



Annual Report of the Great Lakes Regional Water Use Database

Representing 2021 Water Use Data

Prepared by the Great Lakes Commission for the
Great Lakes-St. Lawrence River Water Resources Regional Body and the
Great Lakes-St. Lawrence River Basin Water Resources Council



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Preface

This is the Annual Report of the Great Lakes-St. Lawrence River Regional Water Use Database, representing 2021 water use data. These data are provided by the Great Lakes-St. Lawrence River states and provinces to the Great Lakes Commission (GLC), which serves as the database repository under the Great Lakes-St. Lawrence River Basin Water Resources Compact (Compact) and the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement).

The Great Lakes-St. Lawrence River Regional Water Use Database (the database) has been operational since 1988. It was created by the states and provinces in response to a provision of the 1985 Great Lakes Charter (Charter) that called for the establishment and maintenance of a regional system for the collection of data on major water uses, diversions and consumptive uses in the binational Great Lakes-St. Lawrence River Basin (the basin). The Charter (a precursor to the Compact and Agreement) was a nonbinding, “good faith” agreement signed by the Great Lakes governors and premiers that set forth a series of principles and procedures for strengthening water management activities in the basin. The Charter envisioned a centralized database as an important tool to support a regional water resources management program that guides the future development, management and conservation of the water resources of the basin. In 1987, the GLC was selected to serve as the repository for the regional water use database and has operated and maintained the database since that time.

In 2008, the Great Lakes St. Lawrence Governors & Premiers (GSGP, formerly the Council of Great Lakes Governors) helped to implement needed improvements in jurisdictional water use data collection and reporting programs. In its role as Secretariat to the Great Lakes-St. Lawrence River Water Resources Regional Body (Regional Body) and the Great Lakes-St. Lawrence River Basin Water Resources Council (Compact Council), and through its Great Lakes Water Use Information Initiative, the GSGP led the states and provinces through a process that culminated in the drafting of new water use data collection and reporting protocols. The Compact Council and Regional Body adopted these protocols in 2009. The protocols offer guidance to ensure that water use data provided to the database by the states and provinces is accurate, of the highest quality and reported in a consistent manner. Modifications to the reporting protocols were instituted via Compact Council and Regional Body resolutions in 2016 to support the advancement of the regional water use database.

While the updated data protocols were an important step in support of a more robust regional water management regime, it is recognized that improvements in data collection, reporting, quality, accuracy and

compatibility must continue to occur. The following section describes the progress made in 2022 to improve data quality and the quality of data for the 2021 annual report.

Overview

Improving Data Quality

Together with the GSGP, the GLC is working with the states and provinces to improve data collection, reporting, quality, accuracy and compatibility. To guide the preparation of 2021 water use data and this report, several steps have been taken to improve data quality.

Starting with the 2014 water use year, the GLC collected information from each jurisdiction that describes water use data and includes information related to data sources, rates of reporting compliance (i.e., the percentage of users submitting the required reports to the jurisdiction) by water use sector, the year from which the data was collected, significant changes in the data between the current year and previous years, and reasons for those changes. To achieve this, the GLC created an online data management system that assists in the creation of metadata. For this report, the states and provinces submitted metadata along with associated 2021 water use data to the GLC. Project staff met by phone with representatives from each jurisdiction to discuss changes in compliance rates and reported water use from the previous year. Implementing this process has resulted in improvements to the database in both compliance rates and data quality.

The GLC will continue to work with the states and provinces to identify additional areas for improvement. While this report contains the best available information as of its publishing date, the states and provinces may continue to update their data in the online water use database (<https://waterusedata.glc.org/>). Discrepancies between the data online and those summarized in this report may appear. *In all cases, the online database will contain the most current available data.*

In compiling this report, the report authors noted specific steps taken by each jurisdiction to improve reporting compliance and data quality. The states and provinces have reporting programs in place that require users to report their water use each year to their jurisdiction. Reporting compliance varies across the basin by jurisdiction and sector, affecting the quality of the data. Table 1 summarizes reporting compliance rates by jurisdiction in 2021; Illinois, Minnesota, New York, Ohio and Pennsylvania reported 100 percent compliance in data reporting.

Beyond compliance, the number of reported users can also vary from year to year due to user changes in status as a threshold facility. Only water use data from facilities that withdraw more than 100,000 gallons per day (or 380,000 liters per day) averaged over a 30-day period (referred to as the trigger level for reporting) are included, per the Compact and Agreement. Some facilities that tend to withdraw water in volumes close to the reporting trigger level may therefore change from being a threshold facility (defined as a water user withdrawing water at or above the trigger level) from one year to the next based on weather conditions, business operations or other factors. Water use sectors that see more interannual variability in use, like self-supply irrigation, may have greater changes in the number of threshold facilities than other use sectors. In some instances, 2021 saw a 'bounce back' of facilities reporting water use due to lessened restrictions from the COVID-19 pandemic, resulting in an increase in the number of threshold facilities for

certain sectors. This may inflate the relative change in water use, since the water use of these facilities from prior years is not included in the report. These changes are discussed in the jurisdiction report sections.

Table 1. Percent Reporting Compliance to the Jurisdiction by Water Use Sector*

Sector	IL	IN	MI	MN	NY	OH	ON	PA	QC	WI
Public Water Supply	100	90	99	100	100	100	99	100	94	100
Self-Supply Commercial & Institutional	100	80	91	100	100	100	96	100	78	95
Self-Supply Irrigation	100	90	70	100	100	100	95	100	72	96
Self-Supply Livestock	-	100	74	100	100	100	90	100	56	94
Self-Supply Industrial	100	88	90	100	100	100	90	100	80	96
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	100	100	100	100	100	100	-	-	100
Self-Supply Thermoelectric Power Production (Recirculated cooling)	-	100	100	100	100	100	-	-	-	100
Off-Stream Hydroelectric Power Production	-	-	N/A	100	100	100	-	-	-	-
In-Stream Hydroelectric Water Use	-	N/A	N/A	100	100	100	98	-	-	-
Other Self Supply	100	82	85	100	100	100	92	100	80	97

A blank indicates that the jurisdiction did not report any water use figures for that particular sector. N/A indicates that facilities are not required by jurisdiction policy to report water use for that particular sector.

**The definition of Compliance was updated for the 2021 water use data reporting process. For each water use category, the compliance rate measures the percentage of active, registered facilities with the capacity to withdraw 100,000 gallons per day or more averaged over a 30-day period that have reported to the relevant state/provincial program compared with the total number of facilities required to report.*

Great Lakes Regional Water Use for 2021

The Great Lakes-St. Lawrence River basin – the world’s largest fresh surface water system – spans an area of about 289,600 square miles (750,000 square kilometers). Its total volume is 6.5 quadrillion gallons (25 quadrillion liters), an amount that would fill almost ten billion Olympic-size swimming pools.¹

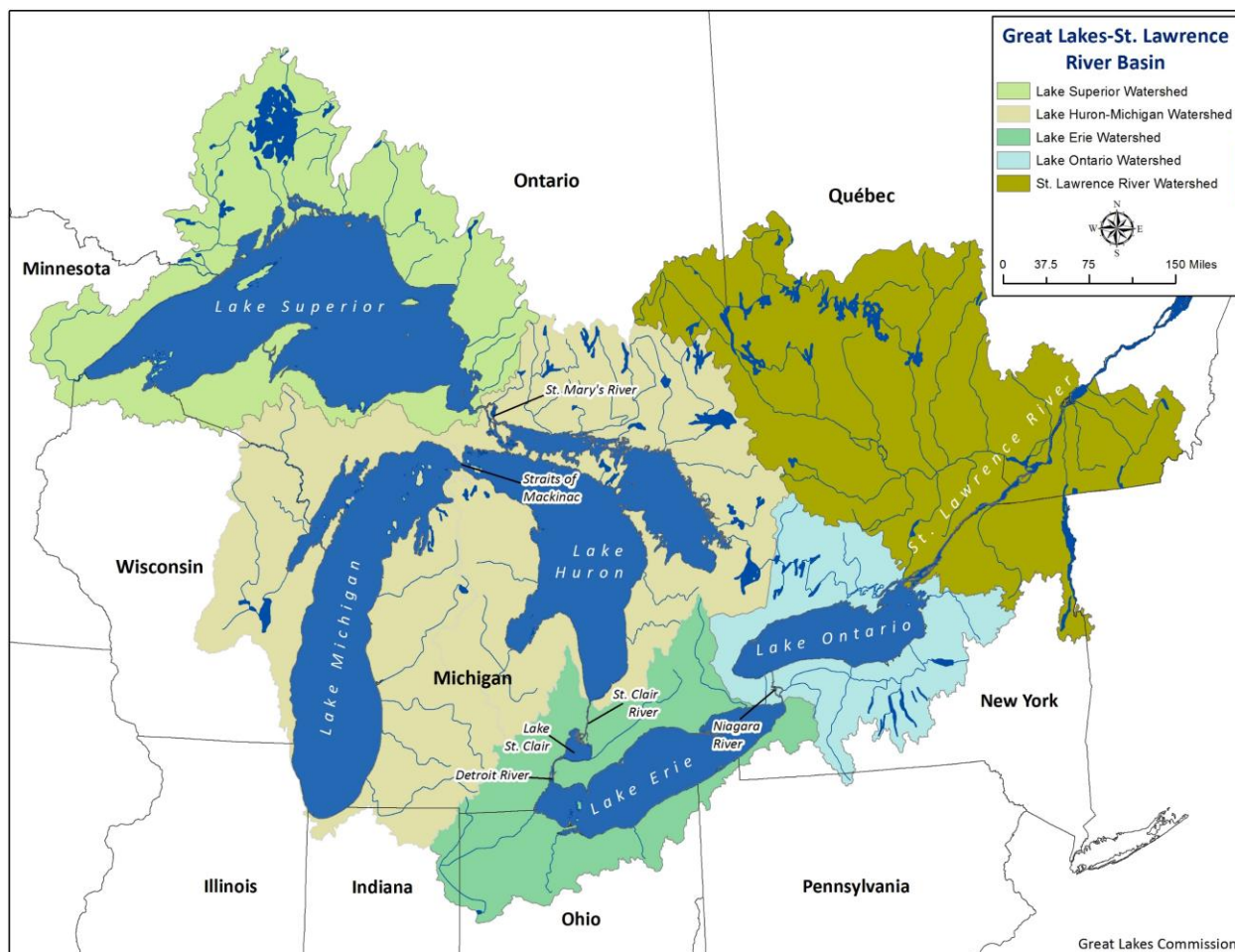


Figure 1. Great Lakes-St. Lawrence River basin

Water Withdrawals

In 2021, the total reported withdrawal amount for the Great Lakes-St. Lawrence River basin, excluding in-stream hydroelectric water use, was 37,469 million gallons per day (mgd) or 141,834 million liters per day (mld). In-stream hydroelectric power water use accounted for approximately 93 percent of the water use in the region but is not considered a withdrawal in the traditional sense because it includes “run of the river” use, where the water remains in the water body and has negligible water consumption. Therefore, despite being an important water use for the Great Lakes-St. Lawrence River region (e.g., New York produced more hydroelectric power than any other state east of the Rocky Mountains in 2021)², in-stream hydroelectric power use is ordinarily excluded from discussion of water use trends and impacts.

¹ An Olympic-size swimming pool holds about 660,000 gallons or 2.5 million liters.

² U.S. Energy Information Administration, [Electricity Data Browser](#). 2021.

Off-stream hydroelectric power generation is considered a withdrawal since the water is removed to a retention area or reservoir that serves as a storage system. This storage substantially increases the surface area of the water body and, in doing so, increases evaporation, resulting in a consumptive use of water. After being used for power generation, the water is returned to its original source. Both off-stream and in-stream totals are mentioned in the watershed and jurisdiction summaries in this report,³ but only off-stream hydroelectric power generation is typically incorporated in discussion, figures and overall water withdrawal totals.

The total 2021 water withdrawal amount represents a decrease of just over 1 percent from the total 2020 withdrawal amount of 37,861 mgd (143,319 mld). It is normal to see some fluctuation in water use from year to year, but some sectors, like self-supply irrigation, may exhibit greater variability due to the influence of weather patterns that increase or decrease seasonal use. It should be noted that withdrawals are not a measure of water consumed or lost to the basin, as much of the withdrawn water is returned to the basin after use. Approximately five percent of the total reported withdrawal amount (1,942 mgd or 7,350 mld) was consumed or otherwise lost from the basin.

Water withdrawals for all water use sectors, excluding the in-stream hydroelectric water use sector, are presented in Figure 2 below. The water use sectors are defined in Appendix A. Self-supply thermoelectric power production (once-through cooling), public water supply and self-supply industrial use are the primary water use sectors (i.e., those withdrawing the largest volumes of water).

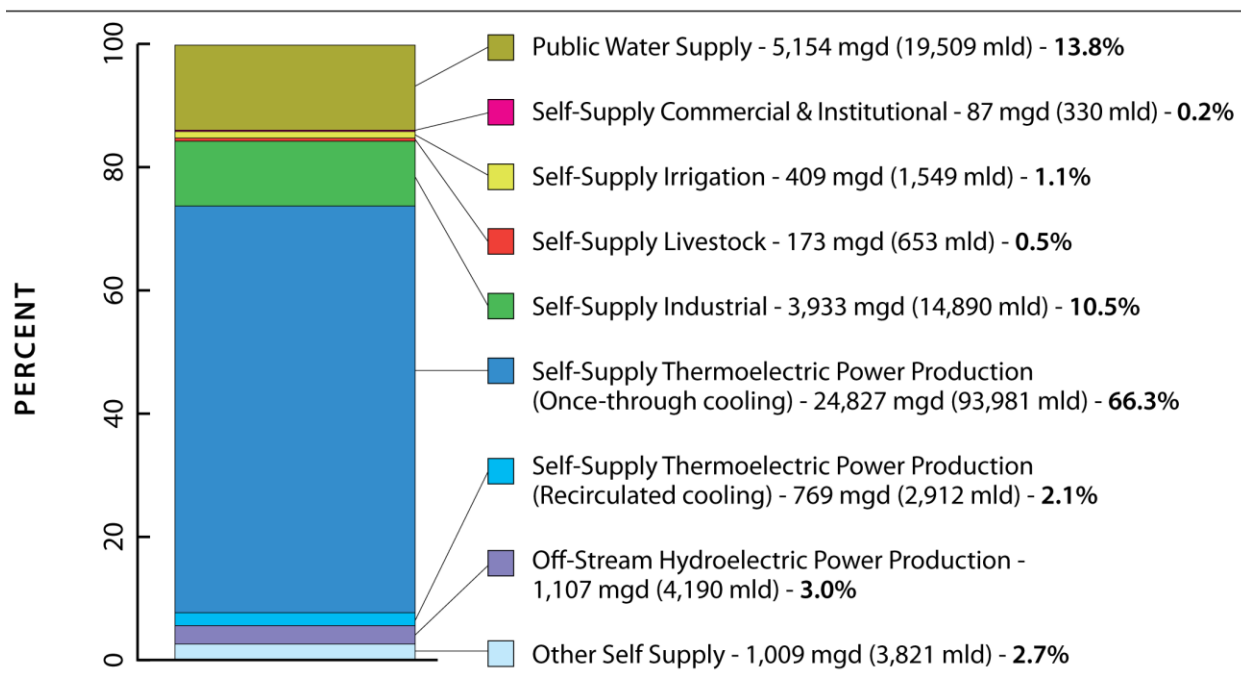


Figure 2. Water withdrawals by water use sector (excluding in-stream hydroelectric water use)

³ Under the 2009 water use data collection and reporting protocols, the reporting of in-stream hydroelectric power production data is optional, so the database and report do not represent this water use by all jurisdictions.

The Lake Michigan watershed had the greatest withdrawal amount, followed closely by Lake Ontario. Figure 3 shows withdrawals by watershed broken down by water source: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW). In most watersheds, Great Lakes surface water was the predominant source of water withdrawals, with the exception of the Lake Superior watershed, which had other surface water as its main source of water withdrawals.

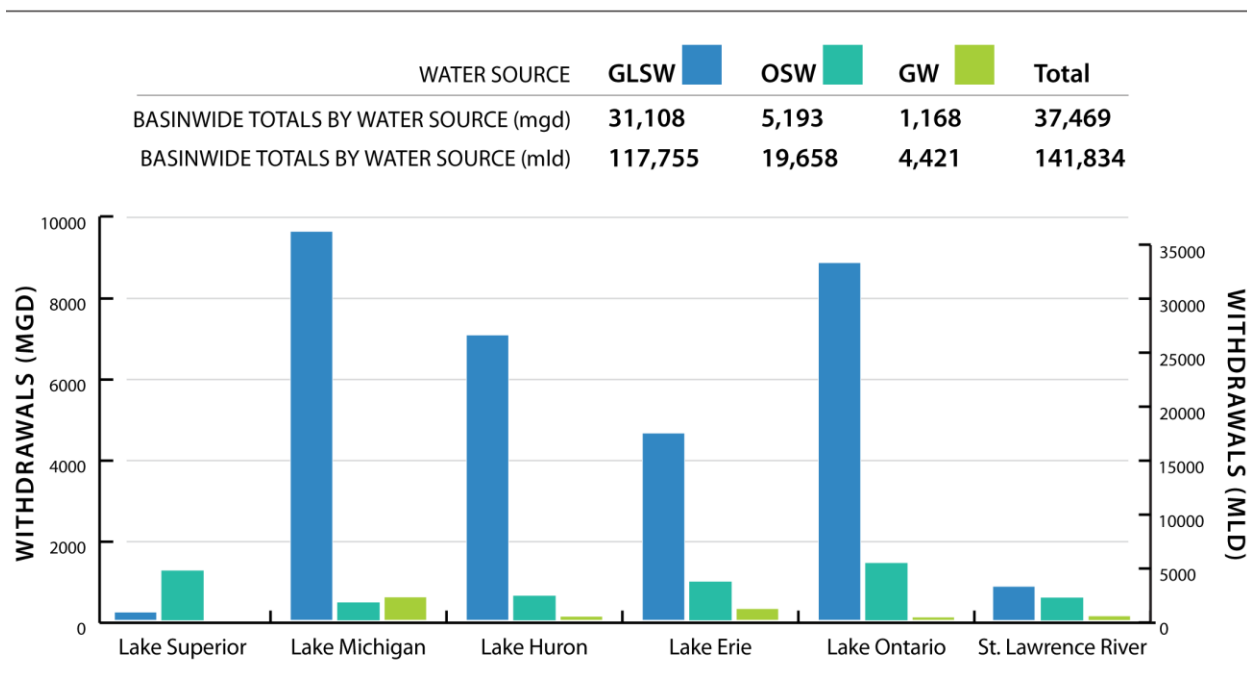


Figure 3. Water withdrawals by watershed (excludes in-stream hydroelectric water use)

Figure 4 shows total withdrawals, excluding in-stream hydroelectric water use, by jurisdiction. At the time of publishing this report, Ontario's 2021 water use data were not available for analysis. This report incorporates revised 2020 water use data throughout, including in Ontario's jurisdiction section. Long Lac and Ogoki diversion data and Welland Canal intrabasin diversion data are updated for 2021 and incorporated into this report.

Ontario, which has the largest land area in the basin of the 10 jurisdictions (108,680 square miles or 281,377 square kilometers over five watersheds), was the largest withdrawer of Great Lakes water. Facilities in Ontario withdrew 15,355 mgd (58,123 mld) or 41 percent of the total withdrawal amount across all jurisdictions. In contrast, Pennsylvania, which has the smallest land area in the basin (508 square miles or 1316 square kilometers), withdrew just 29 mgd (109 mld) or less than 0.1 percent of the total withdrawal amount.

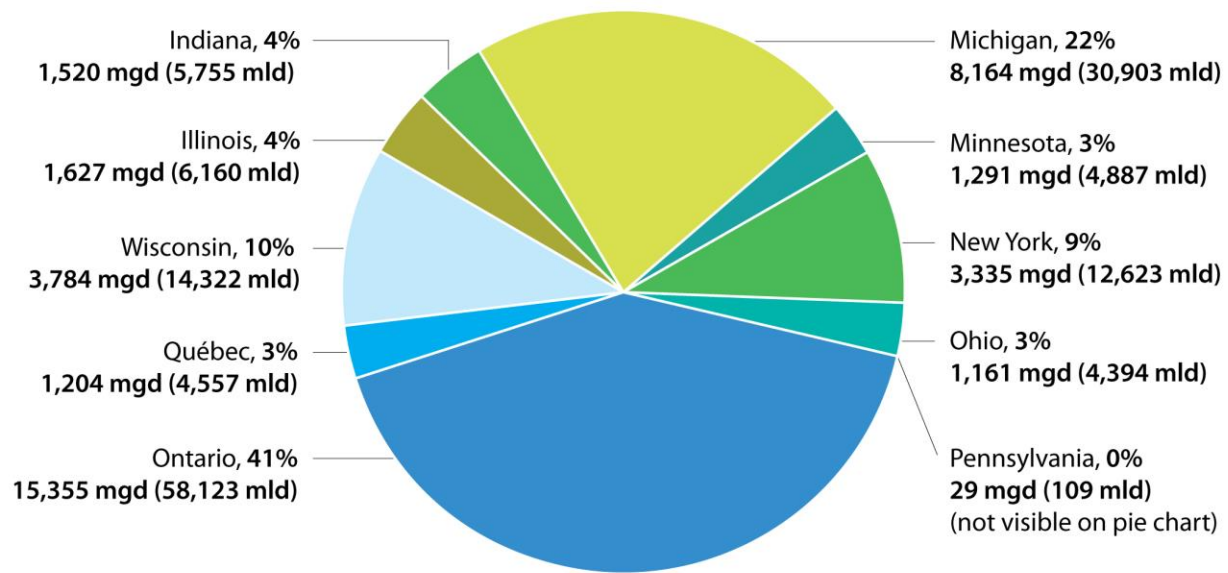


Figure 4. Water withdrawals by jurisdiction (excludes in-stream hydroelectric water use)

Figure 5 shows total water withdrawals by jurisdiction over the past five years (excluding in-stream hydroelectric water use). Water use in each jurisdiction has generally stayed steady or decreased over the past five years. Variances from this general trend are typically explained by one or two large water users in those jurisdictions using more or less water from previous years.

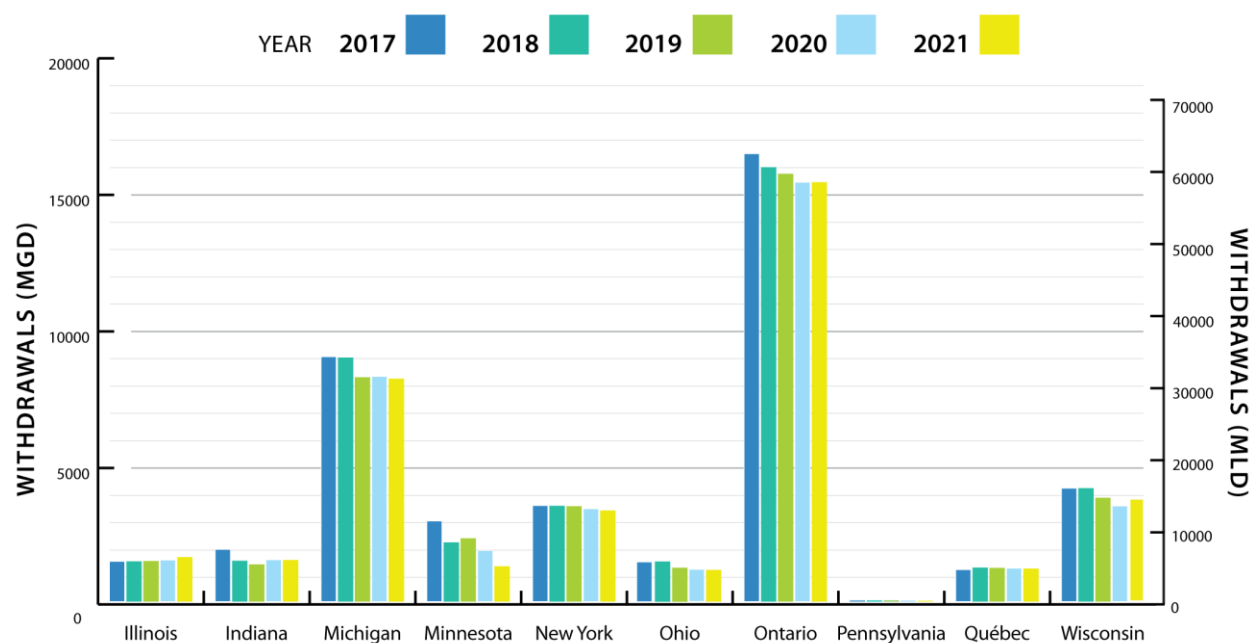


Figure 5. Water withdrawals by jurisdiction over the past five years (excludes in-stream hydroelectric water use)

Diversions and Consumptive Uses

Diversions and consumptive uses of water are key components of the regional water use database. See Appendix B for the Compact's and Agreement's definitions of these terms. Water use data from diversions and consumptive uses are considered particularly informative for assessing the cumulative hydrologic effects of Great Lakes basin water use since they represent water that is not returned to the source watershed.

The total reported 2021 diversion out of the Great Lakes-St. Lawrence River basin was 1,100 mgd or 4,165 mld.⁴ More than 88 percent (974 mgd or 3,685 mld) of this amount was associated with the Illinois diversion, which takes water from Lake Michigan and discharges it into the Mississippi River watershed. The reported amount associated with the Illinois diversion decreased by just under 3 percent from the 2020 reported amount of 999 mgd (3,783 mld). Smaller diversions throughout the region make up the balance of the total, and some of the diverted water is returned to the source watershed as return flow.

There are also diversions into the basin,⁵ including the Long Lac and Ogoki diversions (incoming diversions from the Hudson Bay watershed into northern Lake Superior), which contributed 3,182 mgd (12,046 mld) to the basin in 2021. This is a 16 percent increase from the 2020 reported amount of 2,735 mgd (10,354 mld). Despite this change, both 2020 and 2021 Long Lac and Ogoki diversion amounts are well within the range of flow variability observed from 1944-2015. The flow from these diversions has ranged from 1,643 mgd (6,219 mld) to 5,181 mgd (19,612 mld).⁶ When conditions in the Long Lac and Nipigon (downstream of Ogoki) watersheds are wet, the diversions are often reduced, and water that otherwise would have been diverted into Lake Superior is instead directed through natural outlets that flow toward Hudson Bay. Conversely, when conditions are dry in the downstream watersheds, the diversion flow may be higher.

Overall, the net diversion, or outgoing diversions plus incoming diversions and returns (reported as negative numbers), was a gain of 2,097 mgd (7,940 mld), meaning that more water was diverted into than out of the basin.

Consumptive use is the portion of the water withdrawn or withheld from the basin that is lost from or otherwise not returned to the basin due to evaporation, incorporation into products or other processes. Consumptive use is most often calculated by applying a consumptive use coefficient to the reported withdrawal amount. The database documents the consumptive use coefficient used for each water withdrawal and the consumptive use that was determined through measurement. Figure 6 shows total consumptive use by jurisdiction over the past five years. Because each water use sector has different consumptive use factors, changes in the makeup of each jurisdiction's water withdrawals from year to year can impact its total consumptive use.

The total reported 2021 consumptive use for the basin was 1,942 mgd (7,350 mld) – a 4 percent decrease from the 2020 total consumptive use amount of 2,019 mgd (7,644 mld). The public water supply and self-supply industrial sectors had the greatest consumptive use, accounting for 57 percent of total consumptive use in the basin. The self-supply irrigation sector accounted for most of the decrease from 2020 consumptive use, decreasing by 68 mgd (258 mld) or 16 percent. The Lake Michigan watershed had the largest

⁴ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

⁵ The Great Lakes-St. Lawrence River Regional Water Use Database records incoming diversions with a negative sign and outgoing diversions with a positive sign.

⁶ Information on the flow variability of the Long Lac and Ogoki diversions was provided by Ontario Power Generation.

consumptive use of all watersheds with 791 mgd (2,994 mld) or 41 percent of total consumptive use in the basin.

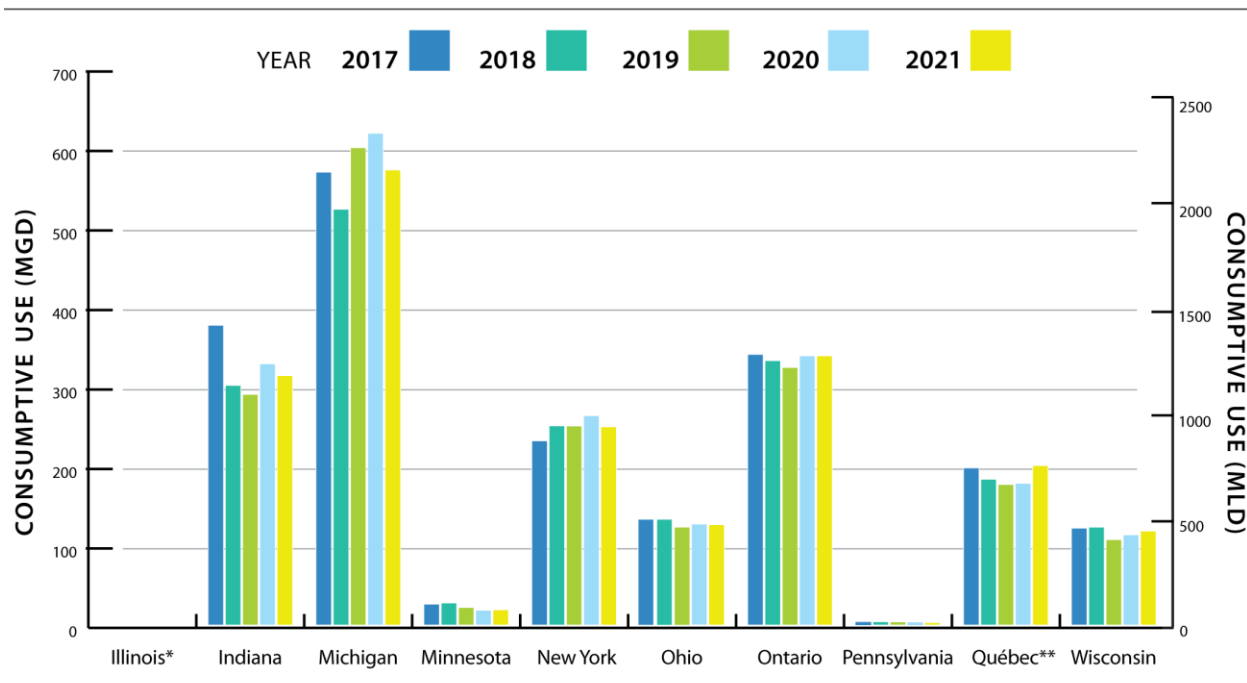


Figure 6. Consumptive use by jurisdiction over the past five years.

* Illinois’s consumptive use is negligible. Water loss associated with the Illinois diversion is reported in Table 2a.

** Québec’s consumptive use variability is the result of changes to the jurisdiction’s reporting accuracy, including consumptive use factor for public water supply, which is Québec’s primary reported water use.

Considering both consumptive use and diversions, the basin gained a total of 156 mgd (589 mld) in 2021. By comparison, the basin lost a total of 401 mgd (1,519 mld) in 2020. Tables 2a to 4b summarize water withdrawals, diversions and consumptive uses by watershed, sector and jurisdiction for 2021.

Table 2a. Basin 2021 Water Use Data Summary by Watershed (includes in-stream hydro) in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	201	30,917	18	31,136	0	-3,173	31
Lake Michigan	9,593	440	574	10,607	0	1,047	791
Lake Huron	25,898	15,741	97	41,736	42	0	143
Lake Erie	57,617	1,575	289	59,481	5,432	-17	389
Lake Ontario	49,965	99,662	79	149,706	-5,432	41	358
St. Lawrence River	167,305	56,860	111	224,276	0	5	230
Total	310,578	205,196	1,168	516,941	42	-2,097	1,942

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 2b. Basin 2021 Water Use Data Summary by Watershed (includes in-stream hydro) in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	761	117,032	69	117,861	-1	-12,012	118
Lake Michigan	36,313	1,665	2,171	40,150	2	3,964	2,994
Lake Huron	98,033	59,588	369	157,989	157	0	543
Lake Erie	218,105	5,962	1,093	225,160	20,563	-64	1,472
Lake Ontario	189,136	377,263	299	566,698	-20,563	154	1,353
St. Lawrence River	633,317	215,240	420	848,977	0	18	870
Total	1,175,665	776,751	4,421	1,956,836	158	-7,940	7,350

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 3a. Basin 2021 Water Use Data Summary by Sector in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,901	772	480	5,154	0	863	569
Self-Supply Commercial and Institutional	7	71	9	87	0	2	13
Self-Supply Irrigation	4	132	273	409	0	0	360
Self-Supply Livestock	0	97	75	173	0	0	17
Self-Supply Industrial	2,328	1,307	299	3,933	0	32	545
Self-Supply Thermoelectric Power Production (Once-through cooling)	23,935	890	1	24,827	0	0	214
Self-Supply Thermoelectric Power Production (Recirculated cooling)	743	23	4	769	0	0	183
Off-Stream Hydroelectric Power Production	0	1,107	0	1,107	0	0	0
In-Stream Hydroelectric Water Use	279,470	200,003	0	479,473	0	-3,182	0
Other Self Supply	189	794	27	1,009	0	187	40
Total	310,578	205,196	1,168	516,941	0	-2,097	1,942

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 3b. Basin 2021 Water Use Data Summary by Sector in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	14,769	2,922	1,818	19,509	0	3,267	2,153
Self-Supply Commercial and Institutional	27	269	34	330	0	7	50
Self-Supply Irrigation	17	499	1,033	1,549	0	0	1,364
Self-Supply Livestock	0	369	285	653	0	-1	64
Self-Supply Industrial	8,812	4,947	1,131	14,890	0	123	2,063
Self-Supply Thermoelectric Power Production (Once-through cooling)	90,606	3,370	5	93,981	0	0	811
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,811	86	15	2,912	0	0	692
Off-Stream Hydroelectric Power Production	0	4,190	0	4,190	0	0	0
In-Stream Hydroelectric Water Use	1,057,910	757,092	0	1,815,002	0	-12,046	0
Other Self Supply	715	3,006	101	3,821	0	709	152
Total	1,175,665	776,751	4,421	1,956,836	0	-7,940	7,350

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 4a. Basin 2021 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	1,627	0	0	1,627	0	974	0
Indiana	1,364	70	86	1,520	0	80	314
Michigan	6,796	856	512	8,164	0	0	572
Minnesota	113	2,406	6	2,525	0	9	19
New York	144,423	82,278	37	226,738	0	43	249
Ohio	677	403	80	1,161	0	-25	126
Ontario	151,400	118,537	253	270,190	0	-3,182	339
Pennsylvania	25	2	3	29	0	0	3
Québec	743	385	76	1,204	0	3	201
Wisconsin	3,410	258	115	3,784	0	2	118
Total	310,578	205,196	1,168	516,941	0	-2,097	1,942

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 4b. Basin 2021 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mld

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	6,160	0	0	6,160	0	3,685	0
Indiana	5,165	264	327	5,755	0	303	1,188
Michigan	25,726	3,240	1,937	30,903	0	0	2,167
Minnesota	426	9,109	23	9,559	0	34	72
New York	546,699	311,458	139	858,296	0	162	944
Ohio	2,563	1,527	304	4,394	0	-96	478
Ontario	573,111	448,713	957	1,022,781	0	-12,046	1,282
Pennsylvania	93	6	10	109	0	0	12
Québec	2,813	1,457	288	4,557	0	10	759
Wisconsin	12,910	977	436	14,322	0	7	447
Total	1,175,665	776,751	4,421	1,956,836	0	-7,940	7,350

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Lake Watershed Summaries

Lake Superior

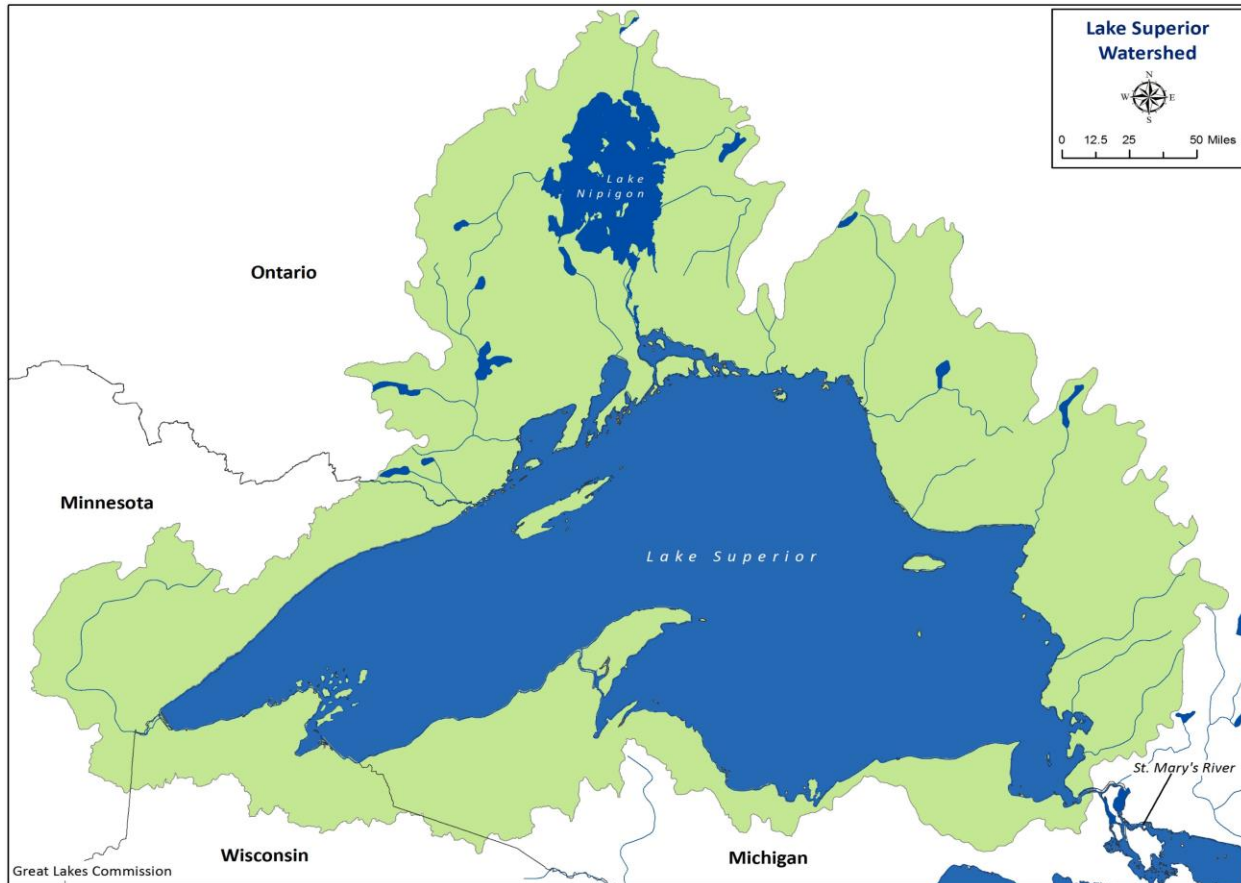


Figure 7. Lake Superior Watershed

Overview of Watershed Characteristics

Lake Superior is the largest Great Lake and the world's third-largest freshwater lake by volume, holding about 2,900 cubic miles (12,100 cubic kilometers) of water. Lake Superior could hold all the water in the other Great Lakes, plus three more Lake Eries.⁷ Its surface area is roughly the size of South Carolina, or approximately 31,700 square miles (82,100 square kilometers).

⁷ Great Lakes Commission, *Lake Superior*.

Basic Stats of Lake Superior

Length: 350 mi/563 km
Breadth: 160 mi/257 km
Elevation: 600 ft/183 m
Depth: 483 ft/47 m average, 1,330 ft/406 m maximum
Volume: 2,900 cubic mi/12,100 cubic km
Lake surface area: 31,700 square mi/ 82,100 square km
Watershed drainage area: 49,300 square mi/127,700 square km
Outlet: St. Marys River to Lake Huron
Retention/replacement time: 191 years
Approximate population in watershed:
 United States – 412,656; Canada 168,437.
 Total: 581,093

Water Withdrawals

Four jurisdictions – Michigan, Minnesota, Ontario⁸ and Wisconsin – share the Lake Superior watershed and collectively withdrew 1,445 mgd (5,471 mld) in 2021, excluding the reported in-stream hydroelectric water use of 29,690 mgd (112,390 mld). This represents a 28 percent decrease from the 2020 total withdrawal amount of 2,018 mgd (7,639 mld). The off-stream hydroelectric power production sector represented 71 percent of all withdrawals from the watershed at 1,027 mgd (3,890 mld). The self-supply industrial (199 mgd or 754 mld) and self-supply thermoelectric power production (once-through cooling) (124 mgd or 469 mld) sectors made up the bulk of remaining water withdrawals from Lake Superior.

Other surface water within the Lake Superior watershed was primarily used to generate electricity with in-stream hydroelectric power. Excluding in-stream hydroelectric water use, 85 percent (1,226 mgd or 4,642 mld) of the total reported withdrawal amount from the watershed came from other surface water. Of the remaining withdrawals, 14 percent came directly from Lake Superior (201 mgd or 761 mld) and 1 percent came from groundwater (18 mgd or 69 mld).

Water Diversions and Consumptive Uses

The reported net water gain⁹ (3,142 mgd or 11,895 mld) in the Lake Superior watershed was largely attributable to the Long Lac and Ogoki diversions in northern Ontario, incoming interbasin diversions that totaled 3,182 mgd or 12,046 mld. On average, these diversions into the basin are about twice the volume of the Illinois diversion out of the basin, although in 2021 they were over three times the Illinois diversion volume.

Outgoing interbasin diversions totaling 9 mgd (34 mld) were reported in Minnesota, associated almost exclusively with the self-supply industrial sector. A small amount of the outgoing diversion (0.01 mgd or 0.04 mld) was also reported for the self-supply irrigation sector. Additionally, an incoming intrabasin transfer of 0.3 mgd (1.1 mld), associated with Ontario's public drinking water supply, was reported. The total watershed consumptive use for all four jurisdictions was 31 mgd (118 mld). Self-supply industrial use (21 mgd or 81 mld) was the largest contributor to total consumptive use for the watershed, followed by public water supply (6 mgd or 24 mld). Total consumption in 2021 increased by 1 mgd (4 mld) or 3 percent from 2020, a marginal difference not attributed to any specific sector.

⁸ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

⁹ Incoming diversions are reported as negative values in the database and on tables in this report.

Table 5a. Lake Superior Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	41	3	12	57	0	0	6
Self-Supply Commercial and Institutional	2	0	0	2	0	0	0
Self-Supply Irrigation	0	0	1	1	0	0	1
Self-Supply Livestock	0	24	3	27	0	0	0
Self-Supply Industrial	76	121	2	199	0	9	21
Self-Supply Thermoelectric Power Production (Once-through cooling)	82	42	0	124	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,028	0	1,028	0	0	0
In-Stream Hydroelectric Water Use	0	29,690	0	29,690	0	-3,182	0
Other Self Supply	0	7	0	7	0	0	0
Total	201	30,917	18	31,136	0	-3,173	31

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 5b. Lake Superior Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	157	12	47	216	-1	0	24
Self-Supply Commercial and Institutional	6	2	0	8	0	0	1
Self-Supply Irrigation	0	2	3	5	0	0	4
Self-Supply Livestock	0	93	10	102	0	0	0
Self-Supply Industrial	287	459	8	754	0	34	81
Self-Supply Thermoelectric Power Production (Once-through cooling)	311	157	1	469	0	0	8
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	3,890	0	3,890	0	0	0
In-Stream Hydroelectric Water Use	0	112,390	0	112,390	0	-12,046	0
Other Self Supply	0	27	0	27	0	0	0
Total	761	117,032	69	117,861	-1	-12,012	118

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Lake Michigan

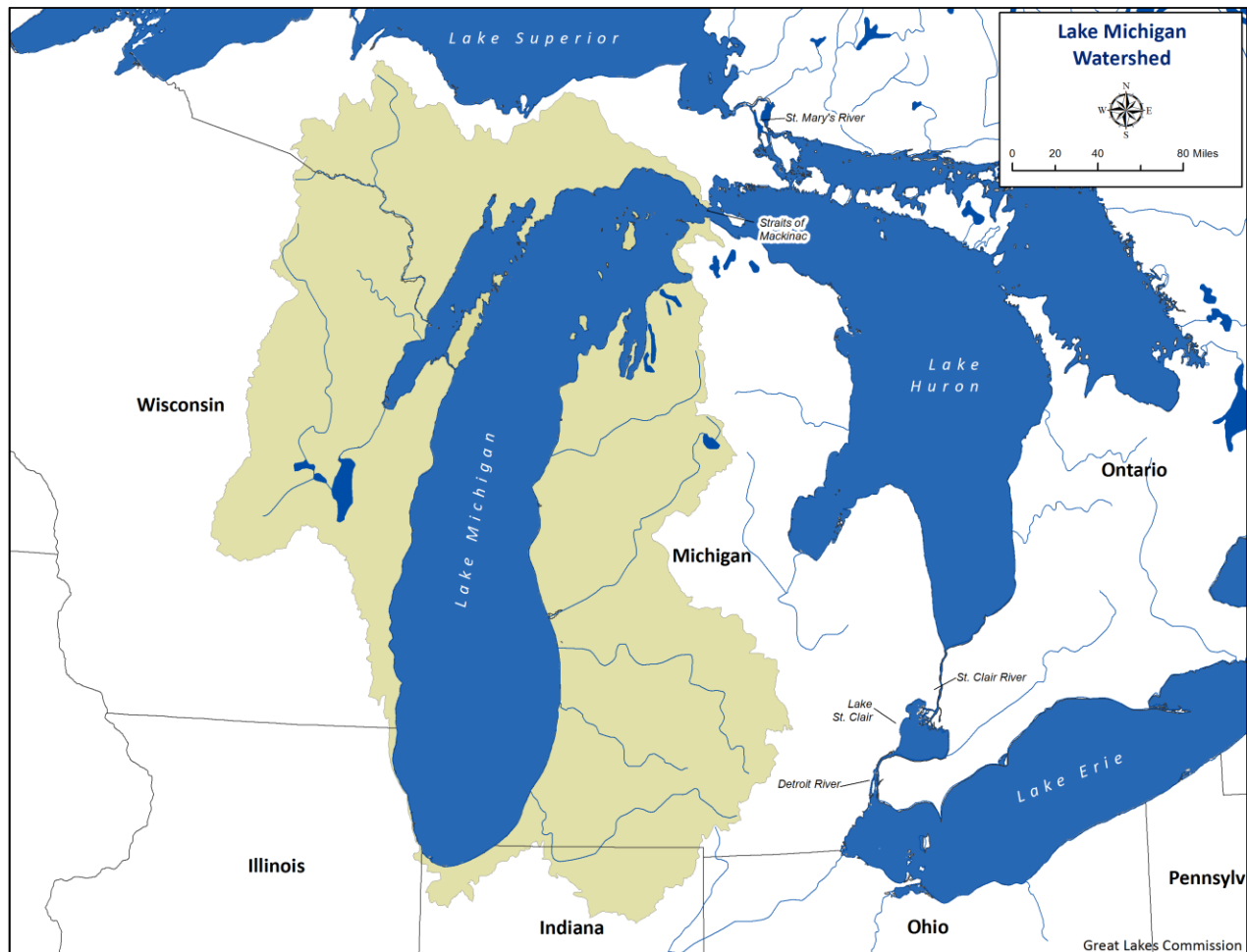


Figure 8. Lake Michigan Watershed

Overview of Watershed Characteristics

Lake Michigan is the only Great Lake situated entirely within the United States. It is the second largest Great Lake by volume, holding about 1,180 cubic miles (4,918 cubic kilometers) of water. Its surface area is roughly the size of West Virginia at approximately 22,300 square miles (57,753 square kilometers). More than 13 million people call the Lake Michigan watershed home.

Basic Stats of Lake Michigan

Length: 307 mi/494 km
Breadth: 118 mi/190 km
Elevation: 577 ft/176 m
Depth: 279 ft/85 m average, 923 ft/281 m maximum
Volume: 1,180 cubic mi/4,918 cubic km
Lake surface area: 22,300 square mi/57,753 square km
Watershed drainage area: 45,600 square mi/118,095 square km
Outlet: Straits of Mackinac to Lake Huron
Retention/replacement time: 62 years
Approximate population in watershed: 13,325,057

Water Withdrawals

Four jurisdictions – Illinois, Indiana, Michigan and Wisconsin – share the Lake Michigan watershed and collectively withdrew 10,607 mgd (40,150 mld) in 2021, a 3 percent increase from the 10,340 mgd (39,142 mld) water withdrawal in 2020. No in-stream or off-stream hydroelectric water use was reported for the watershed. The primary water uses were self-supply thermoelectric power production (once-through cooling) at 6,796 mgd (25,726 mld), self-supply industrial use at 1,611 mgd (6,097 mld) and public water supply at 1,489 mgd (5,636 mld). Surface water from Lake Michigan was the primary source of water withdrawals in the watershed, accounting for 90 percent of total withdrawals (9,593 mgd or 36,313 mld).

Water Diversions and Consumptive Uses

The reported net water loss from the Lake Michigan watershed totaled 1,839 mgd (6,960 mld). This represents 17 percent of total Lake Michigan withdrawals and a 4 percent increase in Lake Michigan water loss from 2020. Water loss primarily consisted of the Illinois diversion of 974 mgd (3,685 mld) and the basin's total consumptive use of 791 mgd (2,994 mld).

Diversions, including the Illinois Diversion, decreased slightly from 2020 and consumptive use decreased by 42 mgd (158 mld) or 5 percent. The sectors that represented the majority of consumptive use in the watershed were self-supply industrial use at 285 mgd (1,077 mld), self-supply irrigation at 247 mgd (934 mld) and self-supply thermoelectric power production (recirculated cooling) at 129 mgd (487 mld).

Table 6a. Lake Michigan Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,252	21	216	1,489	0	840	85
Self-Supply Commercial and Institutional	4	7	6	17	0	2	1
Self-Supply Irrigation	0	46	236	283	0	0	247
Self-Supply Livestock	0	15	30	45	0	0	11
Self-Supply Industrial	1,347	196	68	1,611	0	24	285
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,665	130	1	6,796	0	0	33
Self-Supply Thermoelectric Power Production (Recirculated cooling)	144	21	3	168	0	0	129
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	182	2	14	199	0	182	0
Total	9,593	440	574	10,607	0	1,047	791

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 6b. Lake Michigan Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,738	80	818	5,636	2	3,179	323
Self-Supply Commercial and Institutional	14	28	22	64	0	7	4
Self-Supply Irrigation	1	176	894	1,070	0	0	934
Self-Supply Livestock	0	58	112	170	0	0	43
Self-Supply Industrial	5,099	741	256	6,097	0	89	1,077
Self-Supply Thermoelectric Power Production (Once-through cooling)	25,229	493	4	25,726	0	0	124
Self-Supply Thermoelectric Power Production (Recirculated cooling)	544	80	11	636	0	0	487
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	689	9	54	752	0	688	1
Total	36,313	1,665	2,171	40,150	2	3,964	2,994

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Lake Huron



Figure 9. Lake Huron Watershed

Overview of Watershed Characteristics

By surface area, Lake Huron is the second largest of the Great Lakes. It covers 23,000 square miles (59,565 square kilometers), making it the third largest freshwater lake on Earth by surface area. By volume however, Lake Huron is only the third largest Great Lake.

Basic Stats of Lake Huron

Length: 206 mi/332 km
Breadth: 183 mi/295 km
Elevation: 577 ft/176 m
Depth: 195 ft/59 m average, 750 ft/229 m maximum
Volume: 849 cubic mi/3,538 cubic km
Lake Surface Area: 23,000 square mi/59,565 square km
Watershed Drainage Area: 50,700 square mi/131,303 square km
Outlet: St. Clair River to Lake Erie
Retention/replacement time: 21 years
Approximate population in watershed:
 United States - 1,642,289; Canada - 1,486,864. Total: 3,129,153

Water Withdrawals

Only two jurisdictions – Michigan and Ontario¹⁰ – share the Lake Huron watershed and collectively withdrew 7,738 mgd (29,292 mld) in 2021, excluding the reported in-stream hydroelectric water use (33,998 mgd or 128,697 mld). This is a marginal increase from the 2020 total withdrawal of 7,717 mgd (29,213 mld).

The primary water use was self-supply thermoelectric power production (once-through cooling) at 7,176 mgd (27,165 mld), accounting for 93 percent of the total water use in the watershed. Self-supply industrial use (285 mgd or 1,078 mld) and public water supply (216 mgd or 817 mld) made up most of the remaining water use. Excluding in-stream hydroelectric water use, Lake Huron surface water was the source of 91 percent of the total withdrawals in the watershed.

Water Diversions and Consumptive Uses

Reported net water loss from the Lake Huron watershed was 185 mgd (700 mld), a 4 percent decrease from 2020. Total consumptive use was 143 mgd or 543 mld, accounting for 78 percent of the net water loss. The self-supply thermoelectric power production (once-through cooling) (62 mgd or 236 mld), self-supply industrial use (31 mgd or 117 mld) and public water supply (26 mgd or 100 mld) sectors were the main consumptive uses in the watershed. Consumptive use decreased by 5 percent from 2020, with no major changes in any specific sector.

The remainder of the net water loss consisted of an intrabasin transfer for public water supply in Ontario. This intrabasin diversion represented a loss from the Lake Huron watershed and a corresponding gain to the Lake Erie and Ontario watersheds, and thus did not have an impact on overall Great Lakes-St. Lawrence River basin water loss (i.e., all water diverted remained in the basin). Over 90 percent of the diversion was into the Lake Erie watershed.

¹⁰ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

Table 7a. Lake Huron Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	124	52	41	216	42	0	26
Self-Supply Commercial and Institutional	1	3	1	4	0	0	1
Self-Supply Irrigation	0	7	17	24	0	0	22
Self-Supply Livestock	0	13	15	28	0	0	0
Self-Supply Industrial	16	246	23	285	0	0	31
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,896	280	0	7,176	0	0	62
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	1	1	2	0	0	1
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	18,861	15,137	0	33,998	0	0	0
Other Self Supply	0	2	0	3	0	0	0
Total	25,898	15,741	97	41,736	42	0	143

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 7b. Lake Huron Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	468	196	153	817	157	0	100
Self-Supply Commercial and Institutional	2	11	4	17	0	0	2
Self-Supply Irrigation	0	26	65	91	0	0	82
Self-Supply Livestock	0	51	55	106	0	0	2
Self-Supply Industrial	60	931	87	1,078	0	0	117
Self-Supply Thermoelectric Power Production (Once-through cooling)	26,105	1,060	0	27,165	0	0	236
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	4	3	7	0	0	5
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	71,396	57,301	0	128,697	0	0	0
Other Self Supply	1	8	2	10	0	0	0
Total	98,033	59,588	369	157,989	157	0	543

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Lake Erie

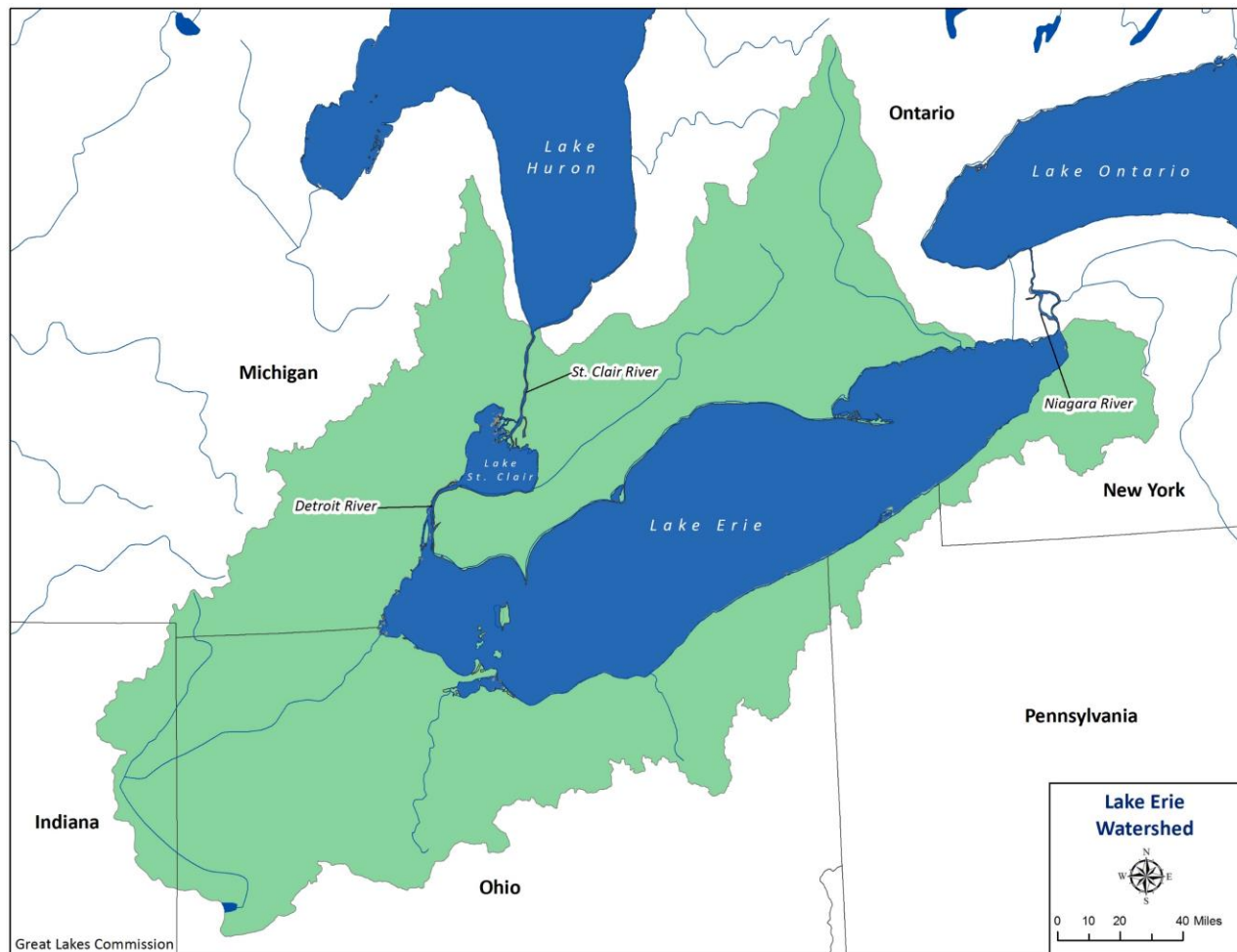


Figure 10. Lake Erie Watershed

Overview of Watershed Characteristics

By surface area, Lake Erie is the 12th largest freshwater lake in the world. The shallowest of the Great Lakes, it has an average depth of 62 feet (19 meters) and a maximum depth of 210 feet (64 meters). The lake holds about 116 cubic miles (483 cubic kilometers) of water. Lake Erie is warmer than the other Great Lakes, which contributes to its biological productivity. However, its small volume relative to the other Great Lakes and overall average shallow depth makes it more ecologically sensitive. The watershed is home to more than 12 million people.

Basic Stats of Lake Erie

Length: 241 mi/388 km

Breadth: 57 mi/92 km

Elevation: 569 ft/173 m

Depth: 62 ft/19 m average, 210 ft/64 m maximum

Volume: 116 cubic mi/483 cubic km

Lake surface area: 9,910 square mi/
25,655 square km

Watershed drainage area: 22,700 square
mi/58,788 square km

Outlets: Niagara River and Welland Canal
Retention/replacement time: 2.7 years

Approximate population in watershed:
United States - 9,987,517; Canada -
2,193,219. Total: 12,180,736

Water Withdrawals

Six jurisdictions – Indiana, Michigan, New York, Ohio, Ontario¹¹ and Pennsylvania – share the Lake Erie watershed and collectively withdrew 5,858 mgd (22,174 mld) in 2021, excluding the reported in-stream hydroelectric water use of 53,623 mgd (202,986 mld). There was a marginal decrease in water withdrawals from the 2020 total withdrawal amount of 5,876 mgd (22,244 mld). Excluding in-stream hydroelectric power generation, the primary water uses were self-supply thermoelectric power generation (once-through cooling) at 3,206 mgd (12,137 mld), public water supply at 1,469 mgd (5,559 mld) and self-supply industrial use at 881 mgd (3,334 mld).

Lake Erie surface water was the source of 79 percent of the total withdrawals in the watershed. However, Lake Erie surface water was not used in Indiana, with other surface water and groundwater making up its water sources, primarily for the public water supply sector.

Water Diversions and Consumptive Uses

Reported net water loss from the Lake Erie watershed totaled 5,764 mgd (21,821 mld). The largest loss from the Lake Erie watershed was from the Welland Canal intrabasin diversion, which diverted 5,432 mgd (20,563 mld) to the Lake Ontario watershed for navigation purposes. Because this diversion is entirely to Lake Ontario, there is no net change or water loss from the Great Lakes-St. Lawrence River basin. The Welland Canal was constructed in 1830 as a ship canal connecting Lake Erie to Lake Ontario. Figure 11 shows the flow through the Welland Canal over the past five years.

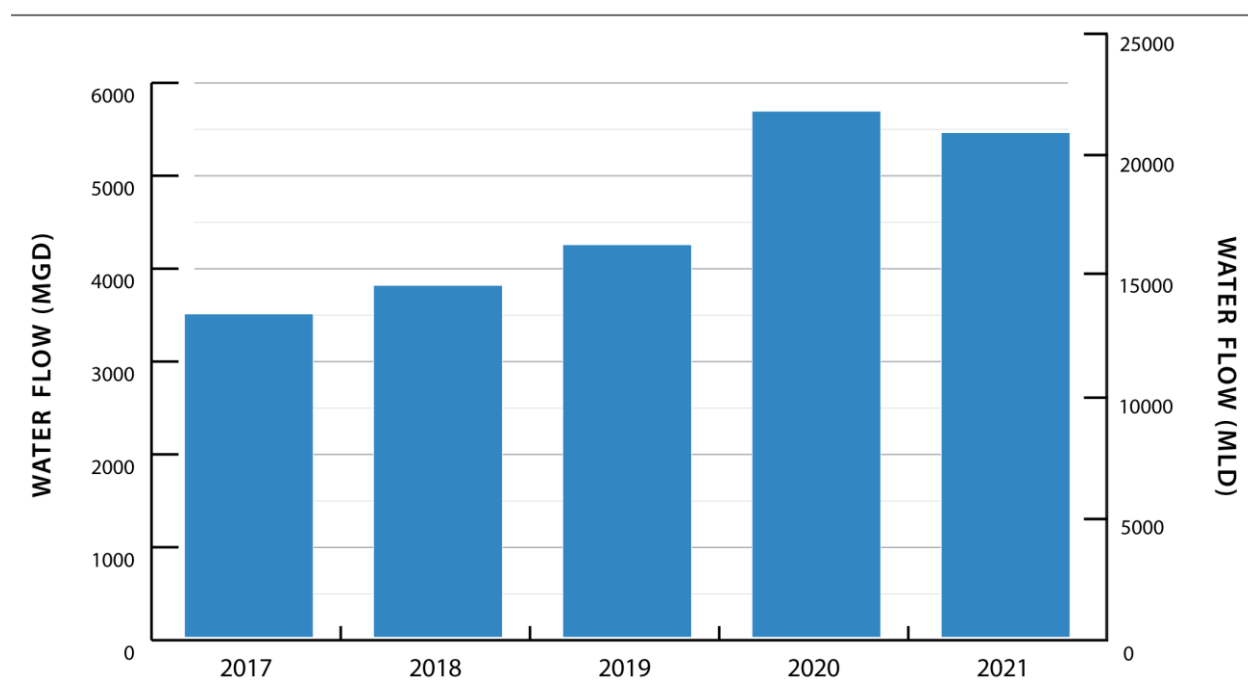


Figure 11. Water flow through the Welland Canal over the past five years.

¹¹ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

Additionally, incoming intrabasin diversions were reported in Ontario and Michigan for the public water sector, totaling 40 mgd or 151 mld, though Michigan's diversion represented a small portion of the total (less than 0.08 mgd or 0.3 mld). Interbasin diversions, both into and out of the basin, were also reported, resulting in a gain¹² of 17 mgd (64 mld) for the Lake Erie watershed and the Great Lakes-St. Lawrence River basin.

Consumptive use in the Lake Erie watershed totaled 389 mgd (1,472 mld), a 2 percent decrease from 2020. The major consumptive uses were for the public water supply (189 mgd or 717 mld) and self-supply industrial (78 mgd or 296 mld) sectors.

¹² Incoming diversions are reported as negative values in the database and on tables in this report.

Table 8a. Lake Erie Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,161	174	133	1,469	-40	10	189
Self-Supply Commercial and Institutional	1	6	1	7	0	0	1
Self-Supply Irrigation	1	40	13	53	0	0	48
Self-Supply Livestock	0	5	8	13	0	0	1
Self-Supply Industrial	413	345	123	881	0	0	78
Self-Supply Thermoelectric Power Production (Once-through cooling)	2,857	350	0	3,206	0	0	36
Self-Supply Thermoelectric Power Production (Recirculated cooling)	184	1	0	185	0	0	32
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	53,000	623	0	53,623	0	0	0
Other Self Supply	1	32	11	44	5,432	-26	3
Total	57,617	1,575	289	59,481	5,392	-17	389

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 8b. Lake Erie Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,396	660	503	5,559	-151	36	717
Self-Supply Commercial and Institutional	2	21	2	25	0	0	3
Self-Supply Irrigation	3	150	49	202	0	0	181
Self-Supply Livestock	0	20	30	51	0	-1	3
Self-Supply Industrial	1,562	1,305	467	3,334	0	0	296
Self-Supply Thermoelectric Power Production (Once-through cooling)	10,814	1,323	0	12,137	0	0	138
Self-Supply Thermoelectric Power Production (Recirculated cooling)	697	2	0	699	0	0	122
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	200,627	2,359	0	202,986	0	0	0
Other Self Supply	4	121	42	167	20,563	-100	13
Total	218,105	5,962	1,093	225,160	20,413	-64	1,472

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Lake Ontario

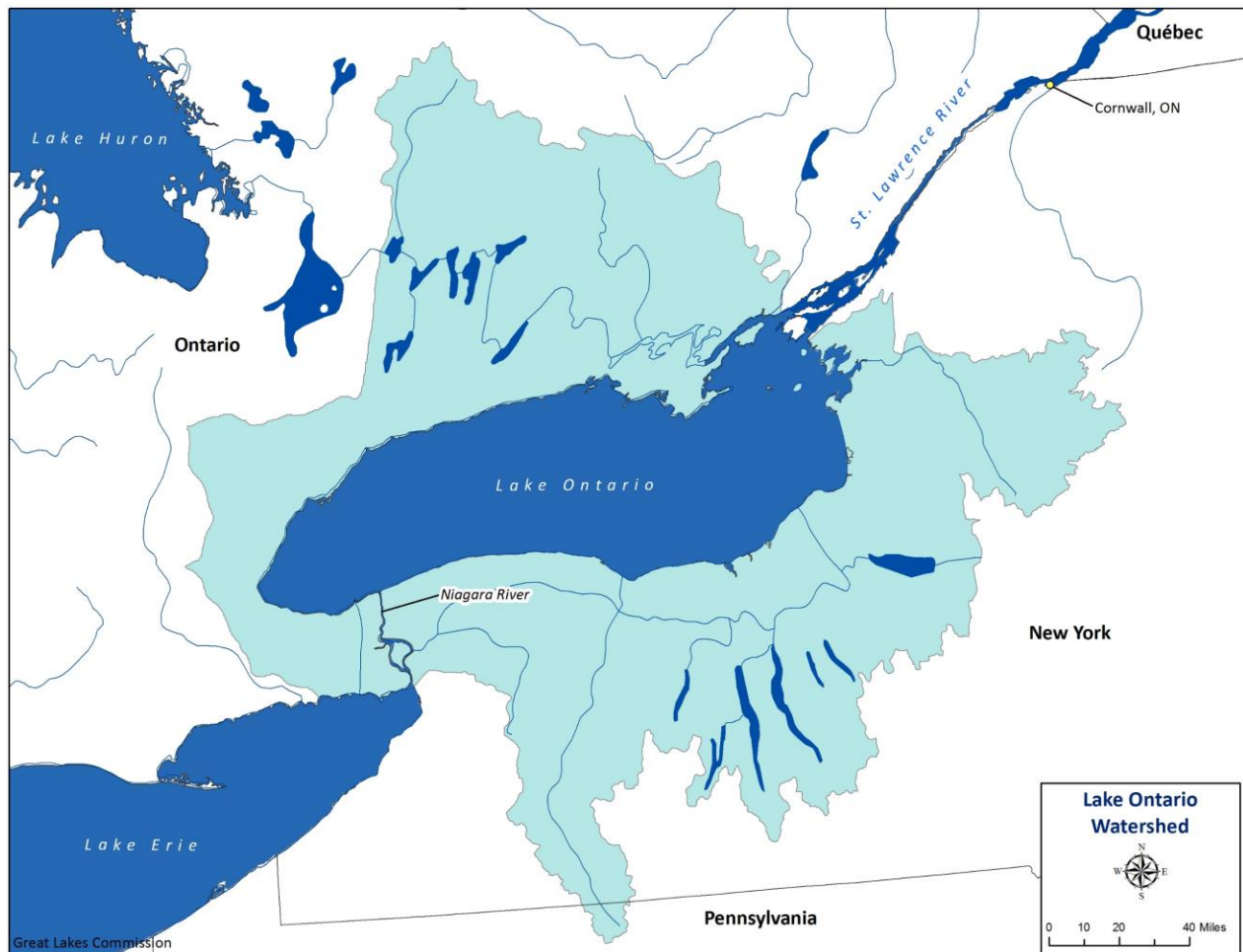


Figure 12. Lake Ontario Watershed

Overview of Watershed Characteristics

Lake Ontario is the easternmost of the Great Lakes and the smallest in surface area (covering 7,340 square miles or 19,009 square kilometers). It is extremely deep (802 feet or 244 meters maximum) and while smaller than Lake Erie in surface area, exceeds it in volume by nearly three and a half times (393 cubic miles or 1,639 cubic kilometers). Lake Ontario is the 14th largest lake in the world by surface area and the 11th largest by volume.

Basic Stats of Lake Ontario

Length: 193 mi/311 km

Breadth: 53 mi/85 km

Elevation: 243 ft/74 m

Depth: 283 ft/86 m average, 802 ft/244 m maximum

Volume: 393 cubic mi/1,639 cubic km

Lake surface area: 7,340 square mi/19,009 square km

Watershed drainage area: 23,400 square mi/60,601 square km

Outlet: St. Lawrence River to the Atlantic Ocean

Retention/replacement time: 6 years

Approximate population in watershed: United States - 2,783,742; Canada – 7,385,657. Total: 10,169,399

Water Withdrawals

Three jurisdictions – New York, Ontario¹³ and Pennsylvania – share the Lake Ontario watershed and collectively withdrew 10,312 mgd (39,036 mld) of water in 2021, excluding the in-stream hydroelectric water use of 139,394 mgd (527,662 mld). There was a less than 1 percent decrease in water withdrawn from the 2020 withdrawal amount of 10,377 mgd (39,280 mld). Excluding in-stream hydroelectric power generation, the primary water uses were self-supply thermoelectric power generation (once-through cooling) (7,496 mgd or 28,376 mld), public water supply (888 mgd or 3,362 mld) and other self-supply (748 mgd or 2,830 mld).

Excluding the in-stream hydroelectric power sector, Lake Ontario surface water was the source of approximately 86 percent of the total withdrawals in the watershed, with 14 percent of withdrawals coming from other surface water and less than 1 percent from groundwater.

Water Diversions and Consumptive Uses

The Lake Ontario watershed reported a net water gain of 5,036 mgd (19,063 mld)¹⁴ in 2021, a 4 percent decrease from the 2020 net gain of 5,250 mgd (19,875 mld). The net water gain in the Lake Ontario watershed was predominately attributable to the Welland Canal (5,432 mgd or 20,563 mld), which diverts water from the Lake Erie watershed to Lake Ontario for navigation purposes. While this represents a net gain for the Lake Ontario watershed, it has a net zero effect for the Great Lakes-St. Lawrence River basin. An additional incoming intrabasin diversion of 2 mgd (7 mld) was reported in the Lake Ontario watershed, associated with the public water supply sector in Ontario.

Outgoing interbasin diversions of 41 mgd (154 mld) from Lake Ontario were reported in New York, associated with the Erie Barge Canal and public water supply for the City of Rome. Consumptive use in the Lake Ontario watershed totaled 358 mgd (1,353 mld), primarily from the public water supply (110 mgd or 415 mld), self-supply thermoelectric power production (once-through cooling) (80 mgd or 304 mld) and self-supply industrial use (71 mgd or 268 mld) sectors.

¹³ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

¹⁴ Incoming diversions are reported as negative values in the database and on tables in this report.

Table 9a. Lake Ontario Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	678	193	17	888	-2	9	110
Self-Supply Commercial and Institutional	0	45	1	45	0	0	9
Self-Supply Irrigation	3	29	4	35	0	0	31
Self-Supply Livestock	0	14	12	26	0	0	3
Self-Supply Industrial	317	218	46	580	0	0	71
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,409	88	0	7,496	0	0	80
Self-Supply Thermoelectric Power Production (Recirculated cooling)	415	0	0	415	0	0	21
Off-Stream Hydroelectric Power Production	0	79	0	79	0	0	0
In-Stream Hydroelectric Water Use	41,143	98,250	0	139,394	0	0	0
Other Self Supply	0	748	0	748	-5,432	32	32
Total	49,965	99,662	79	149,706	-5,434	41	358

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 9b. Lake Ontario Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,568	729	65	3,362	-7	33	415
Self-Supply Commercial and Institutional	0	169	2	171	0	0	33
Self-Supply Irrigation	10	109	14	133	0	0	119
Self-Supply Livestock	0	54	44	98	0	0	13
Self-Supply Industrial	1,199	823	173	2,196	0	0	268
Self-Supply Thermoelectric Power Production (Once-through cooling)	28,045	332	0	28,376	0	0	304
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,570	0	0	1,570	0	0	79
Off-Stream Hydroelectric Power Production	0	299	0	299	0	0	0
In-Stream Hydroelectric Water Use	155,745	371,917	0	527,662	0	0	0
Other Self Supply	0	2,830	0	2,830	-20,563	121	123
Total	189,136	377,263	299	566,698	-20,570	154	1,353

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

St. Lawrence River

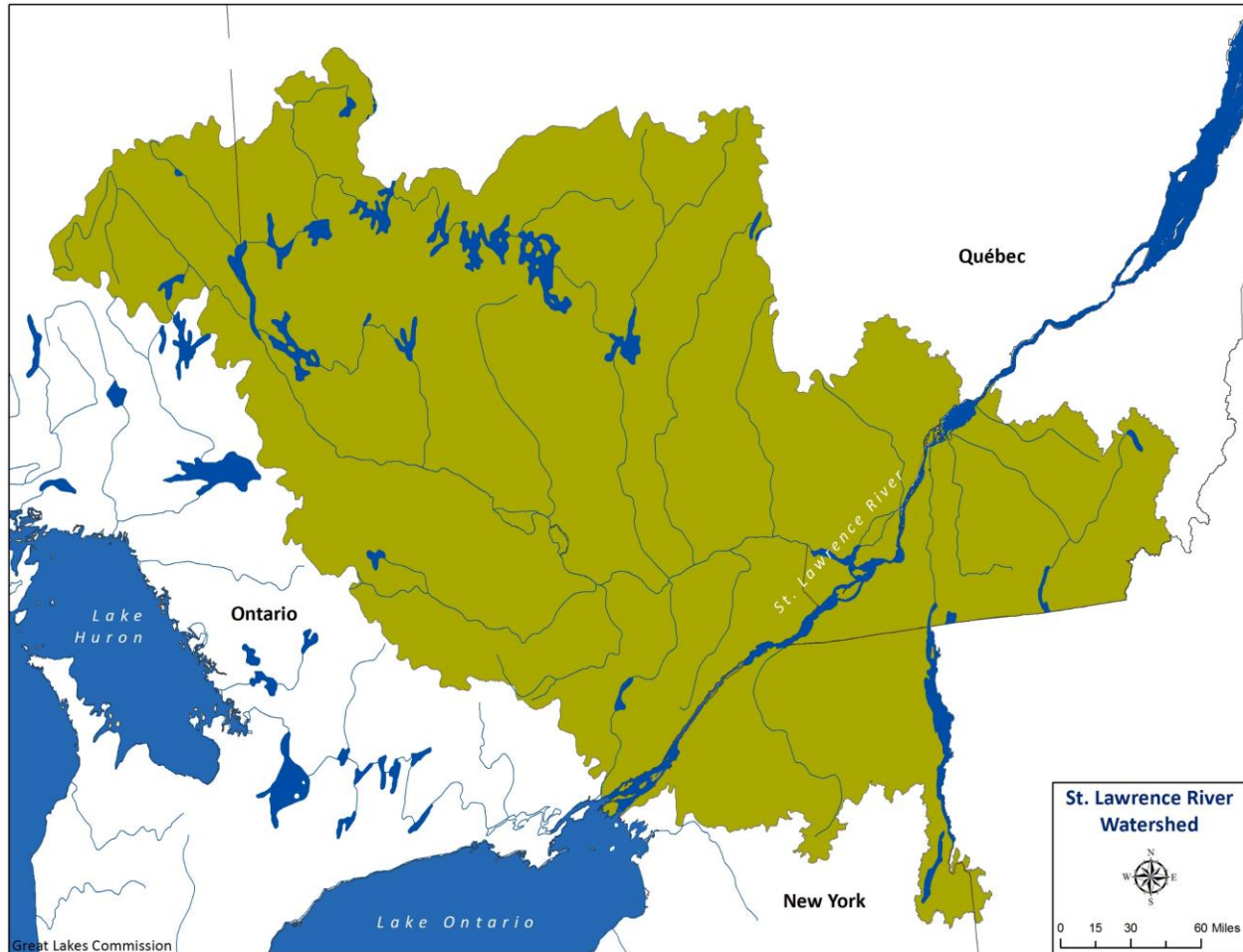


Figure 13. St. Lawrence River Watershed

Overview of Watershed Characteristics

Running 744 miles (1,197 kilometers) in length, the St. Lawrence River is considered a major river of North America. Mostly located in the province of Québec, it links the Great Lakes to the Atlantic Ocean.

Basic Stats of the St. Lawrence River

Length: 744 mi/1,197 km
Elevation: 245 ft/75 m at the source and 0 ft/0 m at the mouth
Average annual flow (Montréal): 7,660 cubic meters/second
Volume: 393 cubic mi/1,639 cubic km
Watershed drainage area: 519,000 square mi/1,344,200 square km
Outlet: Gulf of St. Lawrence/Atlantic Ocean
Approximate population in watershed:
 United States – 79,311; Canada – 2,637,227. Total: 2,716,538

Water Withdrawals

Three jurisdictions – New York, Ontario¹⁵ and Québec – share the St. Lawrence watershed and collectively withdrew 1,508 mgd (5,710 mld) of water in 2021, excluding in-stream hydroelectric water use, which accounted for an additional 222,768 mgd (843,267 mld). St. Lawrence River withdrawals in 2021 decreased by less than 2 percent from the 2020 withdrawal total of 1,532 mgd (5,801 mld). Excluding in-stream hydroelectric water use, the primary water uses were public water supply (1,035 mgd or 3,918 mld) and self-supply industrial use (378 mgd or 1,431 mld).

Excluding in-stream hydroelectric power production, St. Lawrence River surface water was the source for 56 percent of the watershed's total withdrawal amount. Other surface water within the St. Lawrence River watershed accounted for 37 percent of the total, with 7 percent of the total coming from groundwater.

Water Diversions and Consumptive Uses

Reported net water loss in the St. Lawrence River watershed in 2021 totaled 235 mgd (888 mld), a 3 percent decrease from the 2020 net water loss of 242 mgd (916 mld). This net loss includes diversions of 5 mgd (18 mld) for public supply purposes in New York and Québec and a combined consumptive use amount of 230 mgd (870 mld). The largest consumptive uses were the for the public water supply (152 mgd or 575 mld) and self-supply industrial (59 mgd or 224 mld) sectors.

¹⁵ Ontario 2020 data was used due to lack of availability of 2021 data. Updated data will be added to the database as it is made available.

Table 10a. St. Lawrence River Watershed 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	645	329	61	1,035	0	5	152
Self-Supply Commercial and Institutional	1	10	1	12	0	0	2
Self-Supply Irrigation	1	10	2	13	0	0	11
Self-Supply Livestock	0	24	9	33	0	0	1
Self-Supply Industrial	160	182	37	378	0	0	59
Self-Supply Thermoelectric Power Production (Once-through cooling)	27	1	0	28	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	166,466	56,302	0	222,768	0	0	0
Other Self Supply	5	3	1	9	0	0	4
Total	167,305	56,860	111	224,276	0	5	230

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 10b. St. Lawrence River Watershed 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,442	1,245	231	3,918	0	18	575
Self-Supply Commercial and Institutional	3	38	4	45	0	0	7
Self-Supply Irrigation	3	36	9	48	0	0	43
Self-Supply Livestock	0	92	33	126	0	0	4
Self-Supply Industrial	605	688	138	1,431	0	0	224
Self-Supply Thermoelectric Power Production (Once-through cooling)	102	5	0	107	0	0	1
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	630,142	213,125	0	843,267	0	0	0
Other Self Supply	21	11	3	35	0	0	16
Total	633,317	215,240	420	848,977	0	18	870

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Jurisdiction Reports

Illinois

The Illinois portion of the Lake Michigan watershed is only about 100 square miles, which accounts for less than 0.2 percent of the total area of the state. The Lake Michigan coastline of Illinois is 63 miles long, which is less than 0.4 percent of the 1,640 miles of Lake Michigan shoreline. Despite its small size, the Illinois Lake Michigan service area is home to half the total population of Illinois and the lake is the largest public drinking water supply in the state, serving nearly seven million people.

Illinois's reported total withdrawal amount from the basin in 2021 was 1,627 mgd (6,160 mld), an approximately 7 percent increase from 2020 (1,520 mgd or 5,755 mld). The largest reported water uses were public water supply at 789 mgd or 2,988 mld (48 percent of the total withdrawal amount) and thermoelectric power production (once-through cooling) at 623 mgd or 2,357 mld (38 percent of the total withdrawal amount). The source for all withdrawals was Lake Michigan surface water, except for a small groundwater withdrawal in the self-supply industrial sector.

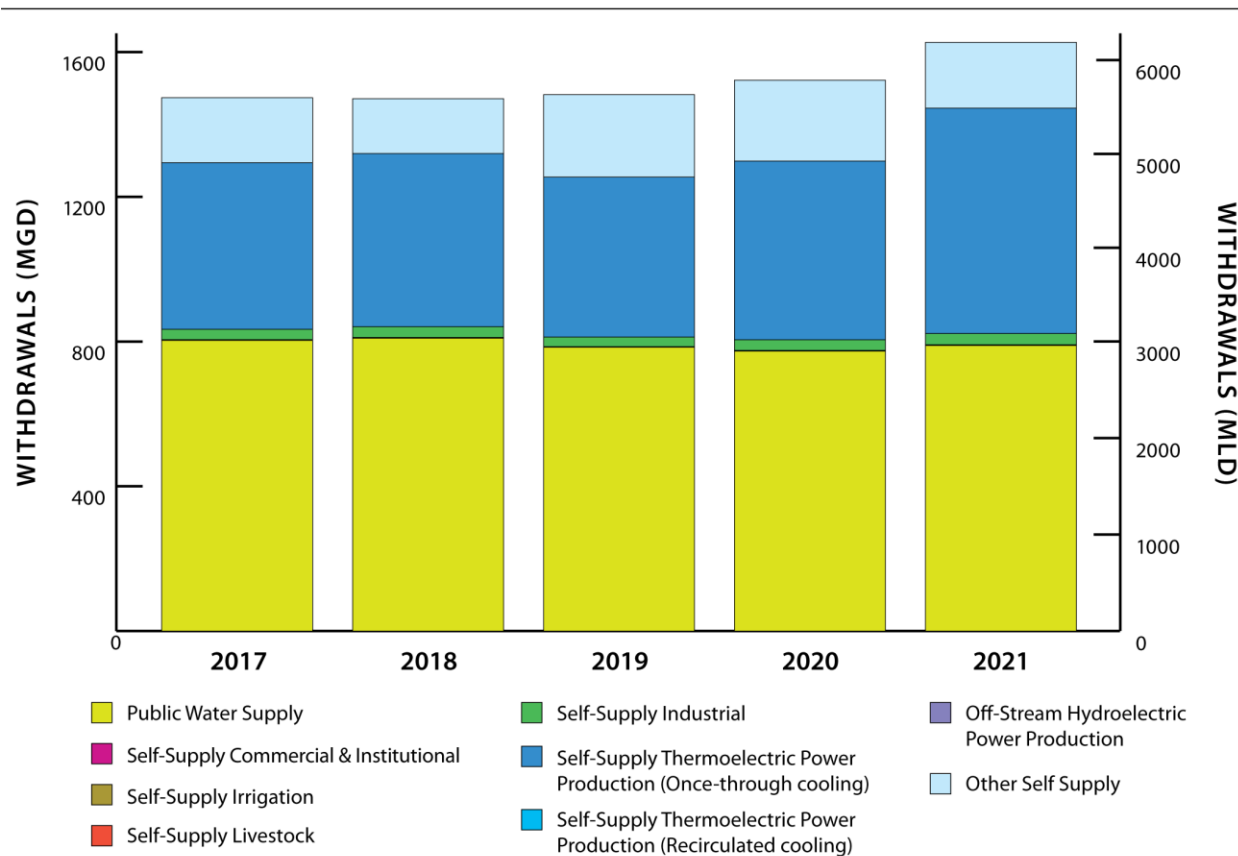


Figure 14. Illinois water withdrawals by sector over the last five years

A total of 974 mgd (3,685 mld) were diverted through the Illinois Diversion in 2021. The Illinois Diversion diverts water from Lake Michigan through the Chicago Area Water System (CAWS) into the Mississippi River watershed and is comprised of three elements: public water supply, stormwater runoff and direct diversion. The amount of water diverted for public water supply was 789 mgd (2,988 mld), with an additional 2.5 mgd (9.4 mld) diverted for the industrial sector and the commercial and institutional sector.

Direct diversion occurs at three lakefront structures: the Chicago River Controlling Structure, the O’Brien Lock and Dam and the Wilmette Pumping Station. Direct diversion consists of four elements: lockage, leakage, discretionary flow and navigational makeup. Lockage is used in moving vessels to and from Lake Michigan through locks and only occurs at the Chicago River Controlling Structure and the O’Brien Lock and Dam. Leakage is water estimated to pass through or around the three lakefront structures. Discretionary flow is used to dilute effluent from sewage discharges and improve water quality in the CAWS. Navigational makeup is used to maintain navigational depths in the CAWS. The total direct diversion was 182 mgd (688 mld). Consumptive use in Illinois is negligible: less than 0.01 percent of water withdrawn is lost through consumptive use, totaling about 0.1 mgd (0.5 mld).

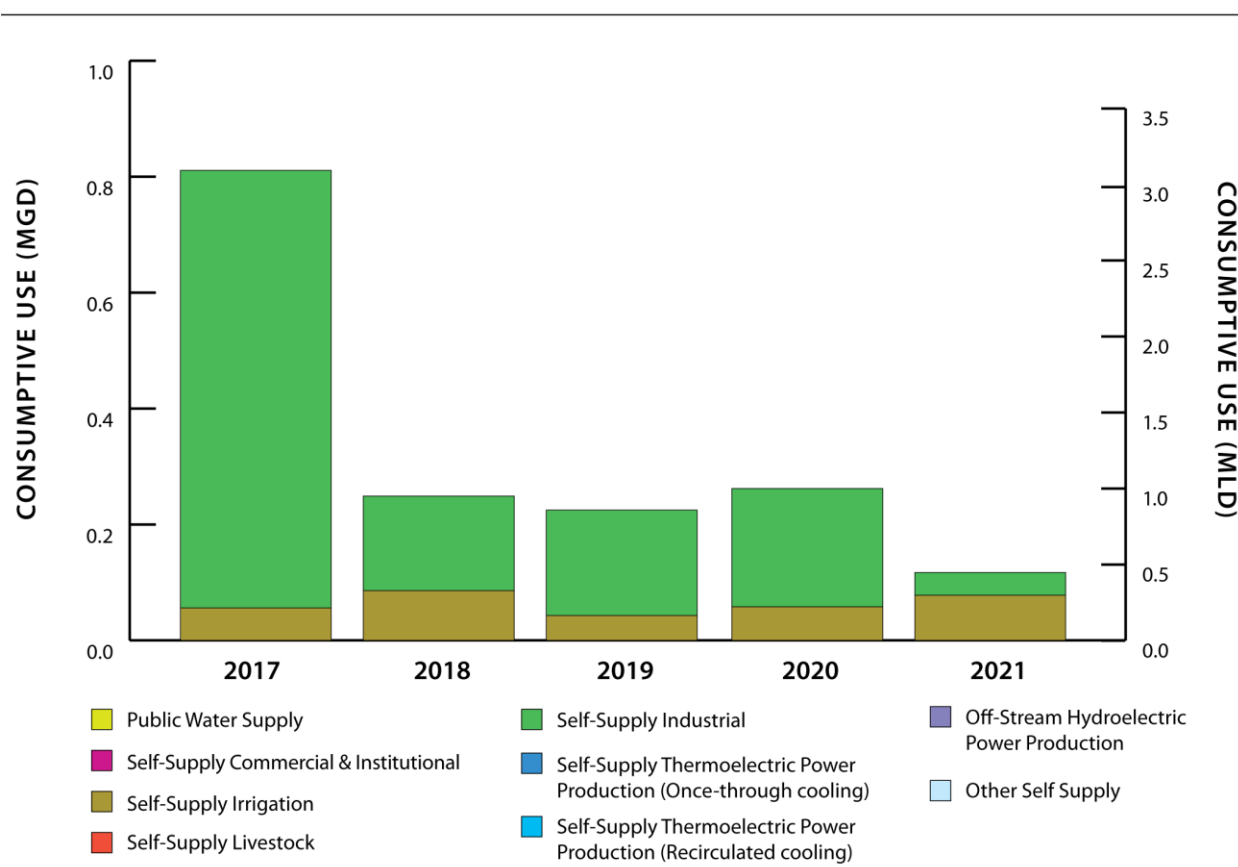


Figure 15. Illinois consumptive use by sector over the last five years

Data collected for this report came from the Illinois State Water Survey and from monthly pumpage reports and annual user reports submitted to the Illinois Department of Natural Resources. These data were generated with 100 percent reporting compliance from permitted water withdrawal facilities.

Notable changes from 2020 water use by Illinois facilities include:

- A 26 percent (129 mgd or 488 mld) increase in water withdrawal for self-supply thermoelectric power production (once-through cooling) due to one power plant pumping much less water in 2020.
- A 19 percent (42 mgd or 159 mld) decrease in water withdrawal for the other self-supply sector, attributable to normal fluctuations in operations to maintain water levels for navigation.

Table 11a. Illinois 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	789	0	0	789	0	789	0
Self-Supply Commercial and Institutional	2	0	0	2	0	2	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	32	0	0	32	0	1	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	623	0	0	623	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	182	0	0	182	0	182	0
Total	1,627	0	2	1,629	0	974	0

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 11b. Illinois 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,988	0	0	2,988	0	2,988	0
Self-Supply Commercial and Institutional	7	0	0	7	0	7	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	120	0	1	120	0	2	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	2,357	0	1	2,358	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	1	1	0	0	0
Off-Stream Hydroelectric Power Production	0	0	1	1	0	0	0
In-Stream Hydroelectric Water Use	0	0	1	1	0	0	0
Other Self Supply	688	0	1	689	0	688	0
Total	6,160	0	6	6,166	0	3,685	0

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Indiana

The state of Indiana uses the water resources of the Lake Michigan and Lake Erie watersheds. Indiana's portion of the Lake Michigan watershed encompasses a total of 241 square miles. Four Indiana counties lie partially within the Lake Michigan watershed, but three (Lake, Porter and LaPorte counties) constitute more than 99.5 percent of its land area. Abundant freshwater from Lake Michigan has promoted the development of an extensive urban and industrial belt along Indiana's coastline. Water supplies in Indiana's noncoastal counties in the Lake Michigan watershed are drawn primarily from groundwater. Indiana also shares a portion of the Maumee River watershed that flows into Lake Erie. The Maumee River watershed encompasses 1,283 square miles of northeast Indiana. Six Indiana counties lie partially within this watershed.

Indiana's reported total withdrawal amount from the basin in 2021 was 1,520 mgd (5,754 mld), a 1 percent decrease from the 2020 reported withdrawals (1,531 mgd or 5,795 mld). The largest uses were self-supply industrial (1,286 mgd or 4,868 mld) and public water supply (165 mgd or 625 mld).

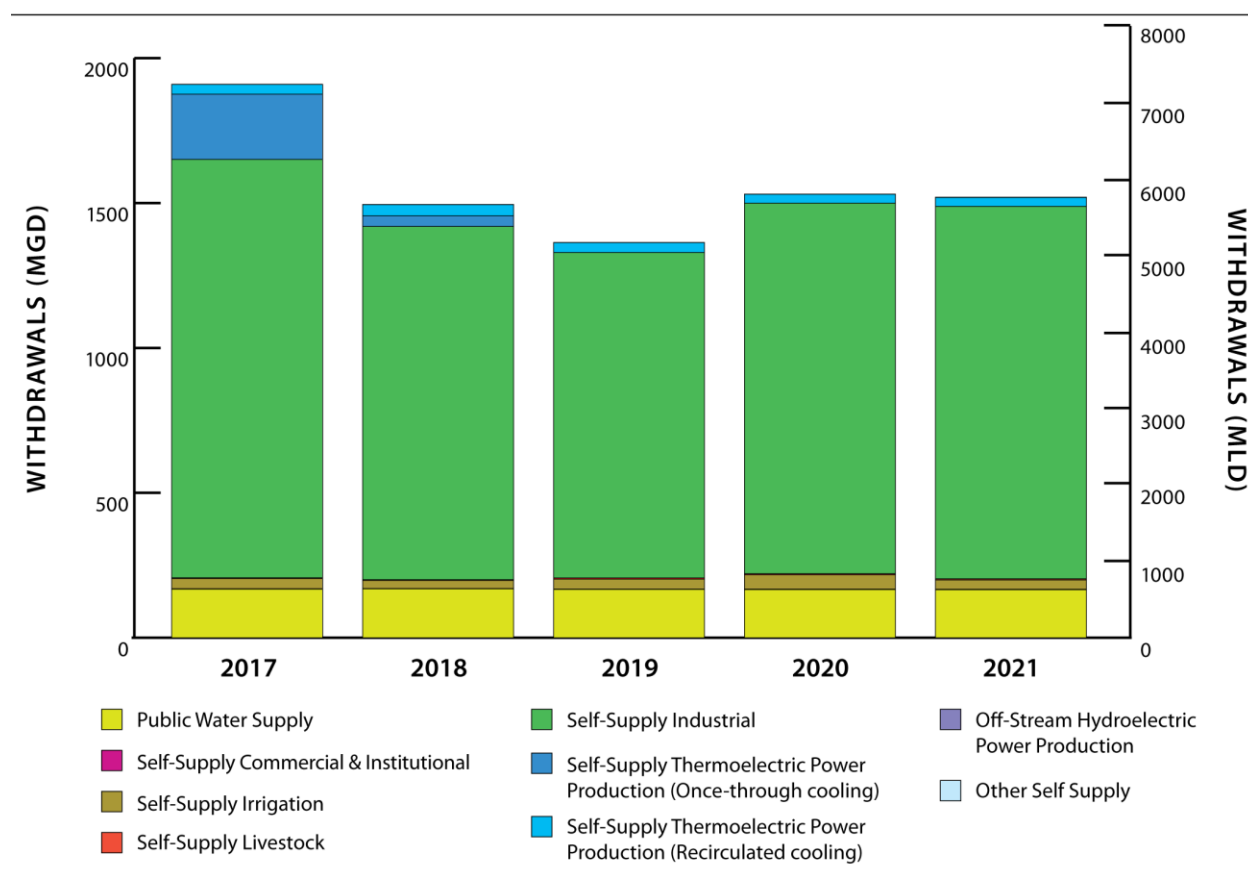


Figure 16. Indiana water withdrawals by sector over the last five years

The total reported diversion amount for Indiana was 80 mgd (303 mld). Because a 65 square mile portion of Indiana drains into the Illinois River (as a result of the Illinois Diversion), water transferred from the Lake Michigan watershed into this area is considered a diversion of water from the Great Lakes-St. Lawrence River basin. Most reported diversions for Indiana (48 mgd or 181 mld) were distributed for public supply purposes from Lake Michigan surface water and discharged to the Illinois Diversion area, with approximately 1 mgd (4 mld) reported as a diversion from groundwater in the Lake Michigan watershed for public supply. The industrial sector also diverted 23 mgd (87 mld) from the Lake Michigan watershed to the Illinois River.

In the Lake Erie watershed, a portion of the city of Fort Wayne’s public water supply distribution system is outside of the Great Lakes basin in the Upper Wabash watershed. The water distributed through that portion of the system (about 8 mgd or 31 mld) was reported as a diversion from the Lake Erie watershed. This diversion was almost exclusively from other surface water with less than 0.01 percent from groundwater.

Consumptive use in Indiana totaled 314 mgd (1,187 mld), with the self-supply industrial sector in the Lake Michigan watershed (252 mgd or 953 mld) representing 83 percent of all consumptive use.

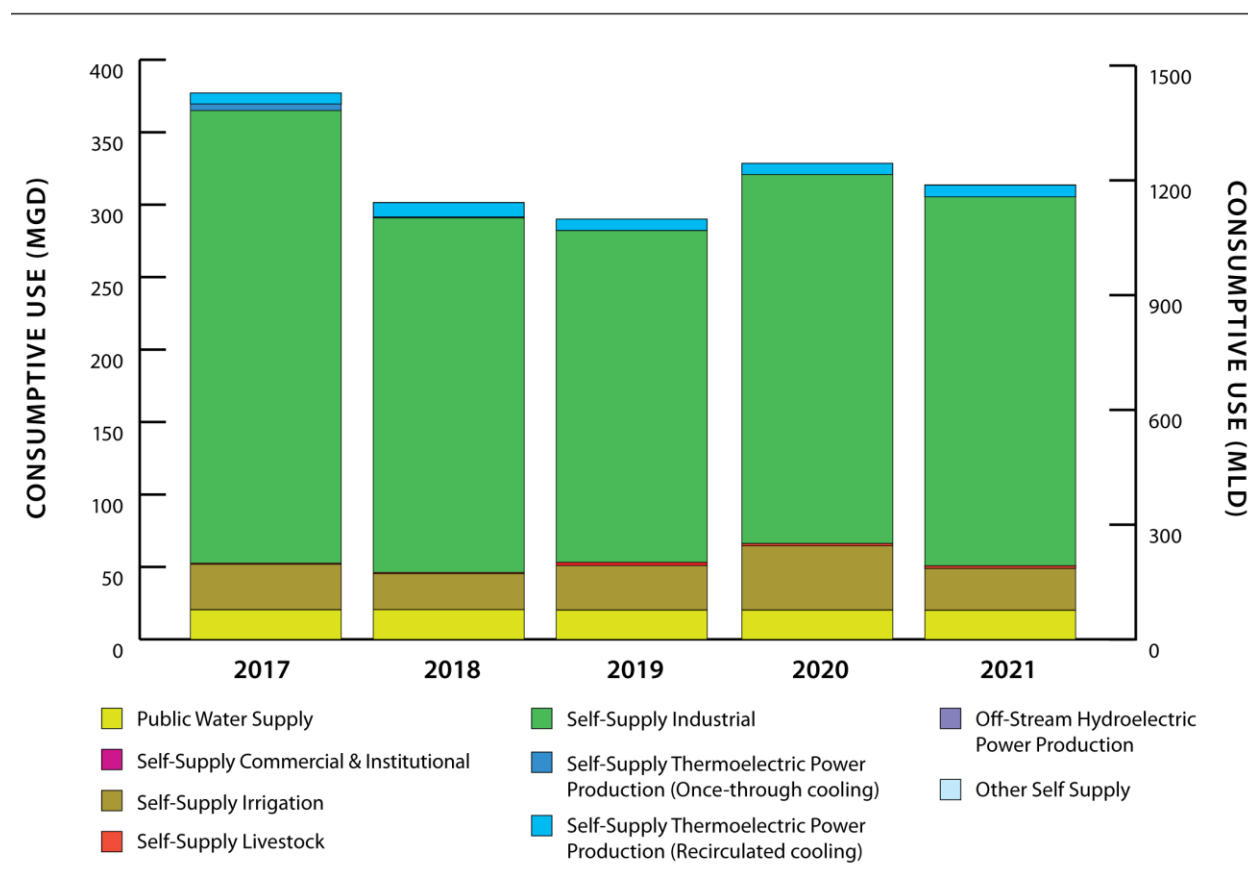


Figure 17. Indiana consumptive use by sector over the last five years

Data collected for this report came from the Indiana Department of Natural Resources. These data were generated with reporting compliance rates from permitted water withdrawal facilities ranging from 80 to 100 percent, depending on the water use sector. Data were not estimated for facilities that did not report. Indiana does not require in-stream hydroelectric water users to register or report this use.

Notable changes from 2020 water use by Indiana facilities include:

- A 35 percent (17 mgd or 64 mld) decrease in water withdrawal and a corresponding 35 percent (16 mgd or 59 mld) decrease in consumptive use for self-supply irrigation, associated with increased precipitation during the summer months of 2021.
- A 34 percent (0.34 mgd or 1.29 mld) increase in water withdrawal and a similar (33 percent) increase in consumptive for other self-supply, primarily due to the registration of a new facility in this sector in 2021.
- A 47 percent (0.07 mgd or 0.26 mld) increase in self-supply industrial water withdrawal of Lake Erie groundwater and a similar (47 percent) increase in consumptive use, primarily due to the addition of a well at one facility.

Table 12a. Indiana 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	85	37	43	165	0	57	20
Self-Supply Commercial and Institutional	0	0	2	2	0	0	0
Self-Supply Irrigation	0	4	28	32	0	0	29
Self-Supply Livestock	0	1	3	4	0	0	2
Self-Supply Industrial	1,269	7	9	1,286	0	23	255
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	10	20	2	31	0	0	8
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	1	1	0	0	0
Total	1,364	70	86	1,520	0	80	314

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding.

Table 12b. Indiana 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	322	142	162	626	0	216	76
Self-Supply Commercial and Institutional	0	0	6	6	0	0	1
Self-Supply Irrigation	0	17	105	122	0	0	108
Self-Supply Livestock	0	4	11	14	0	0	7
Self-Supply Industrial	4,805	27	34	4,867	0	87	963
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	36	74	7	116	0	0	31
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	1	0	3	4	0	0	0
Total	5,165	264	327	5,755	0	303	1,188

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Michigan

Home to more than 10 million people, Michigan borders four of the Great Lakes (Superior, Michigan, Huron and Erie). Virtually the entire land area of the state lies within the Great Lakes basin and Michigan has over 3,200 miles of Great Lakes shoreline – more freshwater coastline than any other state.¹⁶

Michigan's reported total withdrawal amount from the basin in 2021 was 8,164 mgd (30,903 mld), a 1 percent decrease from the 2020 total water withdrawal amount of 8,248 mgd (31,221 mld). The largest water use was self-supply thermoelectric power production (once-through cooling) at 6,191 mgd (23,434 mld), over 75 percent of Michigan's total withdrawal. About 47 percent of the total withdrawal amount (3,812 mgd or 14,430 mld) came from the Lake Erie watershed, mainly used for thermoelectric power production. Another 46 percent of Michigan's total withdrawal amount came from the Lake Michigan watershed (3,767 mgd or 14,258 mld), followed by the Lake Huron watershed at 544 mgd or 2,060 mld (7 percent) and the Lake Superior watershed at 41 mgd or 155 mld (0.5 percent).

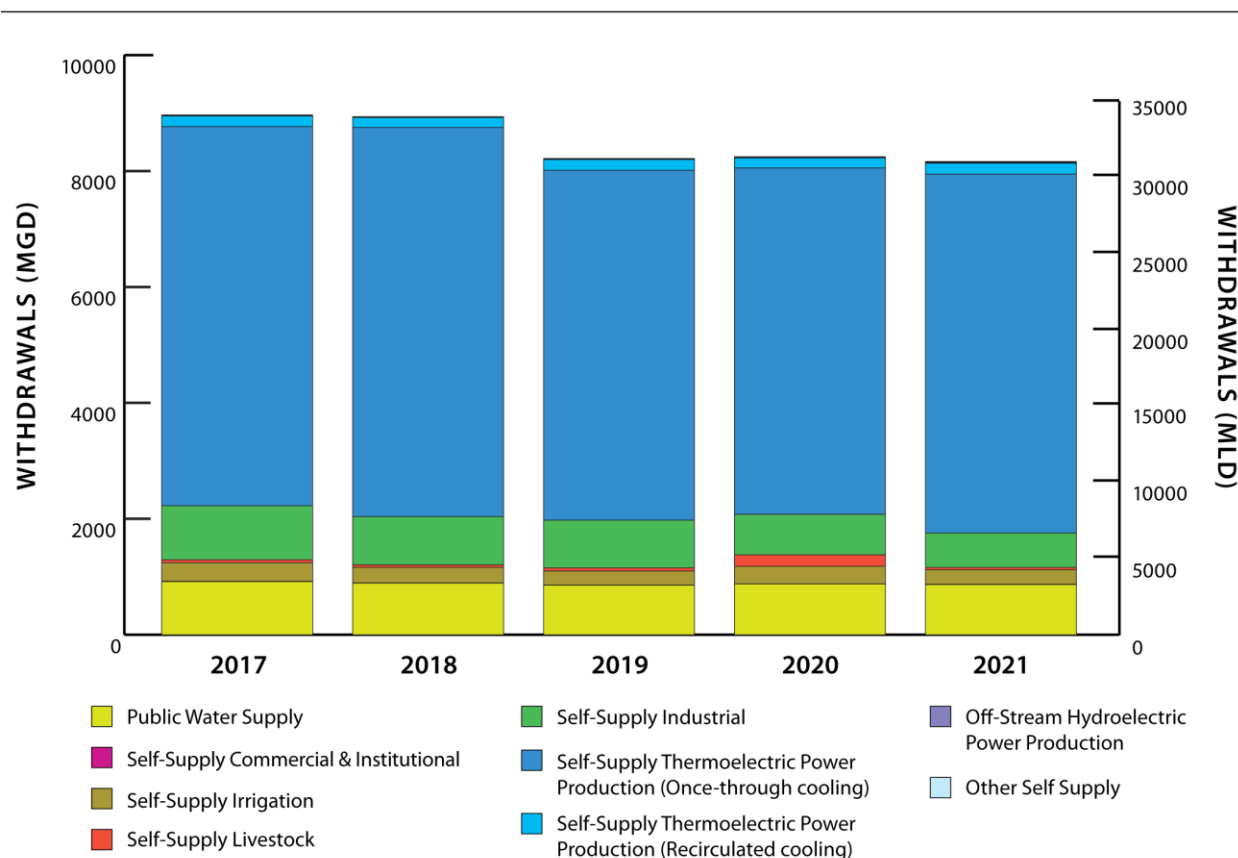


Figure 18. Michigan water withdrawals by sector over the last five years

¹⁶ National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management, [Shoreline Mileage of the United States](#).

In 2021, the total amount of consumptive use in Michigan was 572 mgd or 2,167 mld (approximately 7 percent of the total withdrawal amount), with self-supply irrigation being the largest contributor at 228 mgd (863 mld).

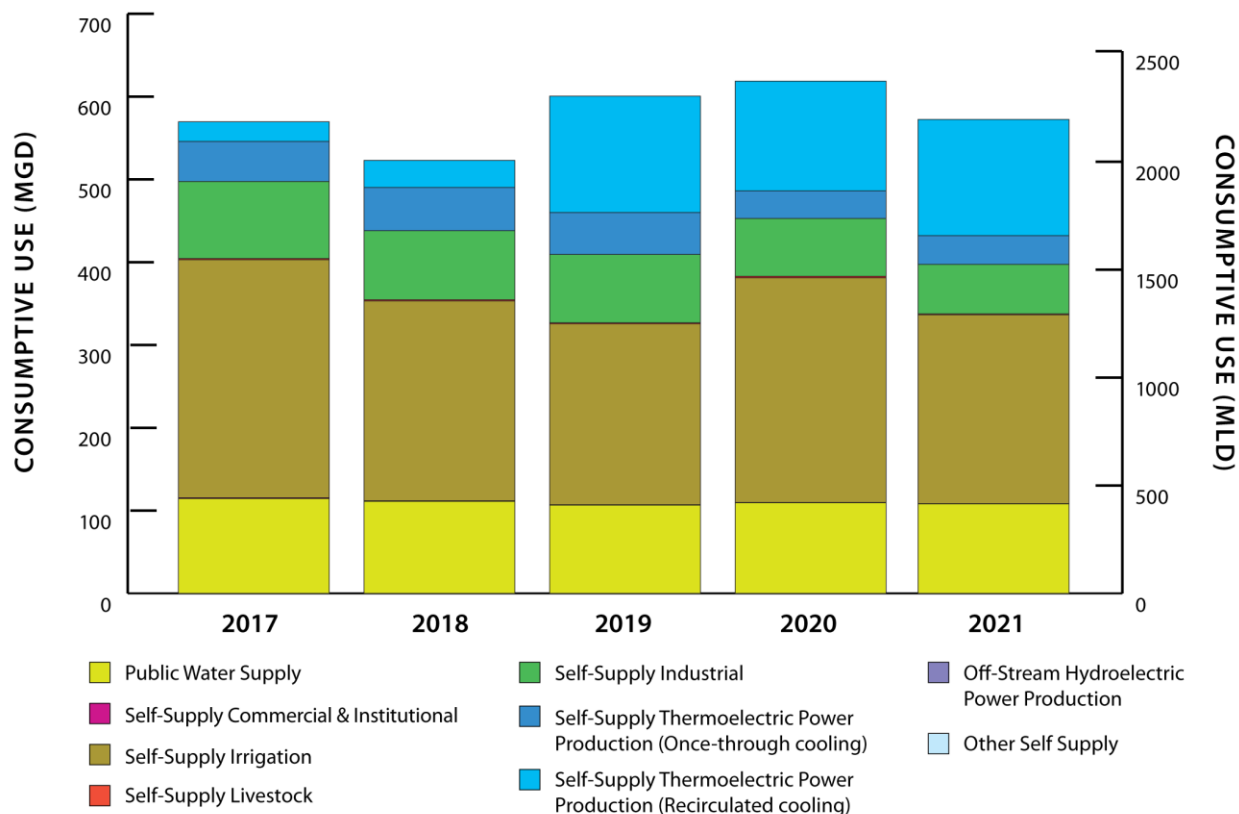


Figure 19. Michigan consumptive use by sector over the last five years

Data collected for this report came from user reports to the Michigan Department of Environment, Great Lakes, and Energy, either directly or via the Michigan Department of Agriculture and Rural Development. These data were generated with estimated reporting compliance rates ranging from 70-100 percent of total water users, depending on the water use sector. Water use for hydroelectric power generation is exempt from reporting requirements under Michigan statute.

Notable changes from 2020 water use by Michigan facilities include:

- An 82 percent (163 mgd or 617 mld) decrease in withdrawals, with a 35 percent (0.6 mgd or 2.4 mld) decrease in consumptive use for the self-supply livestock sector. The withdrawal decrease is largely attributable to a reporting error for water use at a fish hatchery in 2020, which was remedied in 2021 and returned to normal withdrawal amounts.
- A 37 percent (8 mgd or 30 mld) increase in withdrawals for other self-supply, primarily due to changes in needs for temporary construction dewatering projects.
- A 16 percent (48 mgd or 182 mld) decrease in withdrawal and corresponding 16 percent decrease in consumptive use (43 mgd or 163 mld) for the self-supply irrigation sector, primarily attributable to weather conditions necessitating less irrigation.
- A 15 percent (102 mgd or 386 mld) decrease in withdrawals and an associated 15 percent decrease in consumptive use for the self-supply industrial sector, largely due to decreased manufacturing production and mining dewatering.
- A 9 percent (15 mgd or 57 mld) increase in self-supply thermoelectric power production (recirculated cooling), largely due to increased production to make up the difference for several decommissioned power plants in 2021.

Table 13a. Michigan 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	665	13	188	866	0	0	108
Self-Supply Commercial and Institutional	0	0	3	4	0	0	0
Self-Supply Irrigation	0	53	200	253	0	0	228
Self-Supply Livestock	0	21	16	36	0	0	1
Self-Supply Industrial	186	330	81	597	0	0	60
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,760	430	1	6,191	0	0	35
Self-Supply Thermoelectric Power Production (Recirculated cooling)	184	3	2	189	0	0	141
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	6	22	28	0	0	0
Total	6,796	856	512	8,164	0	0	572

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 13b. Michigan 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,519	48	711	3,277	0	0	410
Self-Supply Commercial and Institutional	1	2	11	14	0	0	1
Self-Supply Irrigation	2	201	756	958	0	0	863
Self-Supply Livestock	0	79	59	138	0	0	4
Self-Supply Industrial	705	1,248	305	2,259	0	0	226
Self-Supply Thermoelectric Power Production (Once-through cooling)	21,803	1,627	4	23,434	0	0	131
Self-Supply Thermoelectric Power Production (Recirculated cooling)	697	13	8	717	0	0	532
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	1	23	82	105	0	0	0
Total	25,726	3,240	1,937	30,903	0	0	2,167

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Minnesota

The Minnesota portion of the Lake Superior watershed encompasses approximately 6,800 square miles.¹⁷ Major river watersheds in the basin include the Cloquet, Nemadji and St. Louis River systems, as well as the north shore tributaries to Lake Superior.

Excluding in-stream hydroelectric water use (1,234 mgd or 4,672 mld), Minnesota's reported total withdrawal amount from the basin in 2021 was 1,291 mgd (4,887 mld), a 31 percent decrease from the total withdrawal of 1,866 mgd (7,065 mld) in 2020. This change in withdrawal amount is largely due to a decrease in water use for off-stream hydroelectric power production, which was the sector with the greatest water use (1,028 mgd or 3,890 mld). The second largest use sector was self-supply industrial at 141 mgd (534 mld).

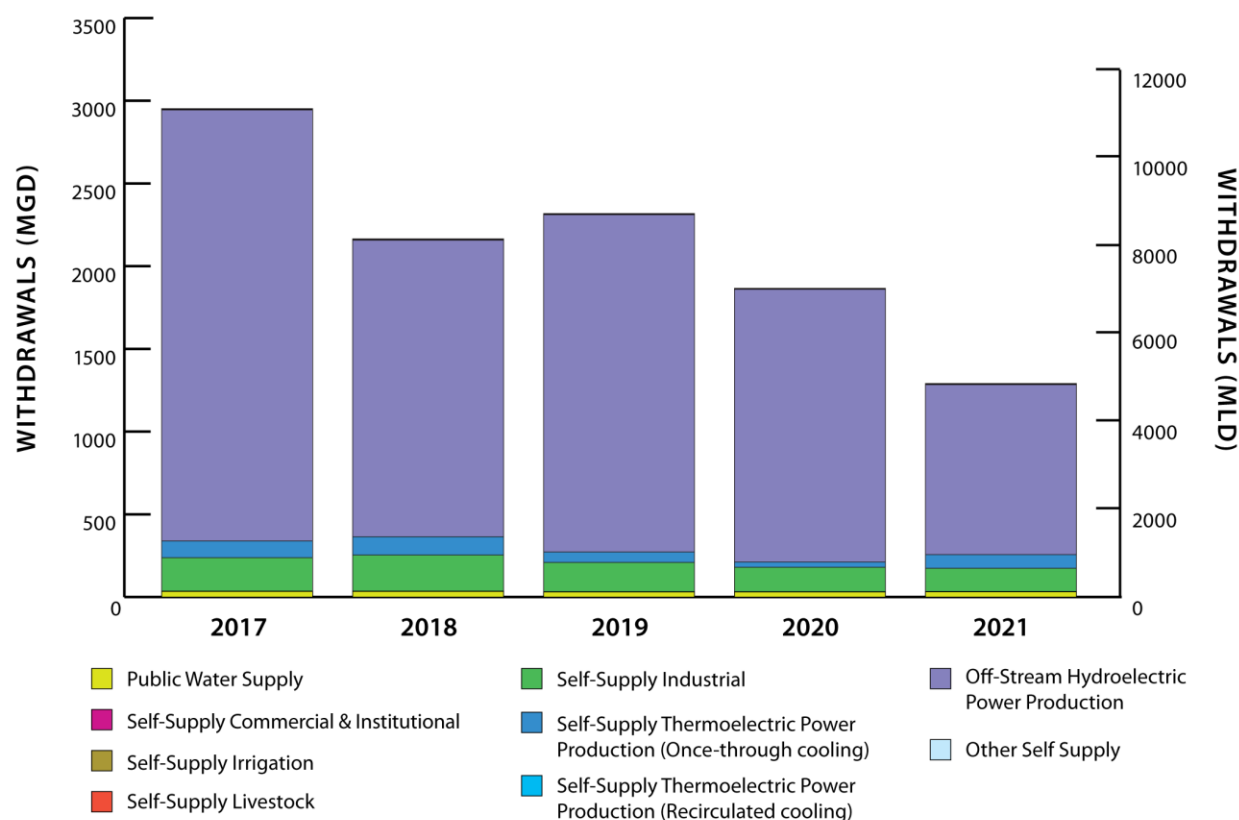


Figure 20. Minnesota water withdrawals by sector over the last five years

Approximately 91 percent of total withdrawals came from other surface water within the Lake Superior watershed (1,172 mgd or 4,438 mld), while just under 9 percent (113 mgd or 426 mld) came directly from Lake Superior. Less than 1 percent of withdrawals (6 mgd or 23 mld) were from groundwater. The large relative use of 'other surface water' comes from water withdrawals for off-stream hydroelectric power production along the St. Louis River. The total reported diversion amount of 9 mgd (34 mld) was almost

¹⁷ Minnesota Pollution Control Agency, [Watershed Information](#).

exclusively for self-supply industrial purposes. A small amount of the outgoing diversion (0.01 mgd or 0.04 mld) was also reported for the self-supply irrigation sector. Total consumptive use was 19 mgd (72 mld), the majority of which was for industrial purposes (14 mgd or 53 mld).

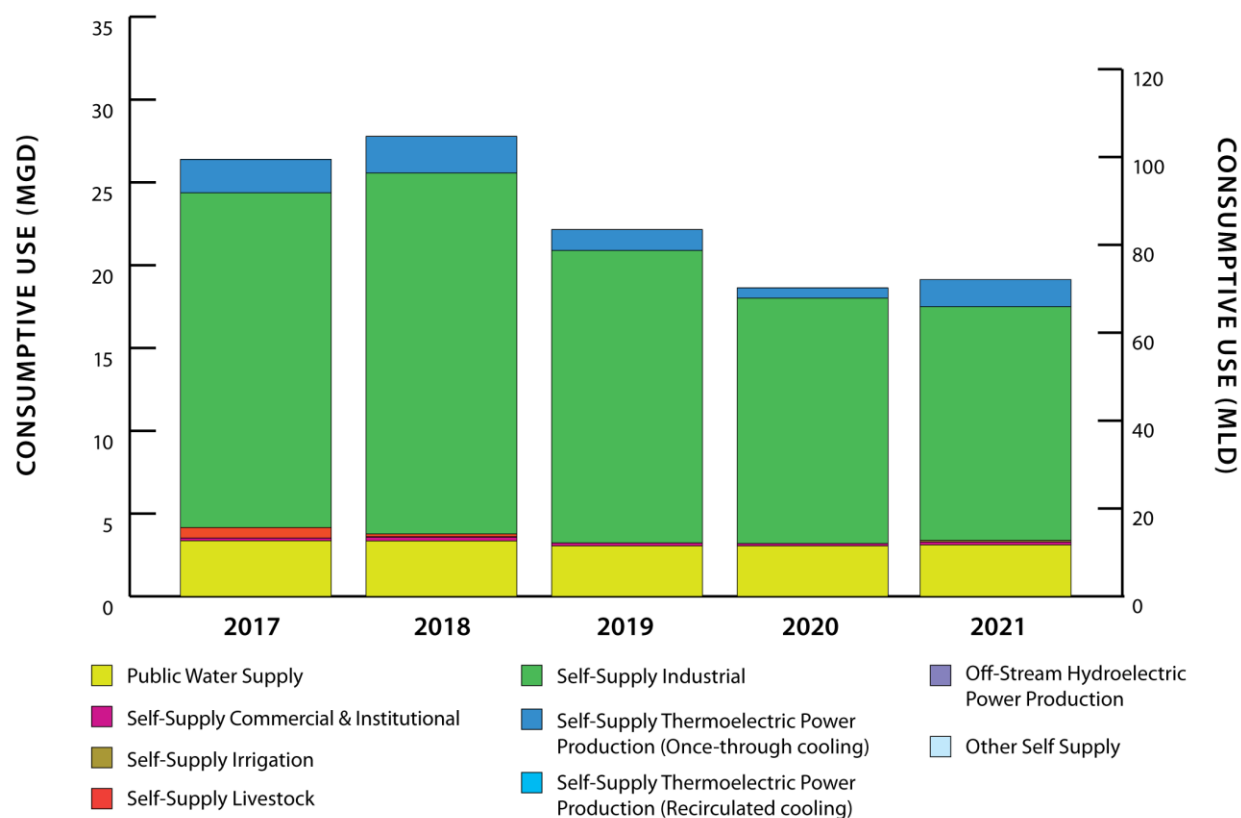


Figure 21. Minnesota consumptive use by sector over the last five years

The water use data were provided by the Minnesota Department of Natural Resources, which collected measured water use data from water withdrawal permit holders with 100 percent reporting compliance from permitted water withdrawal facilities.

Notable changes from 2020 water use by Minnesota facilities include:

- A 162 percent (51 mgd or 193 mld) increase in water withdrawals for self-supply thermoelectric power production (once-through cooling) due to increased production at two facilities, consistent with recent fluctuations and market demand.
- A 38 percent (621 mgd or 2,351 mld) decrease in withdrawals for off-stream hydroelectric power production, a change resulting from drought conditions in 2021.
- A 40 percent (6 mgd or 23 mld) decrease in the total diversion amount. Decreases in both the self-supply industrial and self-supply irrigation sector diversions are attributable to normal fluctuations in operations.

Table 14a. Minnesota 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	25	2	5	31	0	0	3
Self-Supply Commercial and Institutional	2	0	0	2	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	46	94	1	141	0	9	14
Self-Supply Thermoelectric Power Production (Once-through cooling)	40	42	0	82	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,028	0	1,028	0	0	0
In-Stream Hydroelectric Water Use	0	1,234	0	1,234	0	0	0
Other Self Supply	0	7	0	7	0	0	0
Total	113	2,406	6	2,525	0	9	19

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 14b. Minnesota 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	94	6	17	118	0	0	12
Self-Supply Commercial and Institutional	6	1	0	7	0	0	1
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	173	356	5	534	0	34	53
Self-Supply Thermoelectric Power Production (Once-through cooling)	153	157	1	311	0	0	6
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	3,890	0	3,890	0	0	0
In-Stream Hydroelectric Water Use	0	4,672	0	4,672	0	0	0
Other Self Supply	0	27	0	27	0	0	0
Total	426	9,109	23	9,559	0	34	72

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW) totals may not sum exactly due to rounding

New York

Approximately 80 percent of New York state’s fresh surface water, over 700 miles of shoreline and nearly 48 percent of New York’s land area are contained in the watersheds of Lake Erie, Lake Ontario and the St. Lawrence River—including the Lake Champlain and Lake George watersheds. More than four million New Yorkers depend on the fresh water of these watersheds for their drinking water.¹⁸

Excluding in-stream hydroelectric water use (223,403 mgd or 845,672 mld), New York’s reported total withdrawal amount from the basin in 2021 was 3,335 mgd (12,623 mld), an approximately 2 percent decrease from 2020 water use (3,402 mgd or 12,878 mld). New York facilities withdrew the most water from the Lake Ontario watershed, making up 86 percent of New York’s total withdrawal from the basin at 2,854 mgd (10,805 mld).

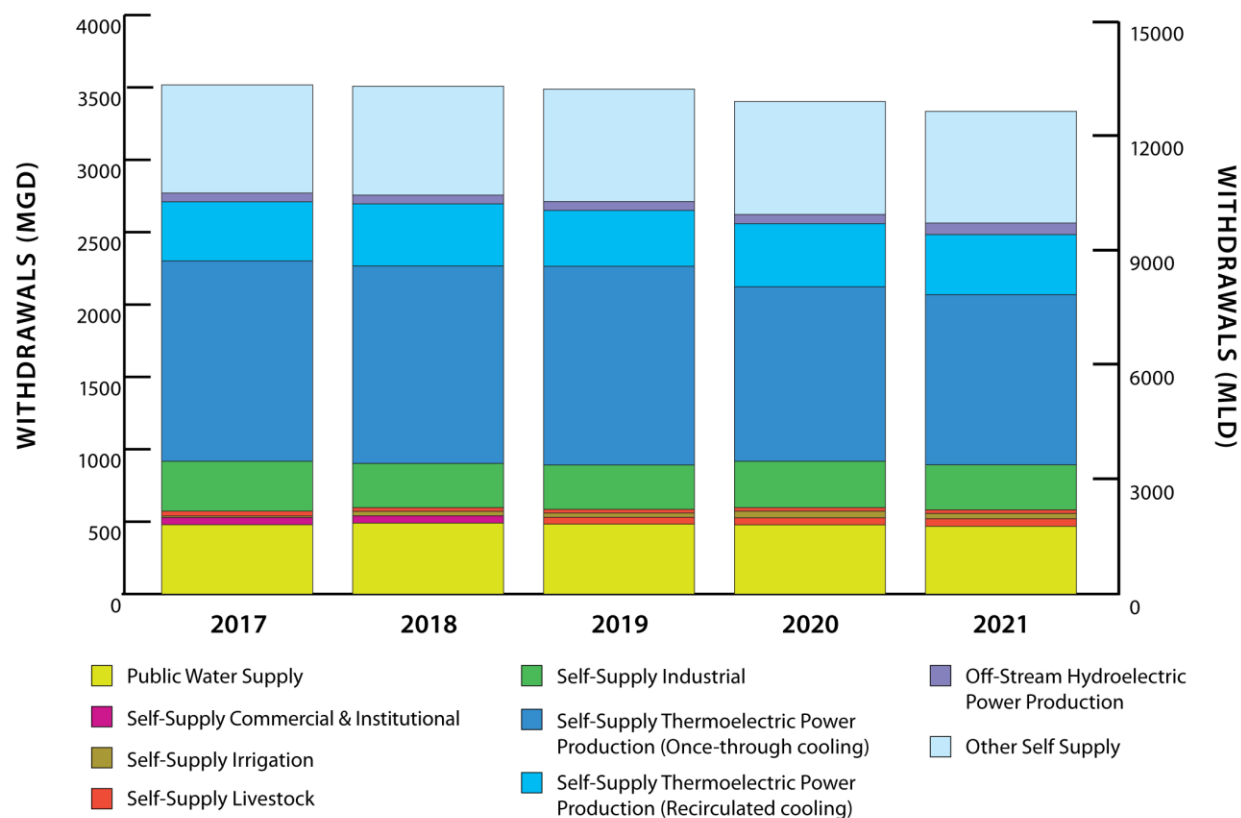


Figure 22. New York water withdrawals by sector over the last five years

¹⁸ Great Lakes Basin Advisory Council, *Our Great Lakes Water Resources: Conserving and Protecting Our Water Today for Use Tomorrow* Final Report. 2010.

The self-supply thermoelectric power production sectors (both once-through and recirculated cooling) withdrew 1,592 mgd (6,025 mld), which represented 48 percent of the total withdrawal amount. Other self-supply was the next largest water use sector, withdrawing 772 mgd (2,923 mld) and accounting for 23 percent of total withdrawals. Excluding in-stream hydroelectric power production, Great Lakes surface water was the primary source of water for the Lake Erie and Lake Ontario watersheds, while other surface water was the primary source for the St. Lawrence River watershed.

The 2021 total (net) diversion amount for New York was 43 mgd (162 mld), the majority of which (32 mgd or 121 mld) was from Lake Ontario for the Erie Barge Canal. The balance of the diversion, 11 mgd or 41 mld, was for public supply. The total consumptive use amount was 249 mgd (944 mld), with the largest consumptive uses attributed to the self-supply industrial sector at 67 mgd (254 mld) and public water supply at 57 mgd (215 mld).

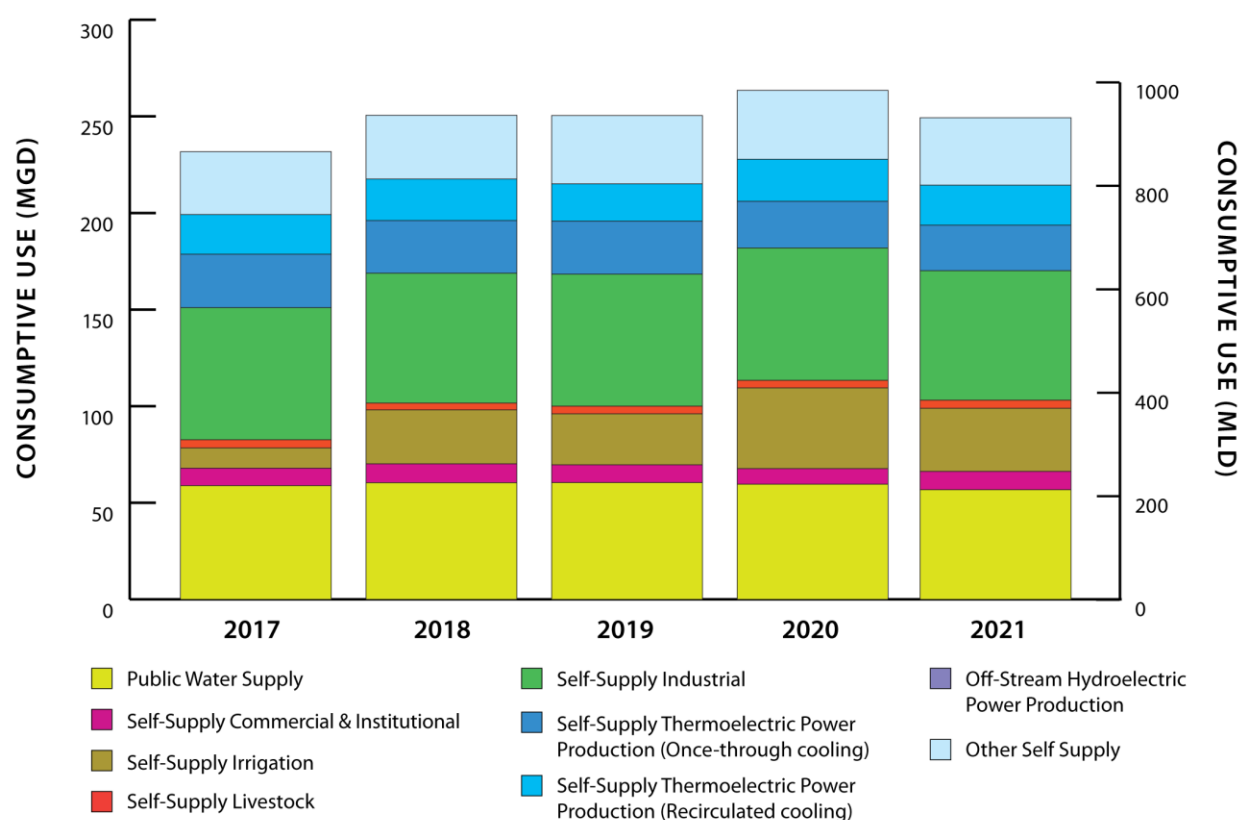


Figure 23. New York consumptive use by sector over the last five years

The water use data were provided by the New York State Department of Environmental Conservation which collected measured water use data with 100 percent reporting compliance from permitted water withdrawal facilities. New York has focused on enhanced permit management and QA/QC practices, achieving 100 percent reporting compliance for all sectors among facilities with water use above the reporting threshold in 2020 and 2021. New York's five-year implementation of permits for water

withdrawal was completed during 2017. The permits include an ongoing requirement to report water use, which should support continued adherence in compliance. Additionally, reporting facilities are required to complete a water conservation program and corresponding report section that includes conservation and efficiency measures. These measures include source metering, water auditing, leak detection and repair, recycling and reuse, and reductions during periods of drought.

Notable changes from 2020 water use by New York facilities include:

- A 23 percent (15 mgd or 57 mld) increase in water withdrawals for off-stream hydroelectric power production, which can be attributed to normal fluctuations in water use.
- A 22 percent (10 mgd or 38 mld) decrease in water withdrawals and consumptive use (9 mgd or 34 mld) for self-supply irrigation due to changes in demand associated with weather and facilities dropping below the reporting threshold in 2021.
- A 19 percent (2 mgd or 8 mld) decrease in diversions for the public water supply sector, which is consistent with typical fluctuations in water use.
- A 9 percent (4 mgd or 15 mld) increase in water withdrawals and a 17 percent (1 mgd or 4 mld) increase in consumption for self-supply commercial and institutional water use, primarily due to an increase in the number of facilities reporting in this sector.

Table 15a. New York 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	290	162	16	468	0	11	57
Self-Supply Commercial and Institutional	0	51	1	52	0	0	9
Self-Supply Irrigation	0	32	4	36	0	0	33
Self-Supply Livestock	0	15	10	25	0	0	4
Self-Supply Industrial	133	171	6	310	0	0	67
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,089	88	0	1,177	0	0	24
Self-Supply Thermoelectric Power Production (Recirculated cooling)	415	0	0	415	0	0	21
Off-Stream Hydroelectric Power Production	0	79	0	79	0	0	0
In-Stream Hydroelectric Water Use	142,495	80,908	0	223,403	0	0	0
Other Self Supply	0	772	0	772	0	32	35
Total	144,423	82,278	37	226,738	0	43	249

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 15b. New York 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,097	615	62	1,773	0	41	215
Self-Supply Commercial and Institutional	0	195	3	198	0	0	36
Self-Supply Irrigation	2	121	15	137	0	0	124
Self-Supply Livestock	0	56	38	94	0	0	16
Self-Supply Industrial	505	648	21	1,175	0	0	254
Self-Supply Thermoelectric Power Production (Once-through cooling)	4,123	332	0	4,455	0	0	89
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,570	0	0	1,570	0	0	79
Off-Stream Hydroelectric Power Production	0	299	0	299	0	0	0
In-Stream Hydroelectric Water Use	539,402	306,270	0	845,672	0	0	0
Other Self Supply	0	2,923	0	2,923	0	121	132
Total	546,699	311,458	139	858,296	0	162	944

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Ohio

Ohio's portion of the Lake Erie watershed drains 11,649 square miles and is home to 4.65 million people. Ohio's 312-mile shoreline includes the cities of Toledo, Sandusky and Cleveland. Agricultural row crops account for 59 percent of the land use in the Ohio watersheds draining to Lake Erie, followed by urban residential and commercial land use at a combined 16 percent. Another 16 percent are forested lands and wetlands, and pastureland makes up five percent of total land use.¹⁹

Ohio's reported total withdrawal amount from the basin in 2021 was 1,161 mgd (4,394 mld), a 1 percent decrease from the total withdrawal amount for 2020 (1,176 mgd or 4,451 mld). The primary water use sectors included public water supply, withdrawing 504 mgd (1,909 mld) and representing 43 percent of the total withdrawal amount, and self-supply thermoelectric power production (once-through and recirculated cooling) at 400 mgd (1,512 mld), accounting for 34 percent of the total. The source for 58 percent of the total withdrawal amount was Lake Erie surface water. However, within specific sectors, other surface water was the predominant source of water, making up 87 percent of self-supply irrigation water withdrawals and 66 percent of self-supply thermoelectric power production (once-through cooling) water withdrawals.

¹⁹ Ohio Environmental Protection Agency, Ohio Lake Erie Phosphorus Task Force Final Report. 2010.

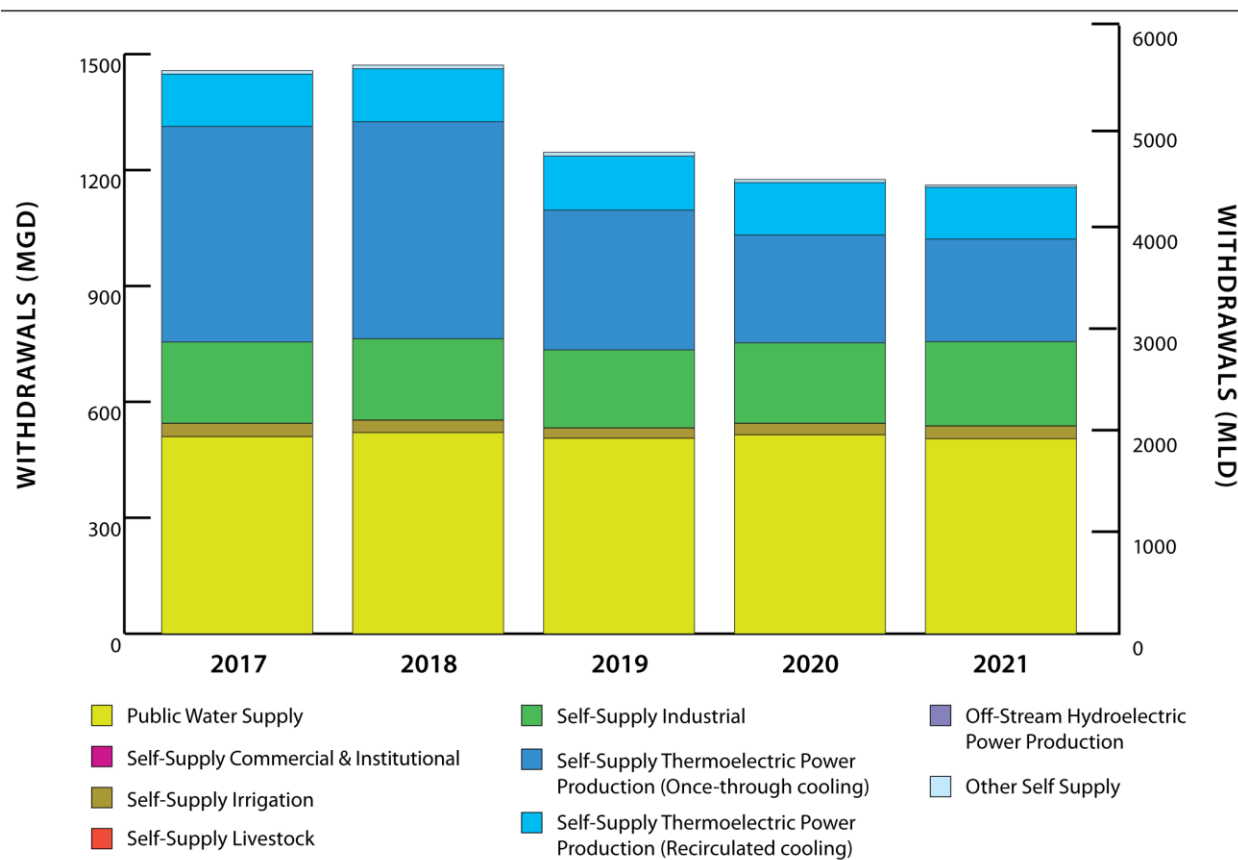


Figure 24. Ohio water withdrawals by sector over the last five years

The total (net) diversion amount was 25 mgd (96 mld) into the Lake Erie watershed.²⁰ Diversions out of the watershed totaled 12 mgd (44 mld)—all for public water supply purposes—and were offset by 40 mgd (152 mld) of incoming diversions—primarily associated with other self-supply (26 mgd or 100 mld)—and diversion returns (10 mgd or 39 mld). Additional small incoming diversions were reported for public water supply (1 mgd or 5 mld) and self-supply livestock (0.2 mgd or 0.8 mld). Total consumptive use was 126 mgd (478 mld), with 60 percent attributed to the public water supply sector.

²⁰ Incoming diversions are reported as negative values in the database and on tables.

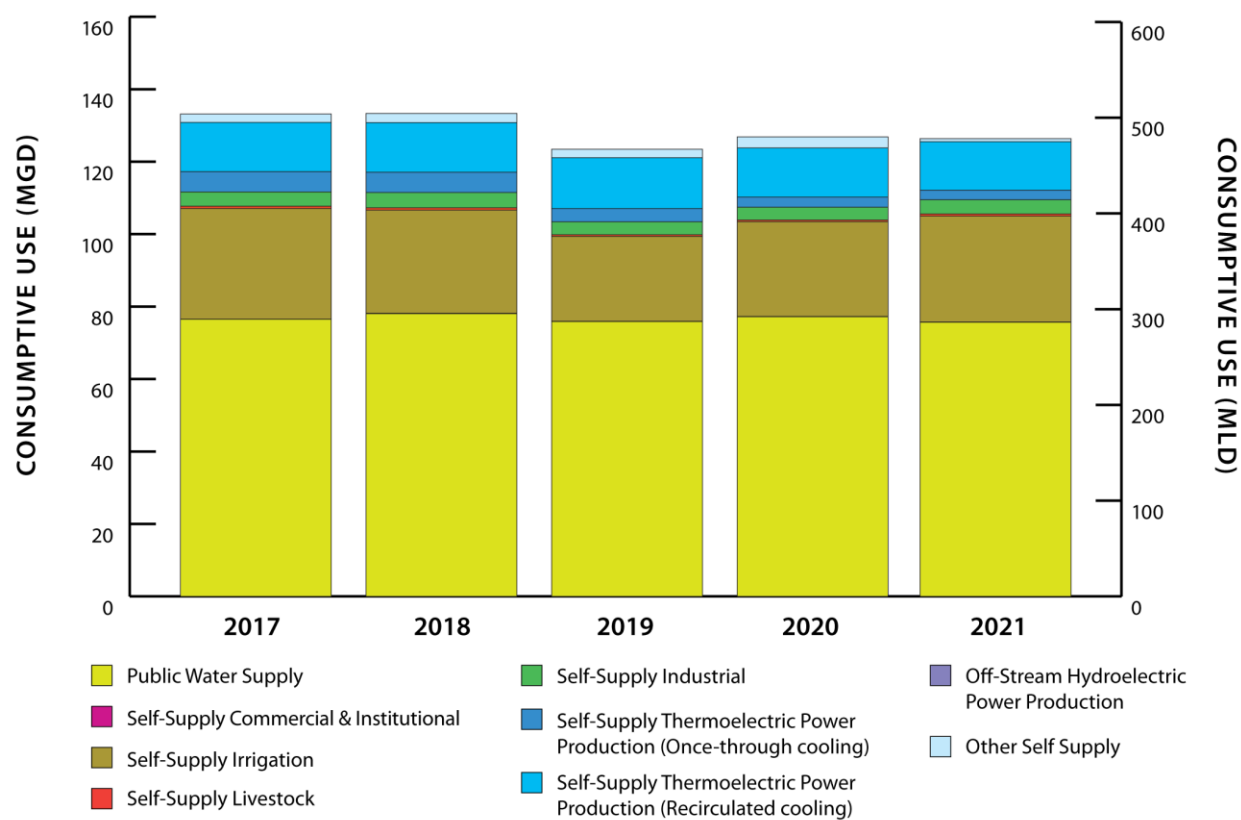


Figure 25. Ohio consumptive use by sector over the last five years

The water use data were provided by the Ohio Department of Natural Resources, which collected water use data with 100 percent reporting compliance from permitted water withdrawal facilities.

Notable changes from 2020 water use by Ohio facilities include:

- A 34 percent (3 mgd or 11 mld) decrease in water use for other self-supply, largely attributable to decreased wetland augmentation at state parks. Consumptive use for the other self-supply sector decreased by 72 percent (2 mgd or 7 mld), likely because the facilities that decreased in withdrawals had relatively high consumptive use coefficients, while other facilities with lower consumptive use coefficients increased water withdrawals based on normal fluctuations in operations.
- A 12 percent (3 mgd or 12 mld) increase in water withdrawals and consumptive use (3 mgd or 12 mld) for self-supply irrigation due to a return to normal trends following decreased use in 2020 from the COVID-19 pandemic.
- A 39 percent (0.21 mgd or 0.79 mld) increase in water withdrawals and 40 percent (0.17 mgd or 0.64 mld) increase in consumption for the self-supply livestock sector due to several facilities meeting the reporting threshold in 2021 after dropping below it in 2020.

Table 16a. Ohio 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	377	97	30	504	0	1	76
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	28	4	32	0	0	29
Self-Supply Livestock	0	0	1	1	0	0	1
Self-Supply Industrial	74	99	45	218	0	0	4
Self-Supply Thermoelectric Power Production (Once-through cooling)	90	175	0	265	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	134	0	0	134	0	0	13
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	1	3	1	5	0	-26	1
Total	677	403	80	1,161	0	-25	126

In millions of gallons per day Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 16b. Ohio 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,426	369	114	1,909	0	5	286
Self-Supply Commercial and Institutional	1	0	0	1	0	0	0
Self-Supply Irrigation	2	107	15	123	0	0	111
Self-Supply Livestock	0	0	2	3	0	-1	2
Self-Supply Industrial	281	375	170	825	0	0	15
Self-Supply Thermoelectric Power Production (Once-through cooling)	341	663	0	1,005	0	0	10
Self-Supply Thermoelectric Power Production (Recirculated cooling)	508	0	0	508	0	0	51
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	4	13	2	20	0	-100	3
Total	2,563	1,527	304	4,394	0	-96	478

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Ontario

More than 98 percent of Ontario residents live within the Great Lakes-St. Lawrence River basin. Ontario's portion of the Great Lakes forms the longest freshwater coastline in the world, stretching more than 6,200 miles (10,000 kilometers) across five major watersheds in the Great Lakes-St. Lawrence River system: Lake Superior, Lake Huron, Lake Erie, Lake Ontario and the St. Lawrence River watersheds.²¹

At the time of publishing this report, 2021 Ontario water use data were not available for analysis. This report incorporates revised 2020 water use data, including here in Ontario's jurisdiction section. Updated data will be added to the database as it is made available. However, Long Lac and Ogoki diversion data and Welland Canal intrabasin diversion data are updated for 2021 and incorporated into this report. The Long Lac and Ogoki diversions, located in northern Ontario, divert water into the Lake Superior basin from the Hudson Bay watershed. The Long Lac diversion began in 1939 and the Ogoki diversion began in 1943. The Welland Canal, operated by the St. Lawrence Seaway Management Corporation, is a navigation route which diverts water from Lake Erie to Lake Ontario, bypassing Niagara Falls.²²

Excluding in-stream hydroelectric water use (254,836 mgd or 964,658 mld), Ontario's reported total withdrawal amount from the basin in 2020 was 15,355 mgd or 58,123 mld, a 2 percent decrease from 2019 water withdrawals (15,667 mgd or 59,305 mld). Self-supply thermoelectric power production (once-through cooling) accounted for 86 percent of the total withdrawal amount at 13,199 mgd (49,962 mld). The next largest water use sectors were public supply at 1,122 mgd (4,247 mld) and self-supply industrial at 961 mgd (3,638 mld). Water withdrawals from Lake Ontario (7,458 mgd or 28,231 mld) and Lake Huron (7,194 mgd or 27,233 mld) collectively accounted for over 95 percent of the total withdrawal amount in Ontario. Great Lakes surface water was the primary source for withdrawals in the Lake Superior, Lake Huron, Lake Erie and Lake Ontario watersheds, while other surface water was the primary source for withdrawals in the St. Lawrence River watershed.

²¹ Ontario Ministry of the Environment, Conservation and Parks, [Ontario's Great Lakes Strategy](#). 2016.

²² International Joint Commission, [An Overview of Great Lakes Diversions](#). Updated April 2020.

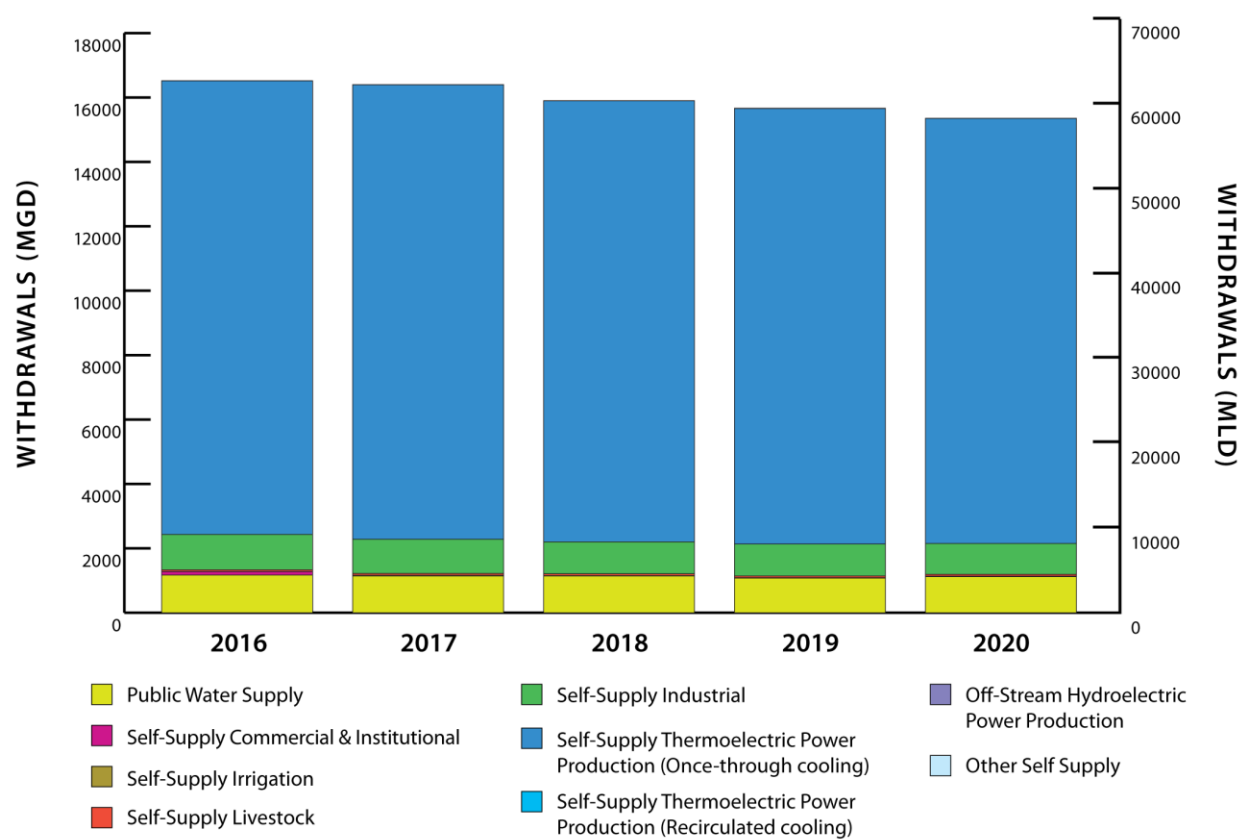


Figure 26. Ontario water withdrawals by sector over the last five years

No diversions out of the basin were reported for Ontario, while 3,182 mgd (12,046 mld) of water was diverted into the Lake Superior basin,²³ associated with the Long Lac and Ogoki diversions. The Welland Canal is entirely within Ontario and functions as two intrabasin transfers (one out of the Lake Erie basin and one into the Lake Ontario basin). These transfers effectively cancel each other out, resulting in a net zero intrabasin transfer. For more information about the volume of these transfers, see the Lake Erie basin section above. Similarly, additional intrabasin diversions for public drinking water supply between Lakes Huron, Erie and Ontario were reported but did not result in a net transfer.

The total consumptive use amount in 2020 was 339 mgd (1,282 mld). The three water use sectors representing the largest consumptive uses were public water supply at 135 mgd (510 mld), self-supply thermoelectric power production (once-through cooling) at 119 mgd (450 mld) and self-supply industrial at 79 mgd (299 mld). Use associated with intrabasin diversions accounted for less than 2 percent of the total consumptive use at 6 mgd (21 mld).

²³ Incoming diversions are reported as negative values in the database and on tables.

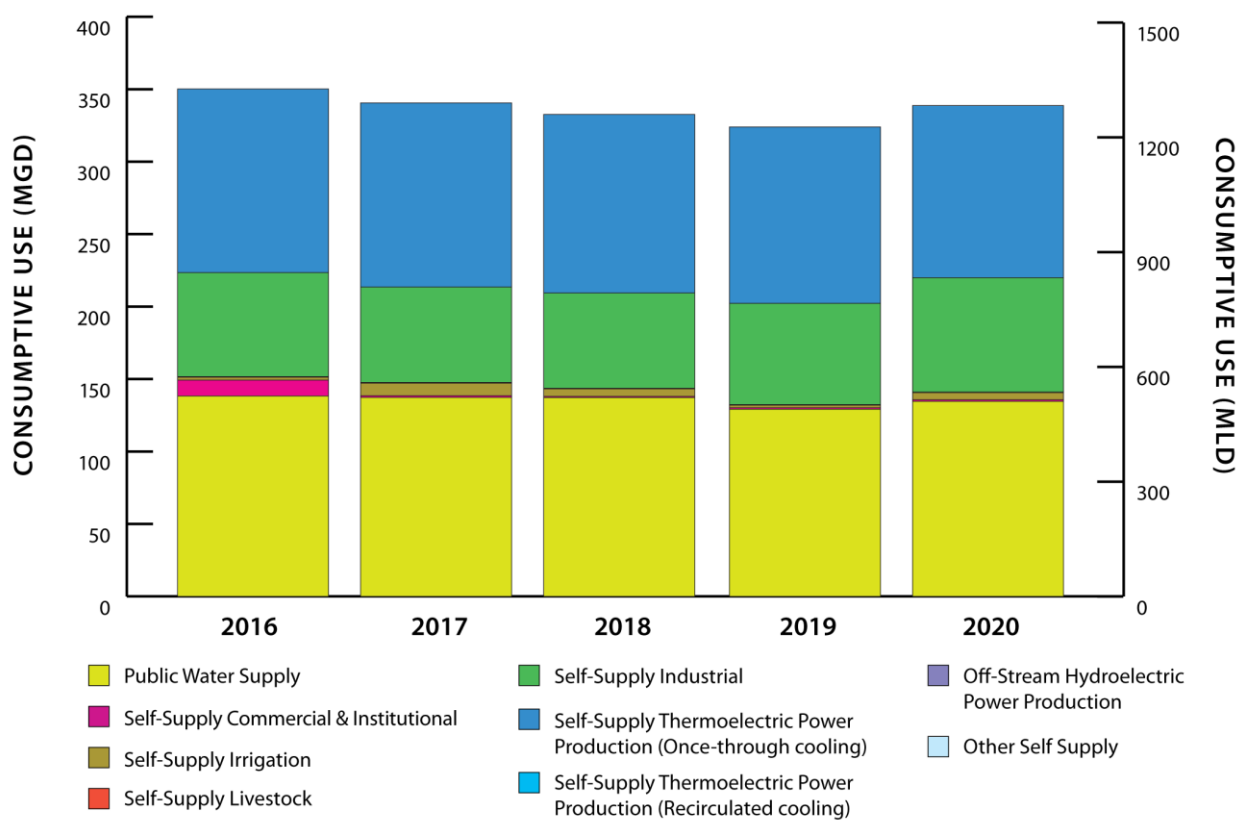


Figure 27. Ontario consumptive use by sector over the last five years

The water use data were provided by the Ontario Ministry of Natural Resources and Forestry and the Ontario Ministry of Environment, Conservation and Parks and were collected primarily through the provincial water taking and reporting system. Some estimates based on the 2019 reported use were used in the absence of 2020 data, including for the intrabasin diversions for public water supply, and for in-stream hydroelectric water use. Reporting compliance varied among water use sectors from 90 percent for the self-supply livestock and self-supply industrial sectors to 100 percent for the self-supply thermoelectric power production (once-through cooling) sector.

Notable changes from 2019 water use by Ontario facilities include:

- A 177 percent increase (4 mgd or 14 mld) in water withdrawals and corresponding increase in consumptive use (3 mgd or 12 mld) for the self-supply irrigation sector, associated with drier conditions in areas of the basin requiring increased use, including several facilities that previously withdrew water at levels below the reporting threshold.
- A 43 percent (3 mgd or 13 mld) decrease in water withdrawals for the other self-supply sector, largely attributable to a facility being reclassified as a self-supply industrial sector facility.
- A 12 percent (9 mgd or 34 mld) increase in consumptive use in the self-supply industrial sector, despite a 3 percent decrease in water withdrawals for the sector, because several facilities with increased use were facilities with relatively high consumptive use coefficients.
- A 16 percent (447 mgd or 1,693 mld) increase in the amount of water diverted into the Great Lakes basin, though changes in diversions are also associated with other water balance needs. Long Lac and Ogoki diversion data are updated for 2021 and reflect a return to normal trends following an especially low diversion amount in 2020.

Table 17a. Ontario 2020 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	791	232	99	1,122	0	0	135
Self-Supply Commercial and Institutional	1	7	1	9	0	0	1
Self-Supply Irrigation	2	3	1	6	0	0	5
Self-Supply Livestock	0	31	23	54	0	0	0
Self-Supply Industrial	458	376	127	961	0	0	79
Self-Supply Thermoelectric Power Production (Once-through cooling)	13,173	26	0	13,199	0	0	119
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	136,975	117,861	0	254,836	0	-3,182	0
Other Self Supply	0	2	2	4	0	0	0
Total	151,400	118,537	253	270,190	0	-3,182	339

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding. Long Lac and Ogoki diversion data are updated for 2021 and reflected in the interbasin diversion column.

** The intrabasin diversions reported effectively cancel each other out, resulting in a net zero intrabasin transfer. For more information about the volume of these transfers, see the Lake Basin sections above.*

Table 17b. Ontario 2020 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,995	878	374	4,247	0	0	510
Self-Supply Commercial and Institutional	2	27	4	34	0	0	4
Self-Supply Irrigation	9	11	2	22	0	0	18
Self-Supply Livestock	0	116	88	204	0	0	2
Self-Supply Industrial	1,733	1,425	480	3,638	0	0	299
Self-Supply Thermoelectric Power Production (Once-through cooling)	49,864	98	0	49,962	0	0	450
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	518,508	446,151	0	964,658	0	-12,046	0
Other Self Supply	0	8	8	16	0	0	0
Total	573,111	448,713	957	1,022,781	0	-12,046	1,282

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding. Long Lac and Ogoki diversion data are updated for 2021 and reflected in the interbasin diversion column.

** The intrabasin diversions reported effectively cancel each other out, resulting in a net zero intrabasin transfer. For more information about the volume of these transfers, see the Lake Basin sections above.*

Pennsylvania

The Pennsylvania portion of the Lake Erie watershed spans 511 square miles and is home to approximately 237,000 people concentrated along the 77 miles of Lake Erie coastline.²⁴ Pennsylvania also contains 99 square miles in the Lake Ontario basin, encompassing the headwaters of the Genesee River. Approximately 2,400 people live in Pennsylvania's portion of the Lake Ontario basin. The largest land uses in Pennsylvania's portion of the basin are agriculture and forest.²⁵

Pennsylvania's reported total withdrawal amount from the basin in 2021 was 29 mgd (109 mld), a 4 percent decrease from the 2020 reported withdrawal of 30 mgd (114 mld). Water withdrawals for public water supply (26 mgd or 99 mld) accounted for 91 percent of the total withdrawal amount.

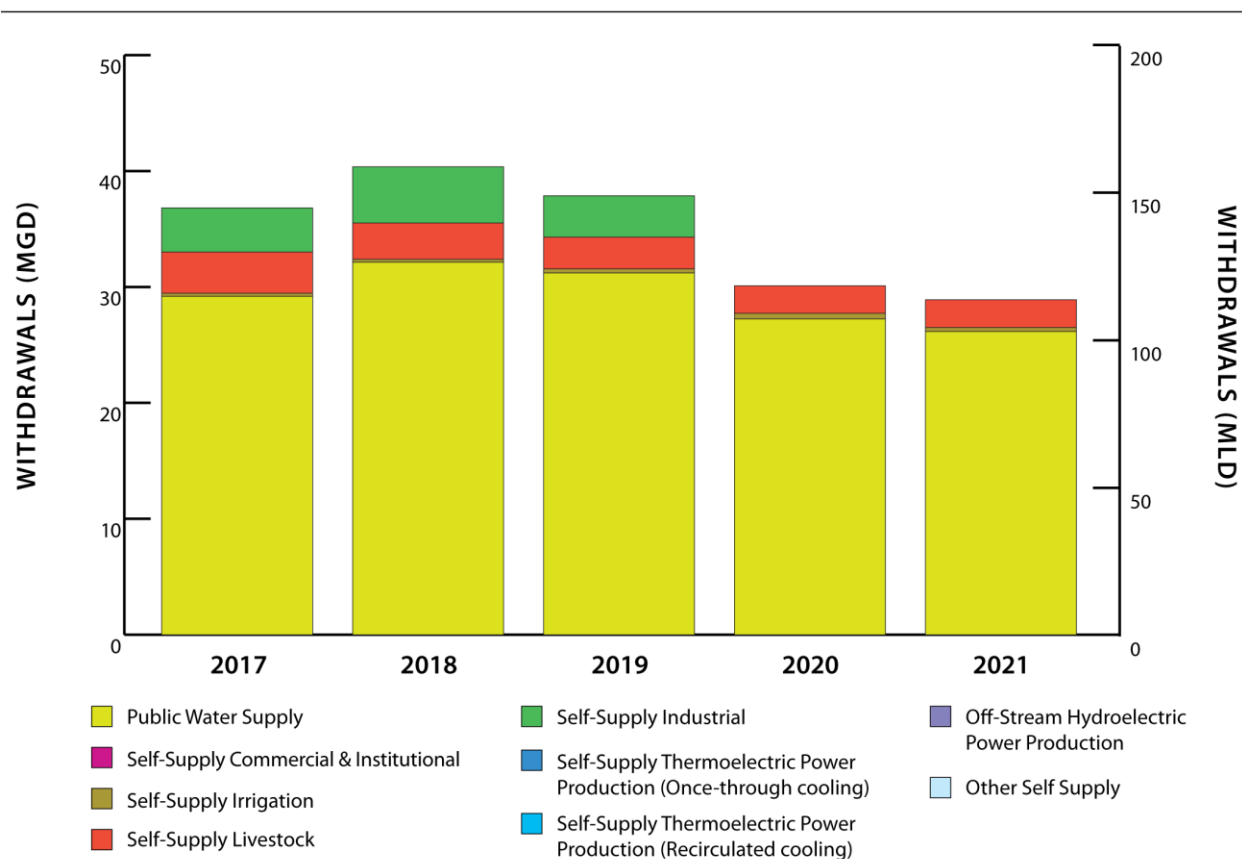


Figure 28. Pennsylvania water withdrawals by sector over the last five years

No diversions were reported in 2021. The total consumptive use was 3 mgd (12 mld). The public water supply sector made up the majority (86 percent) of the total consumptive use.

²⁴ Pennsylvania Department of Environmental Protection, Coastal Resources Management Program.

²⁵ Pennsylvania Department of Environmental Protection, Pennsylvania's Watershed Regions: Great Lakes.

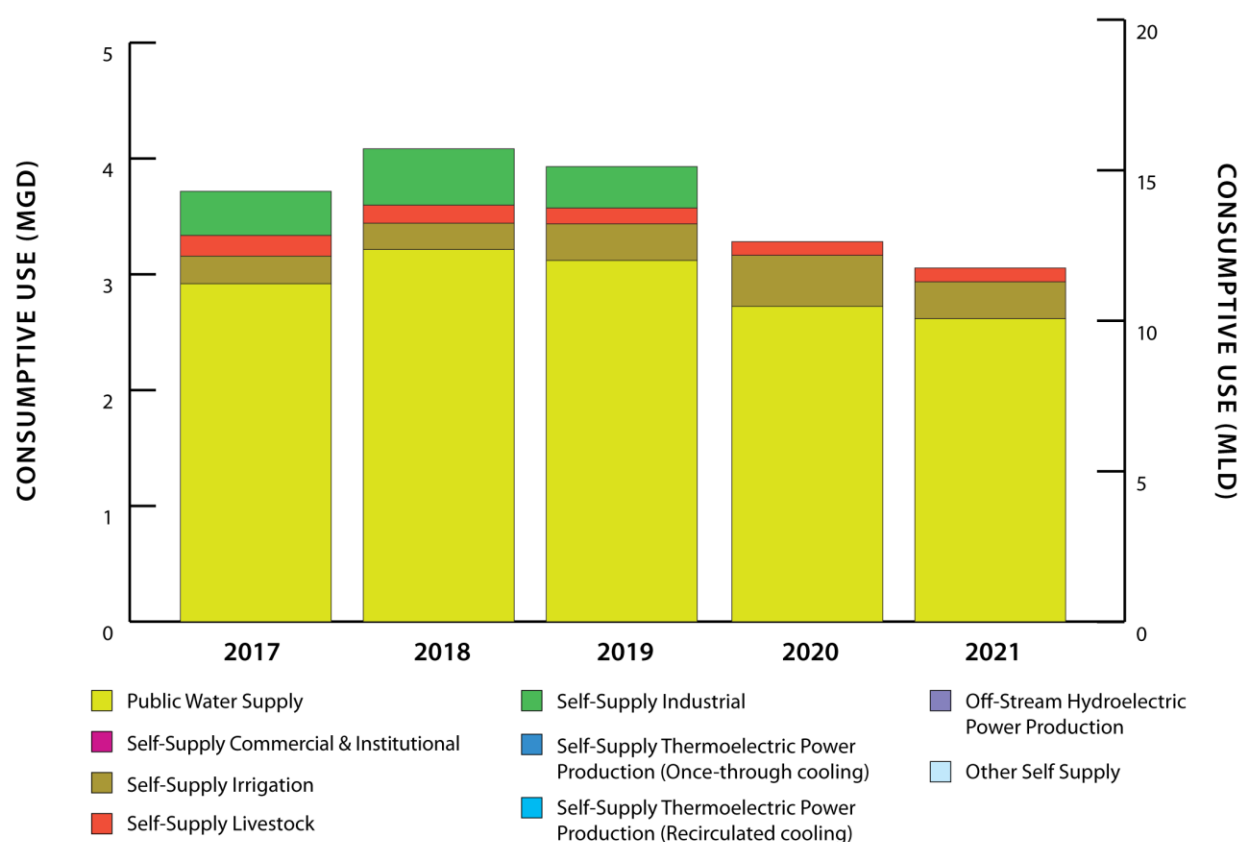


Figure 29. Pennsylvania consumptive use by sector over the last five years

The water use data was provided by the Pennsylvania Department of Environmental Protection (DEP), which collected water use data with 100 percent reporting compliance from permitted water withdrawal facilities. Depending upon the sector, withdrawals were metered, partially metered or calculated.

Notable changes from 2020 water use by Pennsylvania facilities include:

- A 4 percent (1 mgd or 4 mld) decrease in water use for public water supply associated with normal fluctuations in use.
- A 29 percent (0.14 mgd or 0.53 mld) decrease in self-supply irrigation water use, mainly due to small changes in value leading to large percentage changes because of the small total volume of water withdrawn from the basin in Pennsylvania.

Table 18a. Pennsylvania 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	25	0	2	26	0	0	3
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	1	1	2	0	0	0
Self-Supply Industrial	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	25	2	3	29	0	0	3

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Table 18b. Pennsylvania 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	93	0	6	99	0	0	10
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	1	0	1	0	0	1
Self-Supply Livestock	0	5	4	9	0	0	0
Self-Supply Industrial	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	93	6	10	109	0	0	12

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding

Québec

Much of Québec's population lives in the Great Lakes-St. Lawrence River watershed. The portion of the St. Lawrence River included in the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement territory includes the Montréal metropolitan area that represents nearly 50 percent of Québec's population. Some tributaries with the greatest flow within that portion are the Outaouais (Ottawa) River, the Richelieu River and the St. François River.

Québec's reported total withdrawal amount from the basin in 2021 was 1,204 mgd (4,557 mld), a 2 percent decrease from the 2020 withdrawal total of 1,227 mgd (4,646 mld). Public water supply made up 72 percent of the total withdrawal with 868 mgd (3,284 mld), while the self-supply industrial sector made up 24 percent of the total with 290 mgd (1,098 mld).

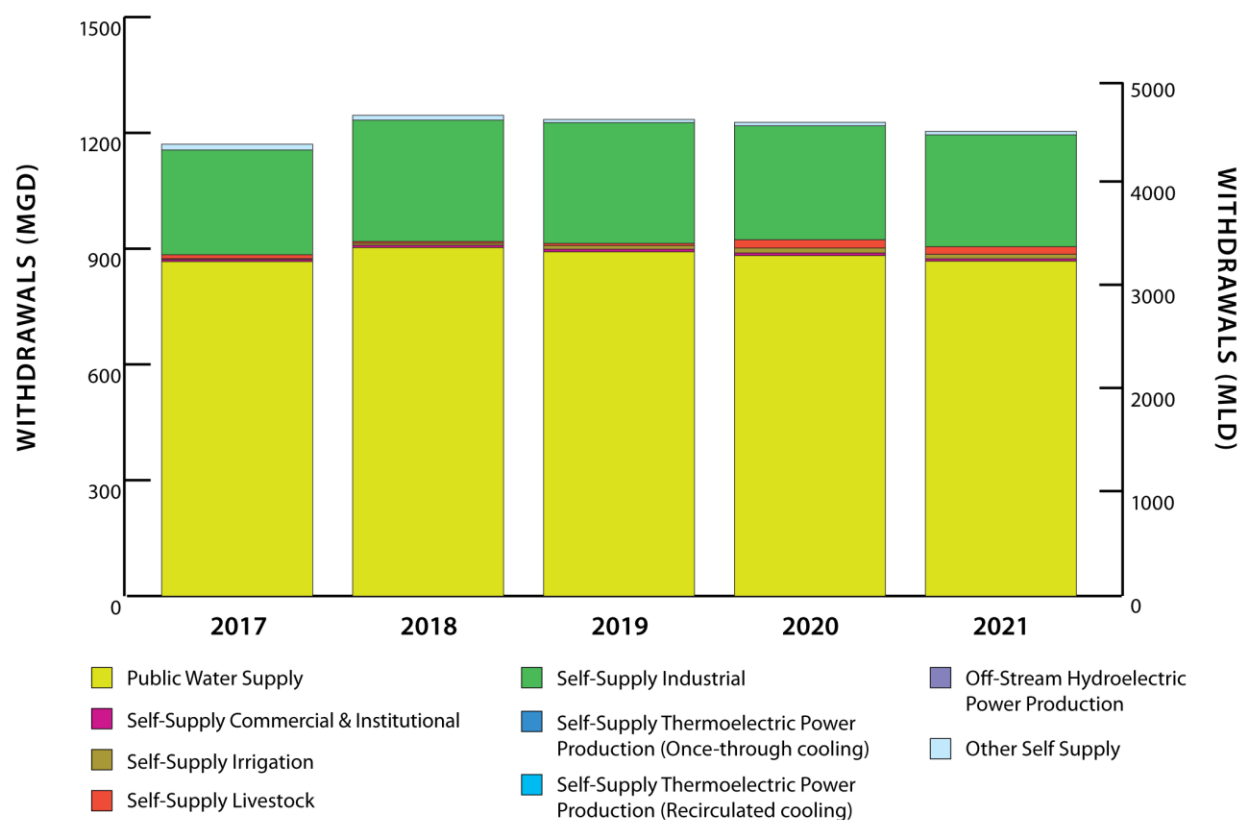


Figure 30. Québec water withdrawals by sector over the last five years

The total diversion amount was 3 mgd (10 mld) for public supply purposes from the St. Lawrence River. The total consumptive use was 201 mgd (759 mld), comprising 17 percent of the total withdrawal amount. The primary water use sectors contributing to the total consumptive use were public supply at 130 mgd (493 mld) and self-supply industrial at 54 mgd (206 mld).

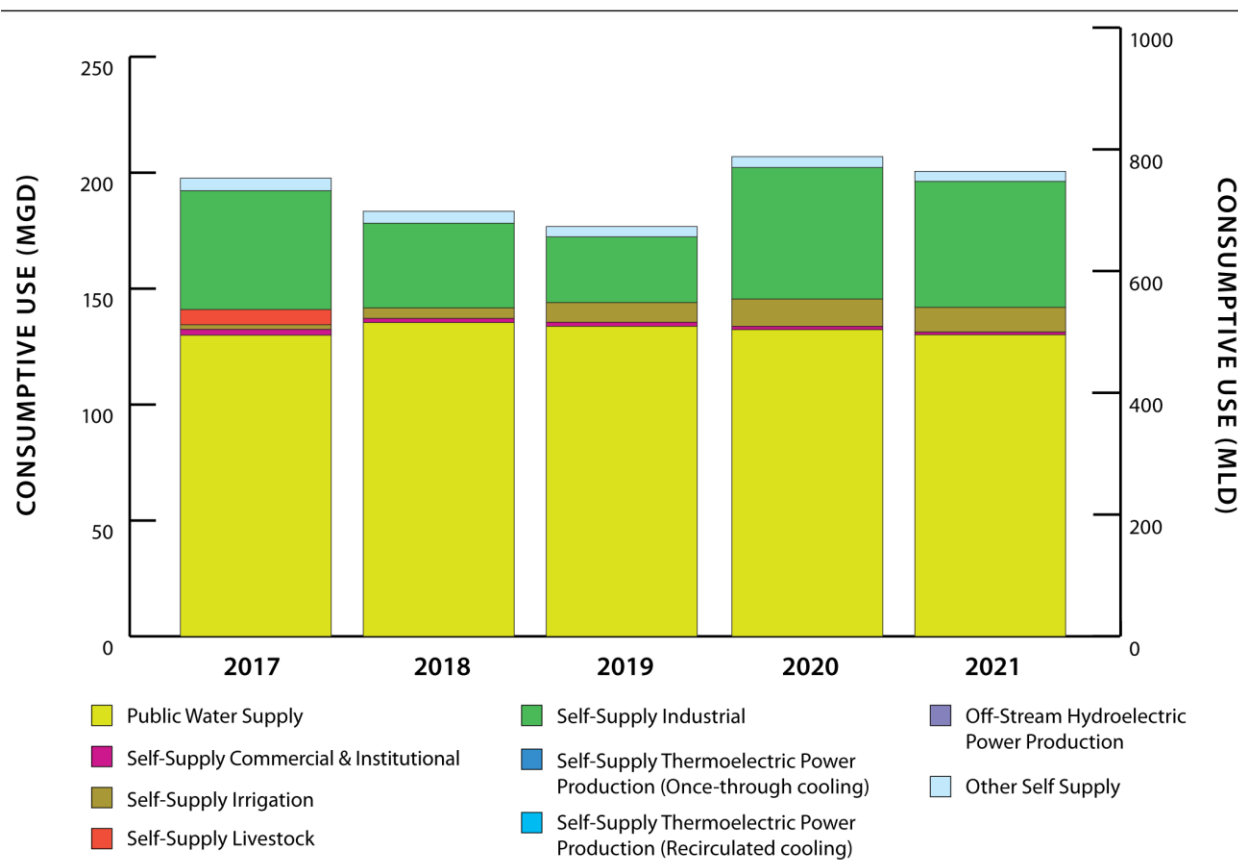


Figure 31. Québec consumptive use by sector over the last five years

Starting with 2012 data, the province of Québec began its data collection program which gathers estimated or metered water use data reported by water users. Québec began collecting water use reports from the irrigation (agricultural users), livestock and aquaculture sectors in 2016. Due to new sectors reporting and a relatively new legal system for water withdrawals, data quality and compliance rates are a continual focus for improvement for Québec. As a result of these ongoing efforts, reporting compliance rates continue to increase overall with the largest increase from 2020 in the other self-supply sector (30 percent). Compliance rates varied among water use sectors from 56 percent for self-supply livestock to 94 percent for public water supply.

Notable changes from 2020 water use by Québec facilities include:

- An 8 percent (2 mgd or 6 mld) decrease in water withdrawals for the self-supply livestock sector, primarily due to normal fluctuations in use and one user changing sectors in 2021.
- A 9 percent (1 mgd or 5 mld) decrease in water withdrawals and associated 9 percent (1 mgd or 4 mld) decrease in consumption for the self-supply irrigation sector, primarily due to fewer water users reporting in this sector in 2021.

Table 19a. Québec 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	609	207	52	868	0	3	130
Self-Supply Commercial and Institutional	1	5	0	6	0	0	1
Self-Supply Irrigation	1	9	2	12	0	0	11
Self-Supply Livestock	0	16	3	20	0	0	0
Self-Supply Industrial	127	145	18	290	0	0	54
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	5	3	1	9	0	0	4
Total	743	385	76	1,204	0	3	201

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding.

Table 19b. Québec 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,304	784	196	3,284	0	10	493
Self-Supply Commercial and Institutional	3	18	2	23	0	0	4
Self-Supply Irrigation	3	33	9	45	0	0	40
Self-Supply Livestock	0	62	12	74	0	0	0
Self-Supply Industrial	482	548	68	1,098	0	0	206
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	21	11	2	34	0	0	16
Total	2,813	1,457	288	4,557	0	10	759

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding.

Wisconsin

Wisconsin has more than 1,000 miles of Great Lakes shoreline along Lake Michigan and Lake Superior. More than 25 percent of the state's land area lies within the basin, where half the population of the state lives. Over 1.6 million Wisconsin residents get their drinking water from Lake Michigan or Lake Superior.²⁶

Wisconsin's reported total withdrawal amount from the basin in 2021 was 3,784 mgd (14,322 mld), an 8 percent increase from the 2020 water withdrawal total of 3,504 mgd (13,263 mld). The Lake Michigan watershed comprised 99 percent of the total withdrawal amount, the majority of which were from Lake Michigan surface water. The primary water use sectors were self-supply thermoelectric power production (once-through cooling), public water supply and self-supply industrial.

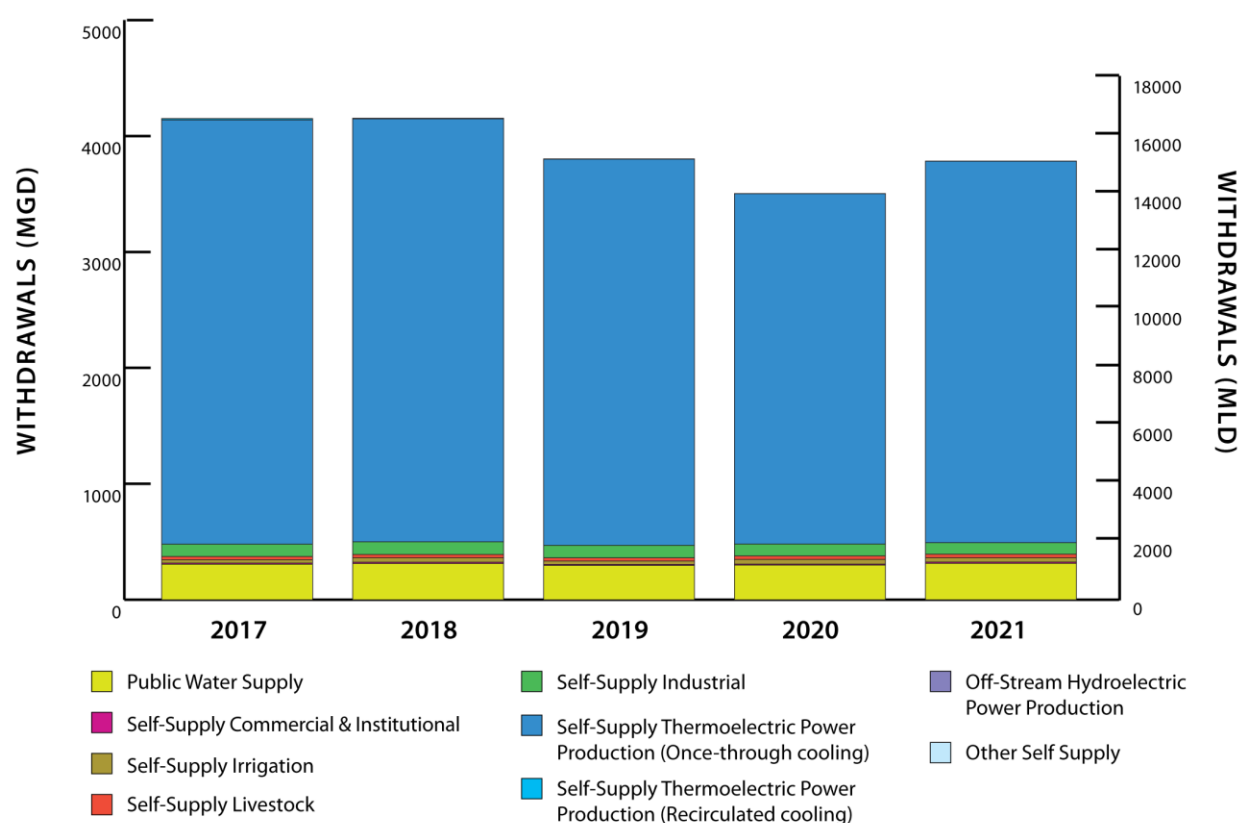


Figure 32. Wisconsin water withdrawals by sector over the last five years

The reported net diversion was 2 mgd (7 mld) from the Lake Michigan watershed. Diversions out of the Lake Michigan watershed totaled 7 mgd (28 mld), 98 percent of which were for public water supply purposes. The remainder of the diversions totaled 0.1 mgd (0.5 mld) and were associated with the self-supply commercial and institutional, self-supply irrigation and self-supply livestock sectors. Of the total diversion amount, 5 mgd (21 mld) was returned to the Lake Michigan basin.

²⁶ Wisconsin Department of Natural Resources, *Wisconsin Water Use*. 2019.

The total consumptive use was 118 mgd (447 mld), primarily from the public water supply, self-supply thermoelectric power production (once-through cooling) and self-supply irrigation sectors.

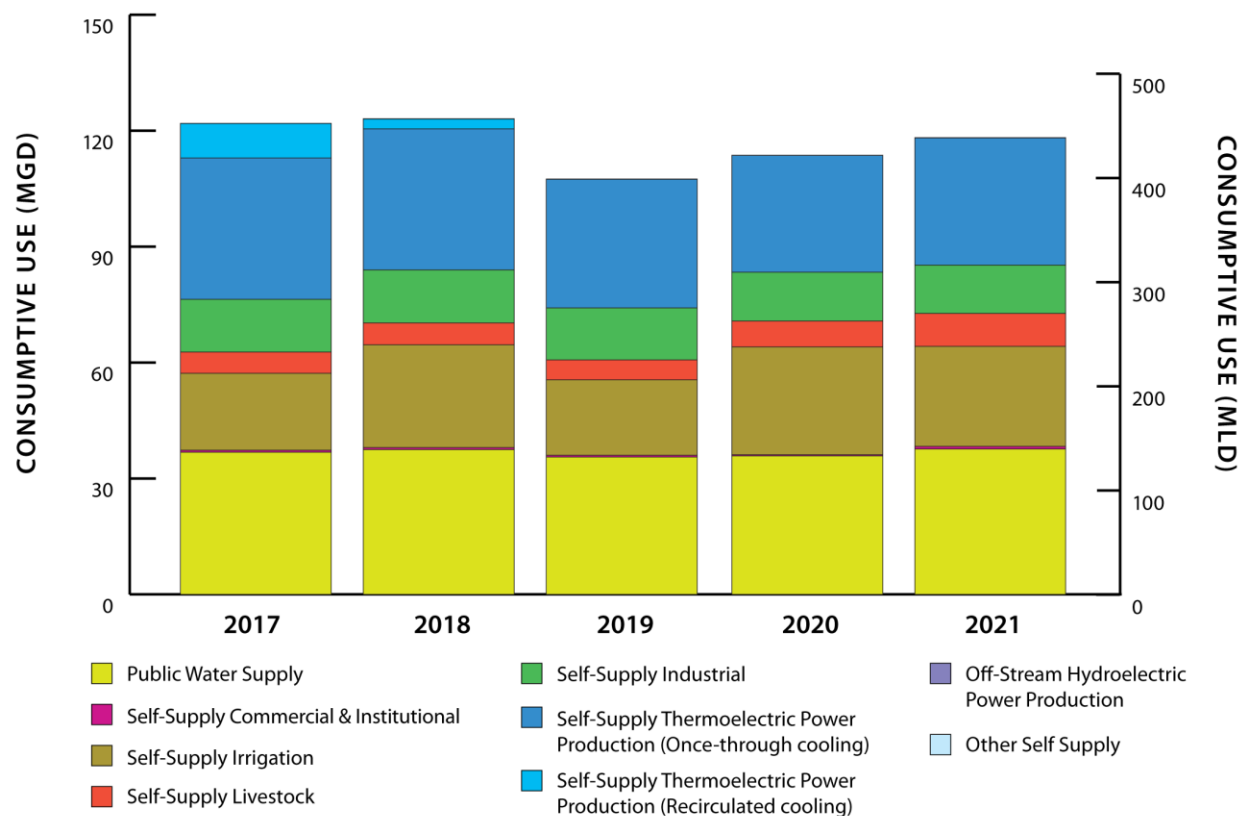


Figure 33. Wisconsin consumptive use by sector over the last five years

The water use data were provided by the Wisconsin Department of Natural Resources. Reporting compliance varied among water use sectors from 94 percent for the self-supply livestock sector to 100 percent for the self-supply thermoelectric power production and public water supply sectors. Data were not estimated for the facilities that did not report water use.

Notable changes from 2020 water use by Wisconsin facilities include:

- A 9 percent (269 mgd or 1018 mld) increase in water withdrawal and associated 9 percent increase in consumptive use for self-supply thermoelectric power production (once-through cooling). Water use in this sector was abnormally low in 2020, leading to a return to normal water use trends in 2021.
- A 22 percent (2 mgd or 8 mld) increase in self-supply commercial and institutional water withdrawal, largely because multiple water users reporting in 2021 did not meet the reporting threshold in 2020.
- A 5 percent (15 mgd or 57 mld) increase in water withdrawal and associated 5 percent (2 mgd or 8 mld) increase in consumptive use for public water supply, primarily due to normal weather variability.

Table 20a. Wisconsin 2021 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	246	21	46	314	0	2	38
Self-Supply Commercial and Institutional	2	7	2	11	0	0	1
Self-Supply Irrigation	0	2	35	37	0	0	26
Self-Supply Livestock	0	13	18	31	0	0	9
Self-Supply Industrial	2	85	13	99	0	0	13
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,161	130	0	3,291	0	0	33
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	1	1	0	0	0
Total	3,410	258	115	3,784	0	2	118

In millions of gallons per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding.

Table 20b. Wisconsin 2021 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	931	80	175	1,187	0	7	142
Self-Supply Commercial and Institutional	6	27	8	41	0	0	3
Self-Supply Irrigation	0	8	132	140	0	0	98
Self-Supply Livestock	0	48	69	117	0	0	32
Self-Supply Industrial	8	320	48	375	0	0	47
Self-Supply Thermoelectric Power Production (Once-through cooling)	11,964	493	0	12,457	0	0	125
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	1	4	5	0	0	0
Total	12,910	977	436	14,322	0	7	447

In millions of liters per day; Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW); totals may not sum exactly due to rounding.

Appendices

Appendix A. Water Use Sector Definitions

Public Water Supply

Water distributed to the public through a physically connected system of treatment, storage and distribution facilities serving a group of largely residential customers that may also serve industrial, commercial and other institutional operators. Water withdrawn directly from the basin and not through such a system shall not be considered to be used for Public Water Supply purposes.

Self-Supply Commercial and Institutional

Commercial uses include water used by motels, hotels, restaurants, office buildings and institutions, both civilian and military, that would not otherwise be considered Public Water Supplies. This category also includes water for mobile homes, hospitals, schools, air conditioning and other similar uses not covered under a public supply. In addition, this category includes amusement and recreational water uses such as snowmaking and water slides.

Self-Supply Irrigation

Water artificially applied on lands to assist in the growing of crops and pastures or in the maintenance of recreational lands, such as parks and golf courses.

Self-Supply Livestock

Water used by animals such as horses, cattle, sheep, goats, hogs and poultry. Water used in fish hatchery operations is also included under this category.

Self-Supply Industrial

Industrial water includes water used in the manufacture of metals, chemicals, paper, food and beverage, and other products, as well as mining water use. Mining water use includes water used in the extraction or washing of minerals, for example solids, such as coal and ores, and liquids, such as crude petroleum and natural gas. Water used in quarrying and milling is also included in the industrial category. Brine extraction from oil and gas operations is not included. Withdrawals and consumptive uses for industrial and mining purposes (including dewatering operations) recorded under another category (e.g., public supply) will not be recorded here. Once initially reported, water used in a closed cycle (recirculation) will not be reported as a withdrawal. “Make-up water”¹ will be reported once upon entering the system. Other situations should be evaluated on a case-by-case basis.

Self-Supply Thermoelectric Power Production (Once-through cooling)

Cooling water and ancillary water use such as boiler make-up water and contact cooling water at electrical power generating facilities that use once-through cooling systems. Withdrawals and consumptive uses already recorded under another category (e.g., public supply) will not be reported here.

¹ For industrial boiler systems, make-up water is the raw water, softened water or demineralized water required for steam generation. <http://www.pdhcenter.com/courses/m165/m165content.pdf>

Self-Supply Thermoelectric Power Production (Recirculated cooling)

Cooling water and ancillary water use such as boiler make-up water and contact cooling water at electrical power generating facilities that use water recirculating cooling tower systems. Include water used as Combined Cycle Gas Turbine (CCGT) power plants in this category. Withdrawals and consumptive uses already recorded under another category (e.g., public supply) will not be reported here. Once initially reported, water used in a closed cycle (recirculation) will not be reported as a withdrawal. “Make-up water” will be reported once upon entering the system.

Off-Stream Hydroelectric Power Production

Water removed from a stream channel and used to drive turbines that generate electric power. This category also includes “off-stream use” for pumped-storage systems [e.g., reservoir storage] that return water to the source.

In-Stream Hydroelectric Water Use

This category includes “run of the river” use, which is not considered a water withdrawal or consumptive use. Reporting for this category is voluntary.

Other Self Supply

Water used for purposes not reported in the above categories. Examples include, but are not limited to, withdrawals for fish/wildlife, environmental, navigation and water quality purposes. Specifically, water used to maintain levels for navigation, for fish and wildlife habitat creation and enhancement (excluding fish hatchery operations included in category four), for flow augmentation (or diversion), for sanitation, pollution confinement, other water quality purposes, and agricultural activities (services) other than those directly related to irrigation.

Appendix B. General Definitions from the Compact and Agreement

Basin or Great Lakes-St. Lawrence River Basin means the watershed of the Great Lakes and the St. Lawrence River upstream from Trois-Rivières, Québec.

Consumptive Use means that portion of the water withdrawn or withheld from the basin that is lost or otherwise not returned to the basin due to evaporation, incorporation into products or other processes.

Diversion means a transfer of water from the basin into another watershed, or from the watershed of one of the Great Lakes into that of another by any means of transfer, including but not limited to a pipeline, canal, tunnel, aqueduct, channel, modification of the direction of a water course, a tanker ship, tanker truck or rail tanker, but does not apply to water that is used in the basin or a Great Lake watershed to manufacture or produce a product that is then transferred out of the basin or watershed.

Divert has a corresponding meaning.

Withdrawal means the taking of water from surface water or groundwater.

Source Watershed means the watershed from which a withdrawal originates. If water is withdrawn directly from a Great Lake or from the St. Lawrence River, then the Source Watershed shall be considered to be the watershed of that Great Lake or the watershed of the St. Lawrence River, respectively. If water is withdrawn from the watershed of a stream that is a direct tributary to a Great Lake or a direct tributary to the St. Lawrence River, then the Source Watershed shall be considered to be the watershed of that Great Lake or the watershed of the St. Lawrence River, respectively, with a preference to the direct tributary stream watershed from which it was withdrawn.