state's registered sources.
- Owners reported 16% of the registered sources were unused in 2016.

Water Use	Total Active Sources	Total 2016 Withdrawal (Bgal)	Active Ground Water Sources	2016 Ground Water With-drawal (Bgal)	Active Surface Water Sources	2016 Surface Water Withdrawal (Bgal)
Agricultural Irrigation	3,867	67.1	3,734	65.5	123	1.6
All Other Uses	2,437	8.7	2,394	5.3	43	3.4
Non-Municipal Public	1,681	3.6	1,681	3.6	-	-
Municipal Public	1,664	180.2	1,640	93.0	24	87.2
Dairy Production	709	9.5	709	9.5	-	-
Industrial (non-mining)	545	15.3	517	8.7	28	6.6
Golf Course Irrigation	442	4.0	378	3.4	61	0.6
Cranberry Production	404	62.8	139	2.7	263	60.1
Non-Metallic Mining	299	18.8	168	16.1	131	2.7
Aquaculture	163	15.6	144	7.8	19	7.8
Power Generation	66	1,409.6	37	1.1	28	1,408.5
Paper Manufacturing	52	94.8	11	1.7	41	93.1

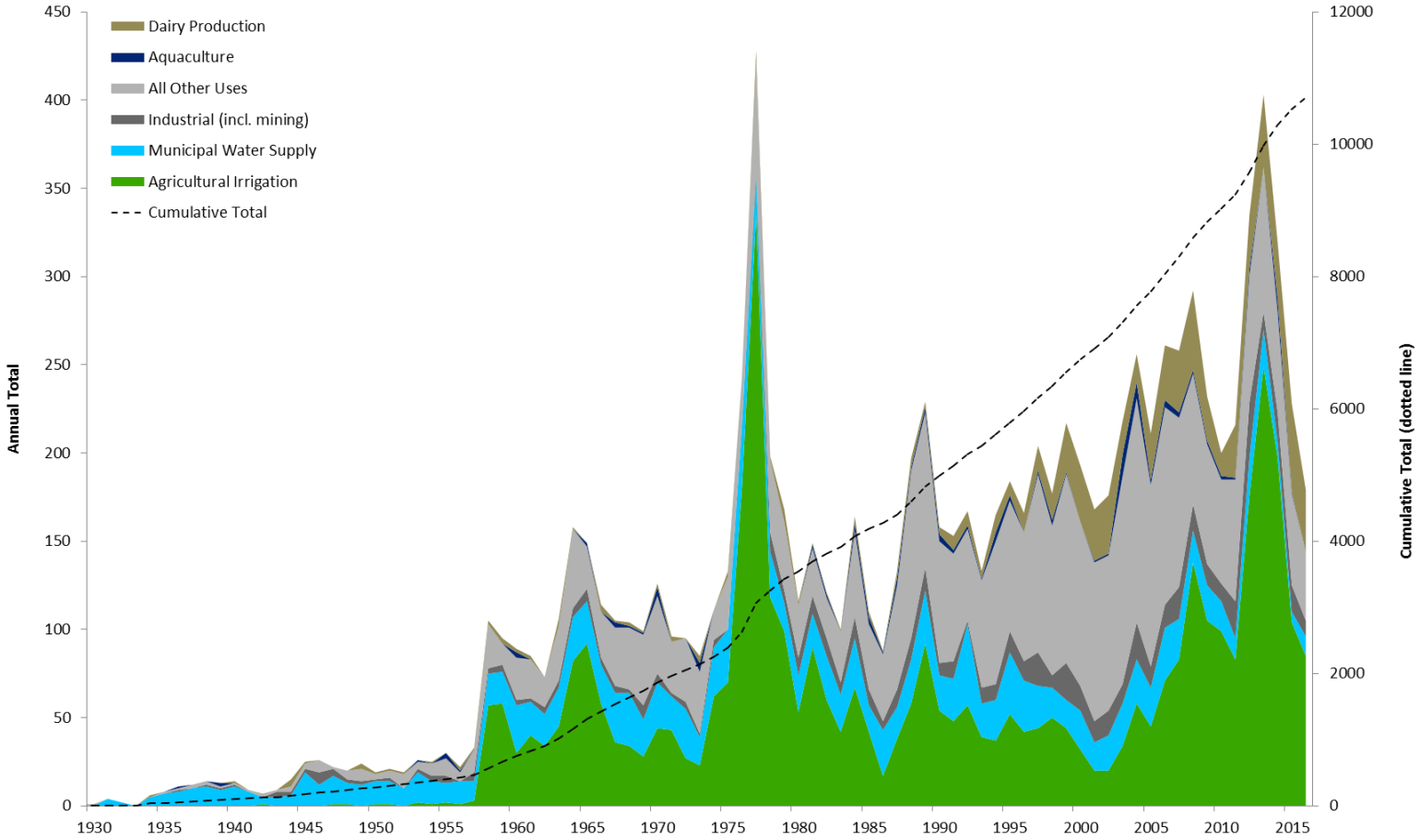
Bgal = Billion Gallons

High Capacity Groundwater Withdrawal Trends

According to Wisconsin law, a high capacity well is any well located on a property on which all wells together have the collective capacity to withdraw 100,000 gallons per day or more, except for wells used solely for residential or fire protection purposes. This is about 70 gallons per minute (gpm). For instance, a high capacity property could be composed of a single 70 gpm well, two 35 gpm wells or any combination of wells that together can withdraw 70 gpm or more. The capacity of many municipal wells is greater than 1500 gpm, most irrigation wells can withdraw about 1,000 gpm, industrial wells average about 300 gpm and dairy wells average about 70 gpm.

- Wisconsin began regulating construction of high capacity wells in 1945.
- Wisconsin maintains an inventory of high capacity wells dating back to the early 20th century.
- About 1/3 of the high capacity wells in Wisconsin are used for agricultural irrigation.
- Widespread use of wells for irrigation began in the late 1950s when a very severe drought coincided with the arrival of new irrigation and well drilling technology.
- The largest spikes in well construction coincide with drought as seen in 1976-77 and in 2012.
- Municipal well construction has declined in the last few years. This is due in part to new water efficient appliances, fixtures and technologies that reduce municipal customer demand.
- Low capacity private well owners are not required to register wells or report water use. These are mostly residential and farm wells that use an estimated 50 to 75 billion gallons per year.

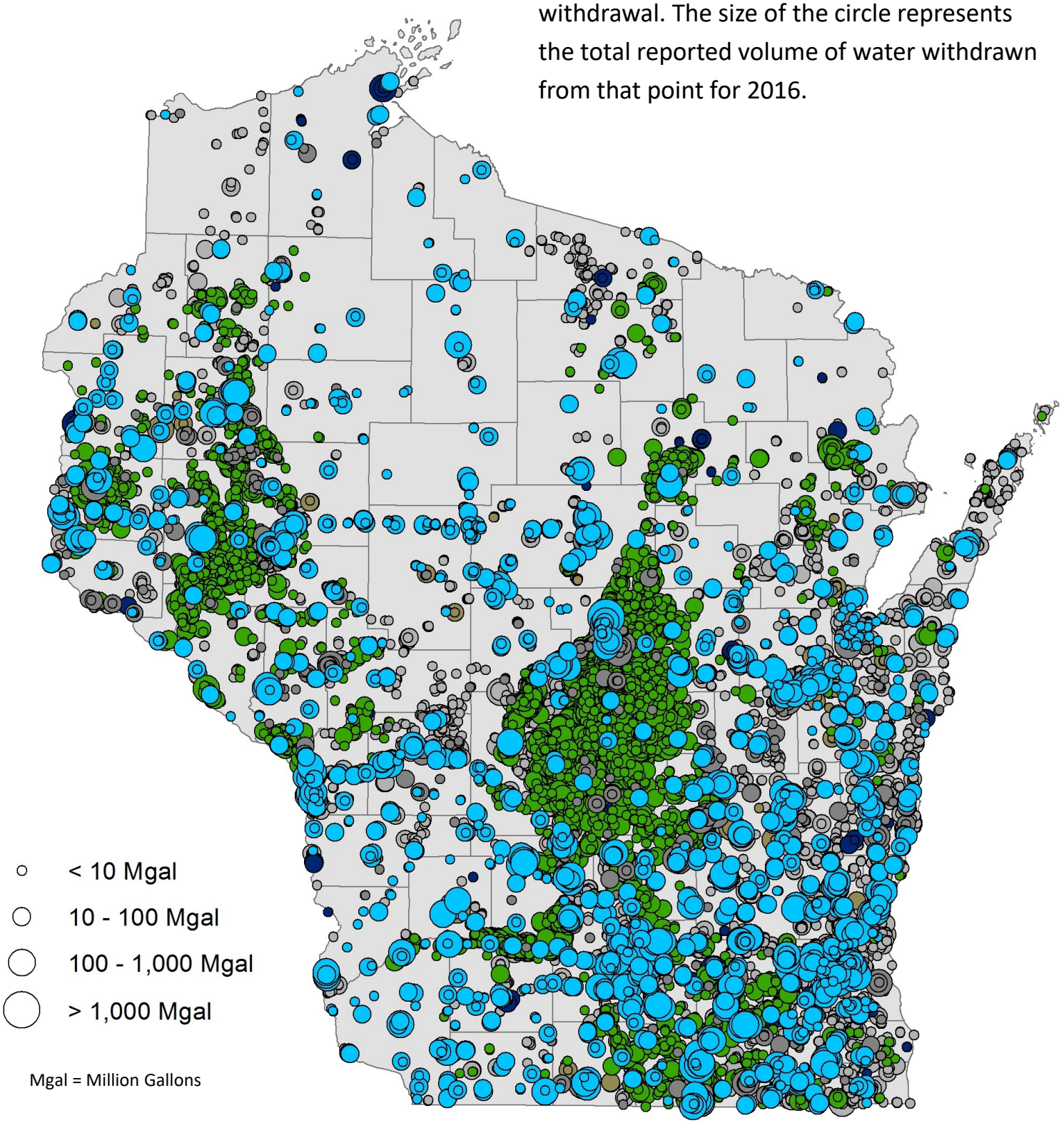
Construction Dates of Currently Active High Capacity Wells



* Does not include approximately 4,000 registered small wells located on high capacity well properties that are used solely for domestic or fire suppression purposes. Includes only currently active wells. Wells constructed and subsequently abandoned are not counted.

2016 Groundwater Annual Withdrawals

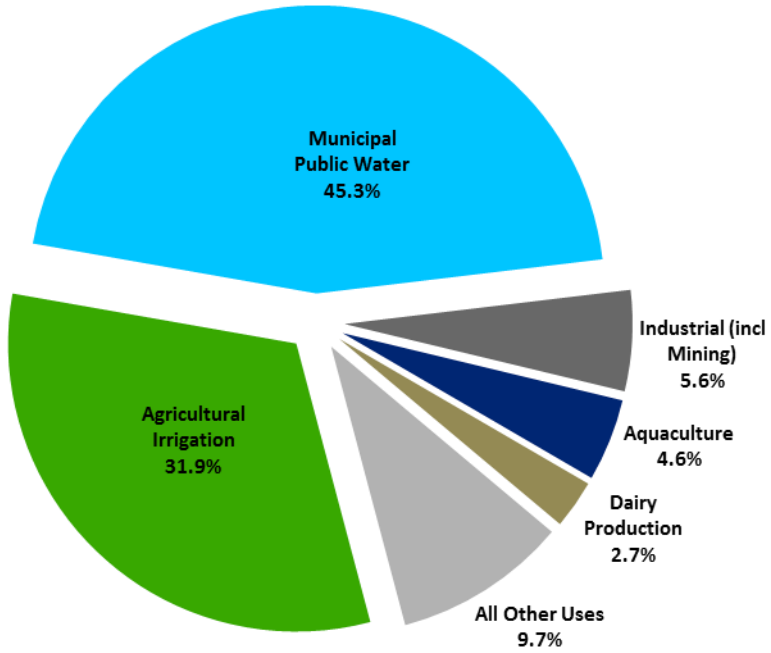
Each circle represents a single 2016 point of withdrawal. The size of the circle represents the total reported volume of water withdrawn from that point for 2016.



2016 Total Groundwater Withdrawals by Water Use

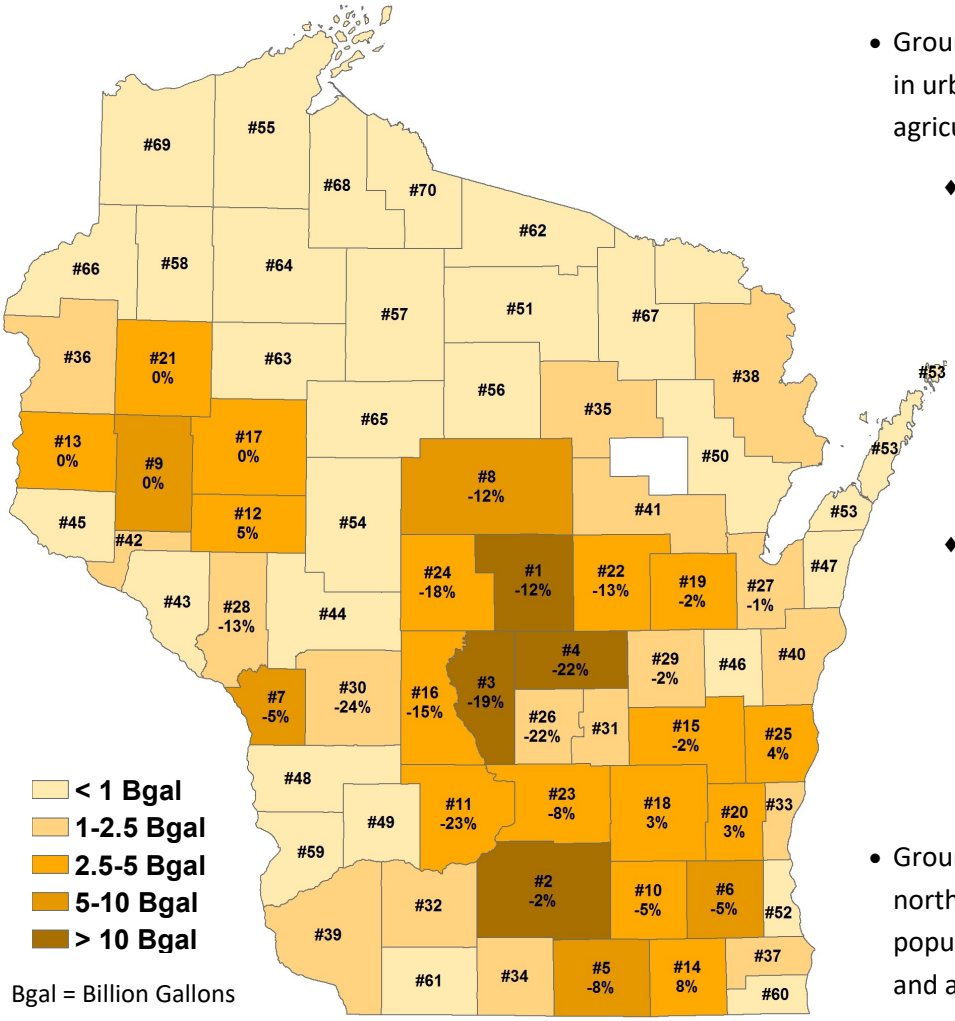
203 billion gallons statewide

- 11% of all statewide withdrawals were from groundwater. These totaled 203 billion gallons from over 11,000 high capacity wells active in 2016.
- Municipal Public Water supplies remained the largest withdrawer of groundwater. These wells are typically owned by cities and deliver water for residential, commercial, institutional and industrial uses. Municipal suppliers withdrew 93 billion gallons, down from 94 billion in 2015.
- Agricultural irrigation is the second largest withdrawer of groundwater in the state. Irrigation rates are typically tied to annual changes in weather. Given the increased rainfall during the 2016 growing season total irrigation withdrawals decreased 19% from 81.2 billion gallons in 2015 to 65.5 billion gallons in 2016.



2016 Total Groundwater Withdrawals by County

Top number indicates ranking of total withdrawal by county (#1 = highest, #71 = lowest).
The bottom number represents percent change from 2015 for the 30 highest ranked counties.

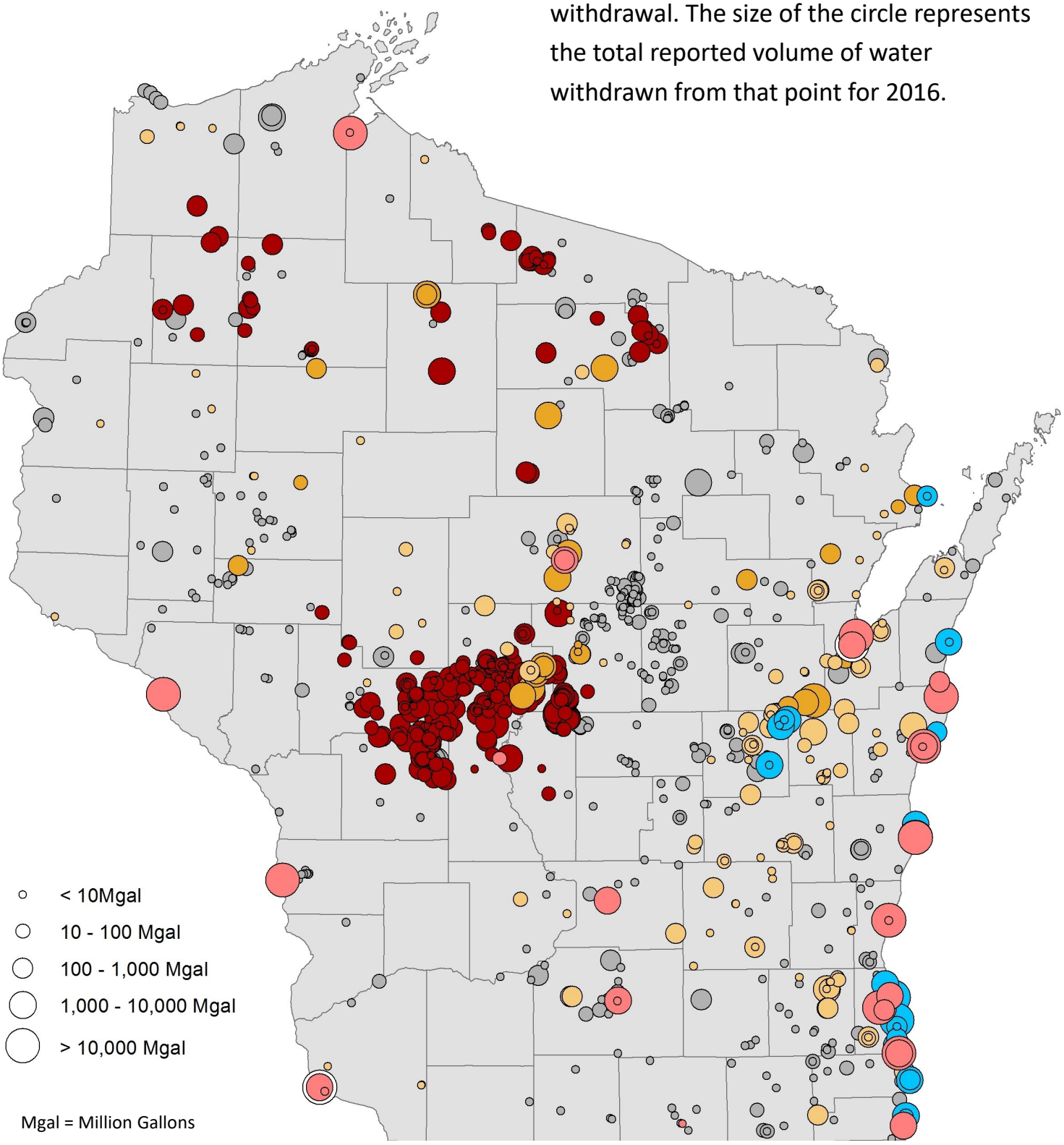


Bgal = Billion Gallons

- Groundwater withdrawals are most concentrated in urban areas not supplied by surface water and agricultural areas with high irrigation demand.
  - Portage (#1), Adams (#3) and Waushara (#4), comprise much of the Central Sands area of the state. This area is a globally significant vegetable and potato producing region. With increased precipitation during the summer months the need for irrigation was significantly reduced resulting in decreased water use for 2016.
  - Dane (#2), Rock (#5), and Waukesha (#6) have large urban/suburban populations that rely on groundwater to meet their residential, commercial and industrial water needs. Withdrawals in Dane decreased slightly, despite becoming the #2 from the #4 groundwater user.
- Groundwater withdrawals are smallest in the far north where land use is more forest based, populations are lower, agriculture is less prevalent and aquifers are less productive.

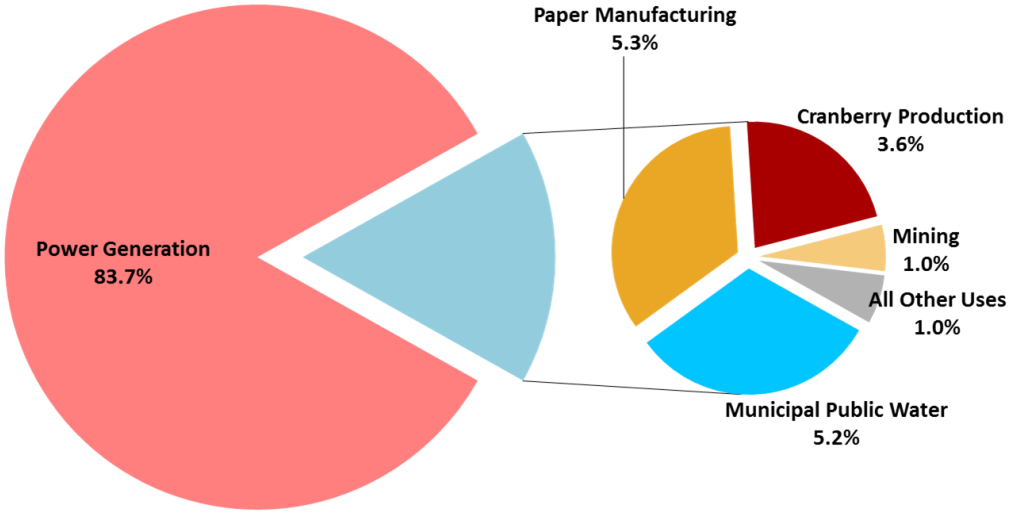
2016 Surface Water Annual Withdrawals

Each circle represents a single 2016 point of withdrawal. The size of the circle represents the total reported volume of water withdrawn from that point for 2016.



2016 Total Surface Water Withdrawals by Water Use

1.68 trillion gallons statewide

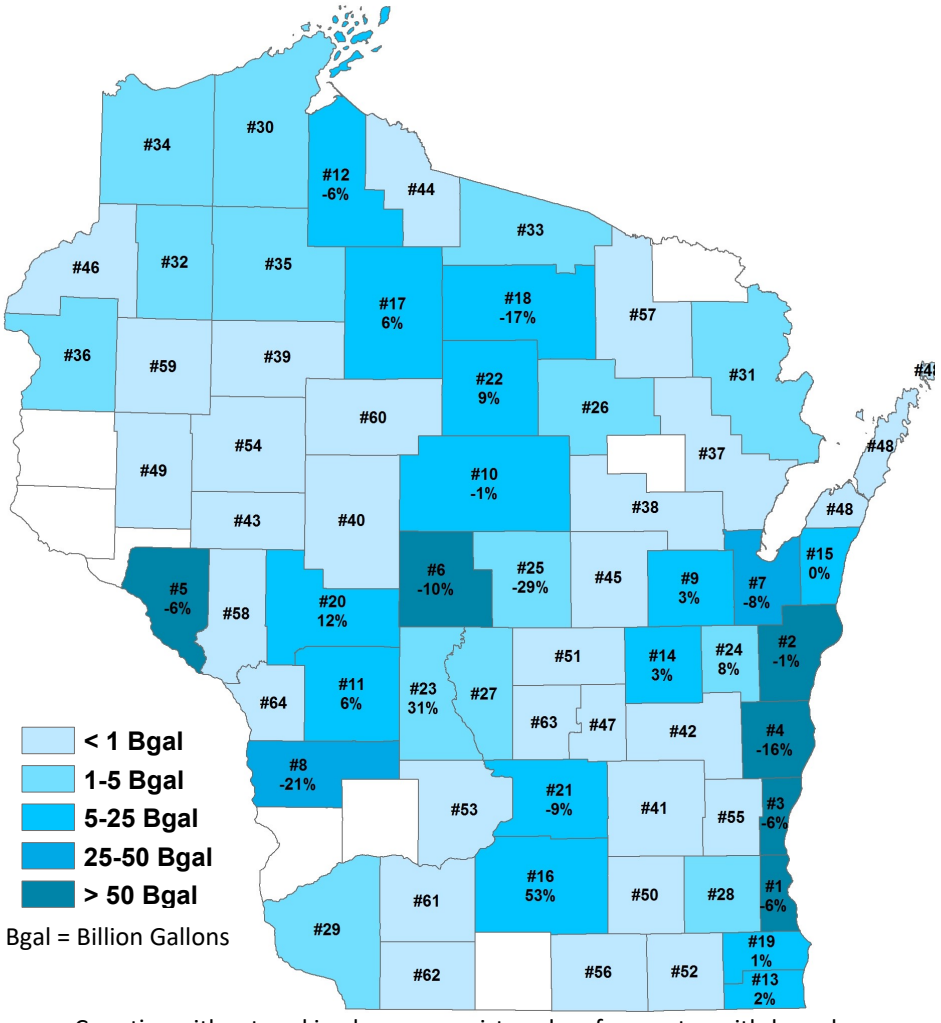


- Many surface water withdrawals are used and discharged near their point of withdrawal. This results in little water lost from the original source relative to the size of the withdrawal.
- 89% of all statewide withdrawals were from surface water. Totaling 1.68 trillion gallons from 754 active sources in 2016.
- The largest volume of water withdrawn in the state (1.41 trillion gallons) was used by Power Generation facilities. These facilities are concentrated along Lake Michigan and the Wisconsin and Mississippi Rivers.

2016 Total Surface Water Withdrawals by County

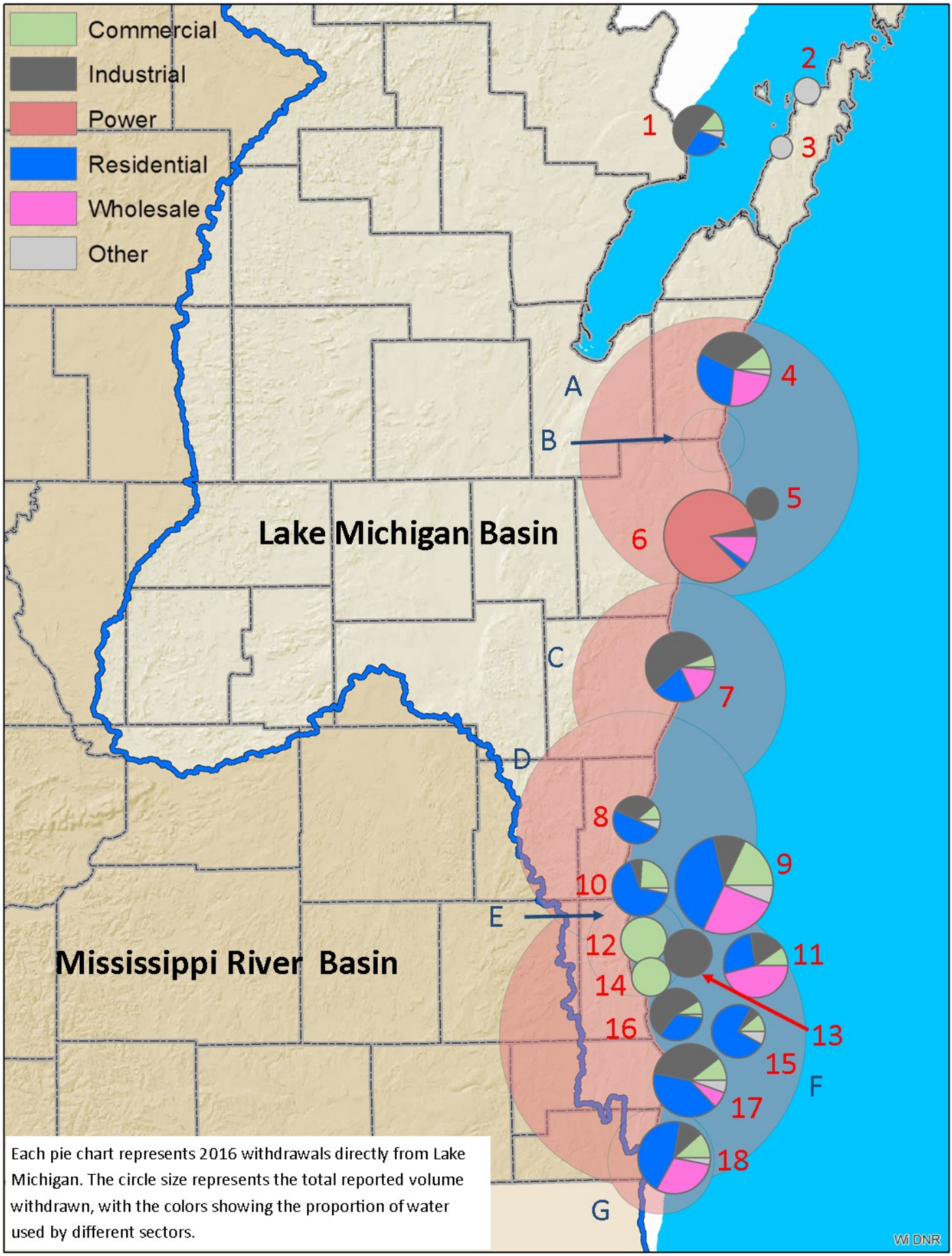
Top number indicates ranking of total withdrawal by county (#1 = highest, #72 = lowest).
The bottom number represents percent change from 2015 for the 25 highest ranked counties.

- The number of active surface water sources remained the same in 2016 with 779 active sources in 65 of Wisconsin's 72 counties.
  - Surface water withdrawals for Municipal Supply (5%) and Cranberry Production (6%) sectors increased from 2015, totaling an increase of 8.3 billion gallons.
- All other sectors using more than 1 billion gallons of surface water saw a decrease in water use in 2016. In total Wisconsin used 133 billion gallons less of surface water in 2016 than 2015.
- Power Generation facilities represented the majority of withdrawals in the five top ranked counties of Milwaukee (#1), Manitowoc (#2), Ozaukee (#3), Sheboygan (#4) and Buffalo (#5).
  - The resumption of full operation of power generation facilities in Dane County resulted in a 53% increase in surface water withdrawals.
- Surface water is key to producing some of Wisconsin's top products:
  - Paper in Brown (#7), Wood (#6), Outagamie (#9) and Marathon (#10) counties.
  - Cranberry in Wood (#6), Monroe (#11), and Jackson (#20).



Counties without ranking have no registered surface water withdrawals.

2016 Lake Michigan Withdrawals



For more information regarding the Water Use Reporting program or to request more specific information on withdrawals, please visit our website or contact Water Use Program staff: dnr.wi.gov keyword "**Water Use**"
DNRWaterUseRegistration@Wisconsin.gov 608.266.2299

2016 Lake Michigan Withdrawals

The table includes annual and average daily surface water withdrawals directly from Lake Michigan. The withdrawal information is from 2016 water use data reported to the Wisconsin DNR water use program. Sector water use percentages were calculated using Wisconsin Public Service Commission reports. The wholesale category represents water sales to other public water systems. The "other" category includes water sales for irrigation, public authority and fire protection.

	Water User	Commercial	Industrial	Power	Residential	Wholesale	Other	Daily Average (million gallons)	Annual Total (million gallons)
1	City of Marinette	14%	52%	-	29%	0%	5%	1.8	661
2	Peninsula State Park	-	-	-	-	-	100%	0.0	17
3	Alpine Inc.	-	-	-	-	-	100%	0.0	5
4	City of Green Bay	11%	32%	-	31%	24%	3%	17.9	6,535
5	Briess Industries	-	100%	-	-	-	-	0.1	42
6	City of Manitowoc	1%	3%	83%	3%	10%	0%	70.4	25,691
7	City of Sheboygan	6%	56%	-	20%	17%	1%	12.7	4,620
8	City of Port Washington	11%	32%	-	50%	-	6%	1.3	467
9	City of Milwaukee	18%	11%	-	39%	26%	6%	98.3	35,879
10	North Shore Water Commision	24%	7%	-	66%	0%	3%	3.6	1,299
11	City of Oak Creek	10%	18%	-	27%	46%	1%	8.0	2,918
12	Milwaukee Art Museum	100%	-	-	-	-	-	1.0	378
13	Milwaukee Metropolitan Sewerage District	-	100%	-	-	-	-	1.3	464
14	Discovery World Museum	100%	-	-	-	-	-	0.4	131
15	City of South Milwaukee	11%	6%	-	75%	-	8%	2.6	967
16	City of Cudahy	9%	55%	-	34%	-	2%	2.2	807
17	City of Racine	10%	36%	-	40%	7%	5%	16.9	6,152
18	City of Kenosha	12%	11%	-	45%	30%	3%	15.9	5,814
A	Nextera Energy Point Beach	-	-	100%	-	-	-	946.2	345,360
B	Dominion Energy	-	-	100%	-	-	-	1.6	575
C	Alliant Energy Edgewater	-	-	100%	-	-	-	241.9	88,278
D	WE Energies Port Washington	-	-	100%	-	-	-	462.4	168,783
E	University of Wisconsin- Milwaukee	-	-	100%	-	-	-	6.7	2,431
F	WE Energies Oak Creek	-	-	100%	-	-	-	1,556.7	568,205
G	We Energies Pleasant Prairie	-	-	100%	-	-	-	12.6	4,606

Lake Michigan Water Withdrawal Information

- There are 25 water systems with 38 intakes withdrawing water directly from Lake Michigan
- Lake Michigan supplies nearly 1.3 trillion gallons of water, more than any other single source in the state. Over 1.2 trillion gallons are used for Power Generation while just over 70 billion gallons are used for all other water uses.
- Municipal Public water use from Lake Michigan varies substantially based on the community and can serve a wide range of purposes driven by local socio-economic factors.
- Briess Industries took over an idled malting facility formerly owned by Budweiser and resumed withdrawals in 2015.
- The Milwaukee Art Museum and Discovery World use Great Lakes water for non-contact geo-thermal cooling purposes.
- Alpine Inc. and Peninsula State Park use Lake Michigan water solely for golf course irrigation.
- It is common for Lake Michigan municipal systems to sell water wholesale to surrounding communities as it maximizes the use of existing infrastructure and is often the most cost effective source for drinking water.
- The 2016 Great Lakes Regional Water Use Report estimates 3.5 trillion gallons were withdrawn directly from Lake Michigan in 2016. Wisconsin withdrawals totaled nearly 1.3 trillion accounted for 36% of total Lake Michigan withdrawals. [1]

[1] Annual Report of the Great Lakes Regional Water Use Database Representing 2016 Water Use Data. Table 6a, P 20. https://waterusedata.glc.org/pdf/2016-Water-Use-Report-Final.pdf