Annual Report of the Great Lakes Regional Water Use Database

Representing 2022 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

Great Lakes Commission
des Grands Lacs

Acknowledgments

The Great Lakes Commission thanks the states and provinces for their commitment to collecting and reporting the water use data included in this report. Appreciation is extended to Steve Altman, James Casey and Russell Flinchum (Illinois); Allison Mann (Indiana); Andrew LeBaron (Michigan); Claudia Hochstein and Sean Hunt (Minnesota); Richard Kruzansky (New York); Bradley Lodge (Ohio); Mimi Santano Carrasco, Darlene Dove, Isaac Noyes and Evan Ronan (Ontario); Elizabeth Cushman and James Horton (Pennsylvania); Félix-Antoine Aubé, Françoise Auger and Chantale Bourgault (Québec); and Jennifer Filbert and Shaili Pfeiffer (Wisconsin) for their time and effort put into preparing and reviewing the 2022 water use data included in this report. Special thanks go to the staff of the Great Lakes St. Lawrence Governors & Premiers for their guidance throughout the process and providing input on this report.

Preface

This is the Annual Report of the Great Lakes-St. Lawrence River Regional Water Use Database, representing 2022 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 necessary improvements in jurisdictional water use data collection and reporting programs. In its role as Secretariat to the Great Lakes-St. Lawrence River Basin Water Resources Council (Compact Council) and the Great Lakes-St. Lawrence River Water Resources Regional Body (Regional Body), 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 database.

While updating the data reporting protocols was 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 be made. The following section describes the progress made in 2023 to improve data quality and reporting compliance for the 2022 annual report.

Overview

Improving Data Quality

Together with the GSGP, the GLC works with the states and provinces to improve data collection, reporting, quality, accuracy and compatibility. To guide the preparation of 2022 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 their respective 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 its associated 2022 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 GLC 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 respective jurisdictions. 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 2022. Illinois, Minnesota, New York, Ohio and Pennsylvania each indicated 100 percent reporting compliance by water users in their respective jurisdictions.

Beyond compliance, the number of reported users can also vary from year to year due to a change 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 in the database, 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 (e.g., self-supply irrigation) may have greater changes in the number of threshold facilities than other use sectors. These changes are discussed in the jurisdiction report sections.

Table 1. State and Provincial Reporting Compliance Percentage by Water Use Sector*

Sector	IL	IN	MI	MN	NY	OH	ON	PA	QC	WI
Public Water Supply	100	91	99	100	100	100	100	100	96	100
Self-Supply Commercial & Institutional	100	81	92	100	100	100	100	-	75	95
Self-Supply Irrigation	100	90	75	-	100	100	100	100	75	95
Self-Supply Livestock	-	80	81	-	100	100	97	100	64	95
Self-Supply Industrial	100	88	95	100	100	100	100	-	77	97
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	100	100	100	100	100	83	-	-	100
Self-Supply Thermoelectric Power Production (Recirculated cooling)	-	100	100	-	100	100	-	-	-	-
Off-Stream Hydroelectric Power Production	-	-	N/A	100	100	N/A	-	-	N/A	N/A
In-Stream Hydroelectric Water Use	-	N/A	N/A	100	100	N/A	98	-	N/A	N/A
Other Self Supply	100	94	94	100	100	100	100	-	80	100

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. Some jurisdictions updated their compliance reporting methodology for the 2022 water use data reporting process; in previous years, some jurisdictions reported numerical compliance rates where blanks or N/As should have been reported.

**The definition of Compliance was updated prior to 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 in 2022

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]

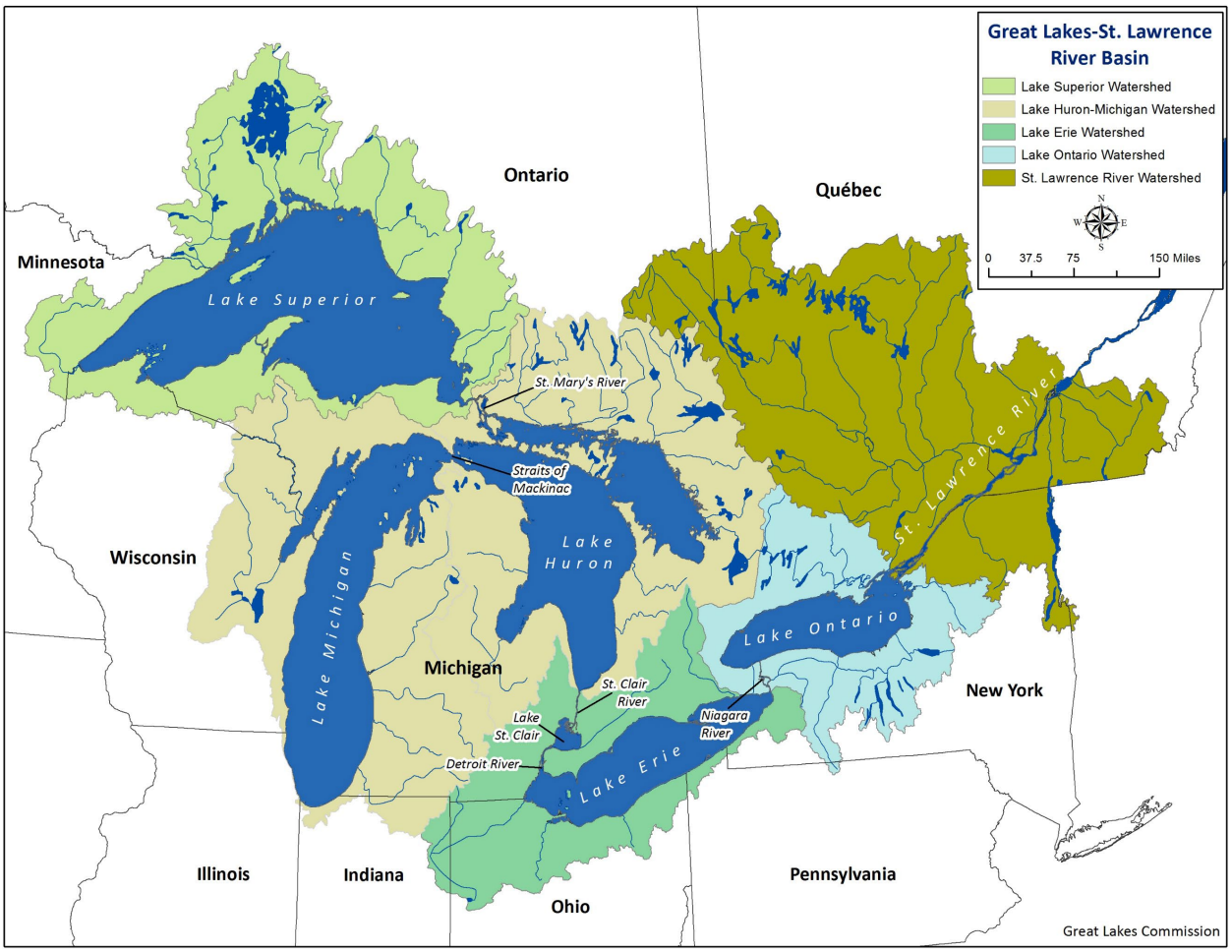

Figure 1. Great Lakes-St. Lawrence River basin

Water Withdrawals

In 2022, the total reported withdrawal amount for the Great Lakes-St. Lawrence River basin, excluding in-stream hydroelectric water use, was 40,805 million gallons per day (mgd) or 154,463 million liters per day (mld). Water used for in-stream hydroelectric power production accounted for approximately 92 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 2022)[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. 2022.

Water used for 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. 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 2022 water withdrawal amount represents a decrease of about 3 percent from the total 2021 withdrawal of 42,146 mgd (159,542 mld).[4] 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, since much of the withdrawn water is returned to the basin after use. Just under 5 percent of the total reported withdrawal amount (1,878 mgd or 7,110 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 are the primary water use sectors (i.e., those withdrawing the largest volumes of water).

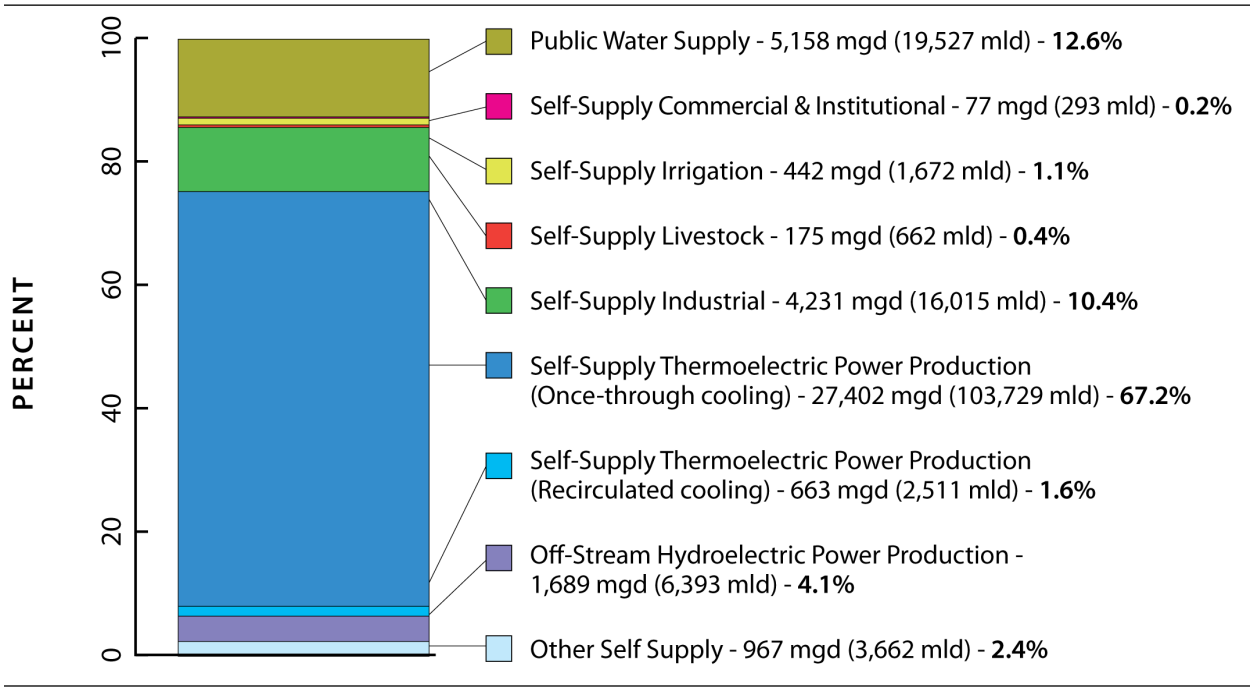

Figure 2. Basin-wide water withdrawals (excluding in-stream hydroelectric water use) by water use sector in 2022

[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.
[4] 2021 total withdrawal data is updated in this report. The 2021 Annual Report used 2020 data for the Province of Ontario, though the 2022 Annual Report uses updated 2021 data for Ontario, creating the difference in the 2021 withdrawal total used in this report and last year's report.

In 2022, the Lake Huron watershed had the greatest withdrawal amount (representing about 28% of total withdrawals), followed closely by Lake Michigan. Figure 3 shows withdrawals by watershed broken down by water source: Great Lakes surface water (GLSW), other surface water (OSW)[5] 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.

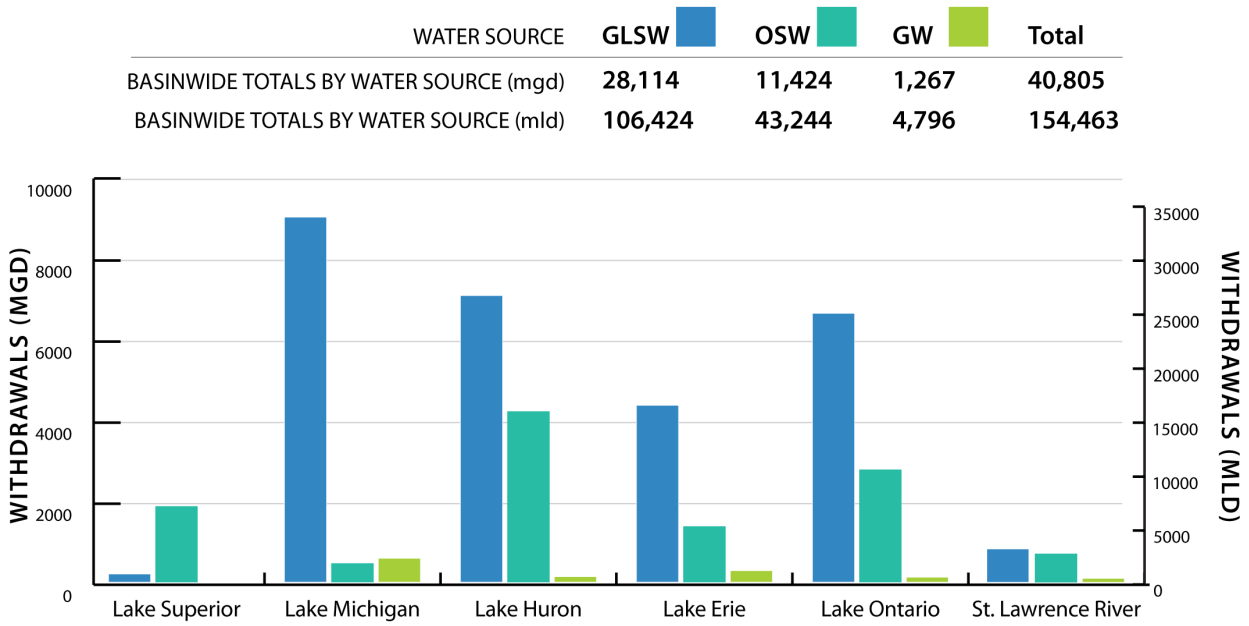

Figure 3. Water withdrawals (excluding in-stream hydroelectric water use) by watershed in 2022

Figure 4 shows total water withdrawals, excluding in-stream hydroelectric water use, by jurisdiction. 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 in 2022. Facilities in Ontario withdrew 18,717 mgd (70,853 mld), accounting for 46 percent of the total withdrawal amount across all jurisdictions. In contrast, Pennsylvania, which has the smallest land area in the basin (511 square miles or 1,316 square kilometers), withdrew just 30 mgd (113 mld) or less than 0.1 percent of the total withdrawal amount.

Figure 5 shows total water withdrawals (excluding in-stream hydroelectric water use) by jurisdiction over the past five years. Water use in each jurisdiction has generally stayed steady or decreased over the last 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. In the case of Ontario, 2020 data was reported in the 2021 Annual Report; however, updated 2021 data is included in this report. This revised data shows a drastic increase in withdrawals from 2020 to 2021, deviating from the trend of generally declining withdrawals over time.[6]

[5] Other surface water is defined as tributary streams, lakes, ponds and reservoirs within the Great Lakes basin.
[6] The increased withdrawals in Ontario between 2020 and 2021 are primarily due to 2 withdrawals by a large water user in the self-supply thermoelectric power production (once-through cooling) sector, taken under 2 new permits issued in 2021 through the provincial water taking and reporting system.

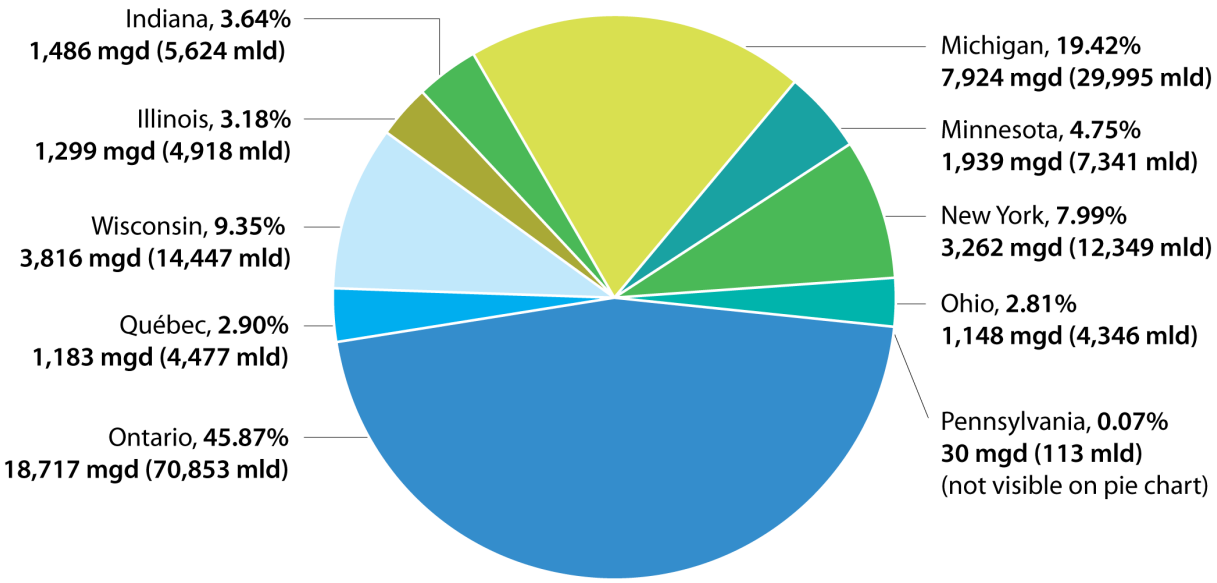

Figure 4. Water withdrawals (excluding in-stream hydroelectric water use) by jurisdiction in 2022

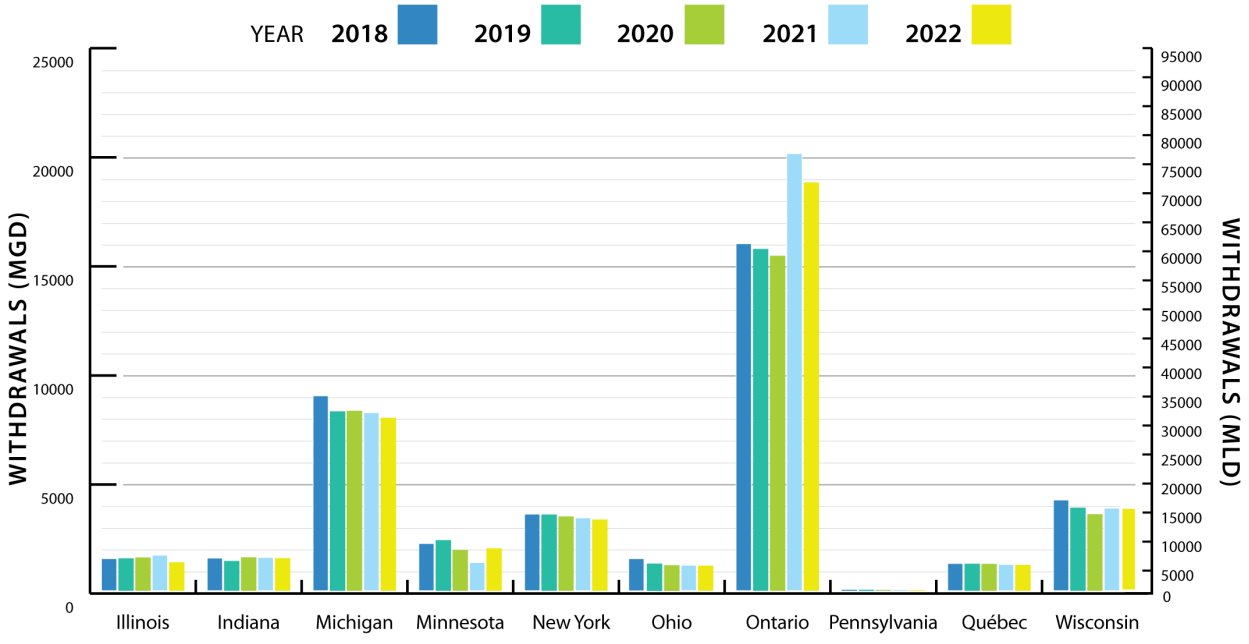

Figure 5. Water withdrawals (excluding in-stream hydroelectric water use) by jurisdiction over the past five years

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 2022 diversion out of the basin was 1,100 mgd or 4,164 mld. About 88 percent (965 mgd or 3,654 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 less than 1 percent from the 2021 reported amount of 974 mgd (3,685 mld). Smaller diversions throughout the region made up the balance of the total, and some of the diverted water was returned to the source watershed as return flow.

There were also diversions into the basin,[7] including the Long Lac and Ogoki diversions (incoming diversions from the Hudson Bay watershed into northern Lake Superior), which contributed 3,831 mgd (14,501 mld) to the basin in 2022; this represents a 20 percent increase from the 2021 reported diversion of 3,182 mgd (12,046 mld). Despite this change, both 2021 and 2022 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).[8] When conditions in the Long Lac and Lake 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 2,747 mgd (10,399 mld), meaning more water was diverted into than out of the basin in 2022.

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 whether a consumptive use coefficient was applied, or the consumptive use was determined through measurement for each reported water withdrawal. Figure 6 shows total consumptive use by jurisdiction over the past five years. Because different consumptive use coefficients are employed for each water use sector, changes in the makeup of each jurisdiction's water withdrawals from year to year can impact its total consumptive use.

The total reported 2022 consumptive use for the basin was 1,878 mgd (7,110 mld) – an 8 percent decrease from the total 2021 consumptive use of 2,038 mgd (7,716 mld). The public water supply and self-supply industrial sectors had the greatest consumptive use, cumulatively accounting for 59 percent of the basin's total consumptive use. The self-supply thermoelectric power production (recirculated cooling) sector accounted for most of the decline from the total 2021 consumptive use, decreasing by 114 mgd (433 mld)

[7] The Great Lakes Regional Water Use Database records incoming diversions with a negative sign and outgoing diversions with a positive sign.
[8] Information on the flow variability of the Long Lac and Ogoki diversions was provided by Ontario Power Generation.

or 62 percent. The Lake Michigan watershed had the largest consumptive use of all watersheds at 678 mgd (2,566 mld), comprising 36 percent of the basin's total consumptive use.

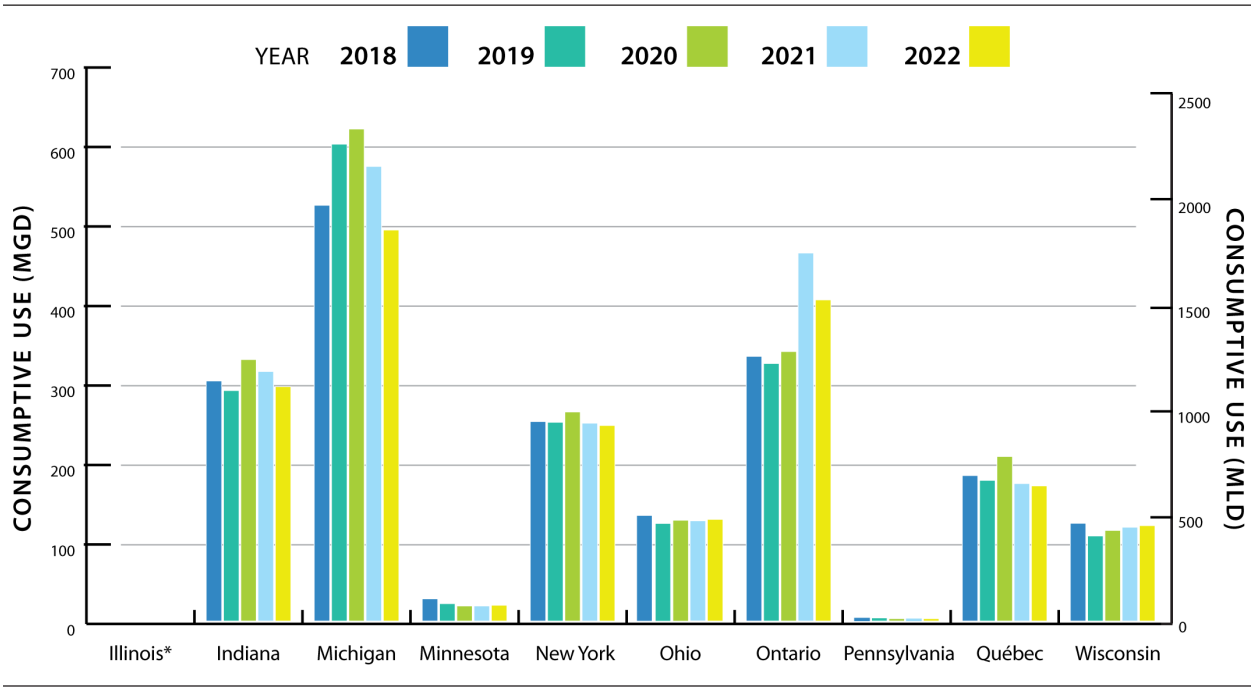

Figure 6. Consumptive use by jurisdiction over the past five years

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

Considering both consumptive use and diversions, the basin gained a total of 869 mgd (3,289 mld) in 2022. By comparison, the basin gained a total of 59 mgd (224 mld) in 2021.[9] Tables 2a through 4b summarize the basin's total 2022 water withdrawals, diversions and consumptive use by watershed, sector and jurisdiction.

[9] The 2021 Annual Report noted that the basin gained a total of 156 mgd (589 mld) in 2021; this is because Ontario reported its 2020 data as its 2021 data was not available at the time last year's report was published. The Province of Ontario has since updated its 2021 water use data, making the figure in this report showing a total gain of 59 mgd (224 mld) to the basin in 2021 the most accurate and up-to-date information available.

Table 2a. Basin-wide 2022 Water Use Data Summary by Watershed (including in-stream hydroelectric water use) in mgd

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	204	32,114	18	32,336	0	-3,818	32
Lake Michigan	9,009	466	592	10,067	0	1,040	678
Lake Huron	25,933	19,351	140	45,424	42	0	187
Lake Erie	53,367	2,003	289	55,659	5,280	-17	429
Lake Ontario	47,780	101,030	127	148,937	-5,322	42	352
St. Lawrence River	166,704	57,010	102	223,816	0	5	201
Total	302,997	211,974	1,267	516,239	0	-2,747	1,878

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-wide 2022 Water Use Data Summary by Watershed (including in-stream hydroelectric water use) in mld

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	773	121,565	67	122,405	-1	-14,451	121
Lake Michigan	34,103	1,765	2,239	38,107	1	3,936	2,566
Lake Huron	98,167	73,252	530	171,949	157	0	706
Lake Erie	202,016	7,583	1,094	210,692	19,988	-63	1,623
Lake Ontario	180,869	382,440	480	563,789	-20,146	160	1,333
St. Lawrence River	631,042	215,806	386	847,235	0	20	761
Total	1,146,970	802,410	4,796	1,954,176	0	-10,399	7,110

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-wide 2022 Water Use Data Summary by Sector (including in-stream hydroelectric water use) in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,836	840	482	5,158	0	859	571
Self-Supply Commercial and Institutional	7	63	7	77	0	2	12
Self-Supply Irrigation	3	128	310	442	0	0	389
Self-Supply Livestock	0	112	63	175	0	0	15
Self-Supply Industrial	2,091	1,762	378	4,231	0	38	532
Self-Supply Thermoelectric Power Production (Once-through cooling)	21,374	6,027	1	27,402	0	0	248
Self-Supply Thermoelectric Power Production (Recirculated cooling)	616	43	4	663	0	0	69
Off-Stream Hydroelectric Power Production	0	1,689	0	1,689	0	0	0
In-Stream Hydroelectric Water Use	274,883	200,551	0	475,434	0	-3,831	0
Other Self Supply	186	759	22	967	0	185	43
Total	302,997	211,974	1,267	516,239	0	-2,747	1,878

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-wide 2022 Water Use Data Summary by Sector (including in-stream hydroelectric water use) in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	14,522	3,181	1,824	19,527	0	3,252	2,162
Self-Supply Commercial and Institutional	27	238	28	293	0	7	47
Self-Supply Irrigation	12	485	1,175	1,672	0	0	1,474
Self-Supply Livestock	0	426	237	662	0	-1	56
Self-Supply Industrial	7,915	6,671	1,429	16,015	0	143	2,014
Self-Supply Thermoelectric Power Production (Once-through cooling)	80,910	22,814	5	103,729	0	0	937
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,332	164	16	2,511	0	0	260
Off-Stream Hydroelectric Power Production	0	6,393	0	6,393	0	0	0
In-Stream Hydroelectric Water Use	1,040,546	759,167	0	1,799,713	0	-14,501	0
Other Self Supply	705	2,873	83	3,662	0	701	161
Total	1,146,970	802,410	4,796	1,954,176	0	-10,399	7,110

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-wide 2022 Water Use Data Summary by Jurisdiction (including in-stream hydroelectric water use) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	1,299	0	0	1,299	0	965	0
Indiana	1,304	89	93	1,486	0	82	295
Michigan	6,490	882	552	7,924	0	0	492
Minnesota	123	3,593	5	3,721	0	13	20
New York	139,841	82,204	33	222,078	0	45	246
Ohio	647	422	79	1,148	0	-25	128
Ontario	149,110	124,120	324	273,553	0	-3,831	404
Pennsylvania	25	2	3	30	0	0	3
Québec	735	381	66	1,183	0	3	170
Wisconsin	3,424	280	113	3,816	0	1	120
Total	302,997	211,974	1,267	516,239	0	-2,747	1,878

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-wide 2022 Water Use Data Summary by Jurisdiction (including in-stream hydroelectric water use) in mld

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	4,918	0	0	4,918	0	3,654	0
Indiana	4,935	337	352	5,624	0	309	1,116
Michigan	24,568	3,338	2,090	29,995	0	0	1,863
Minnesota	466	13,602	18	14,086	0	50	77
New York	529,356	311,177	124	840,657	0	169	929
Ohio	2,448	1,599	300	4,346	0	-94	486
Ontario	564,441	469,845	1,225	1,035,511	0	-14,501	1,528
Pennsylvania	95	9	10	113	0	0	12
Québec	2,783	1,443	250	4,477	0	10	644
Wisconsin	12,961	1,059	427	14,447	0	4	454
Total	1,146,970	802,410	4,796	1,954,176	0	-10,399	7,110

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

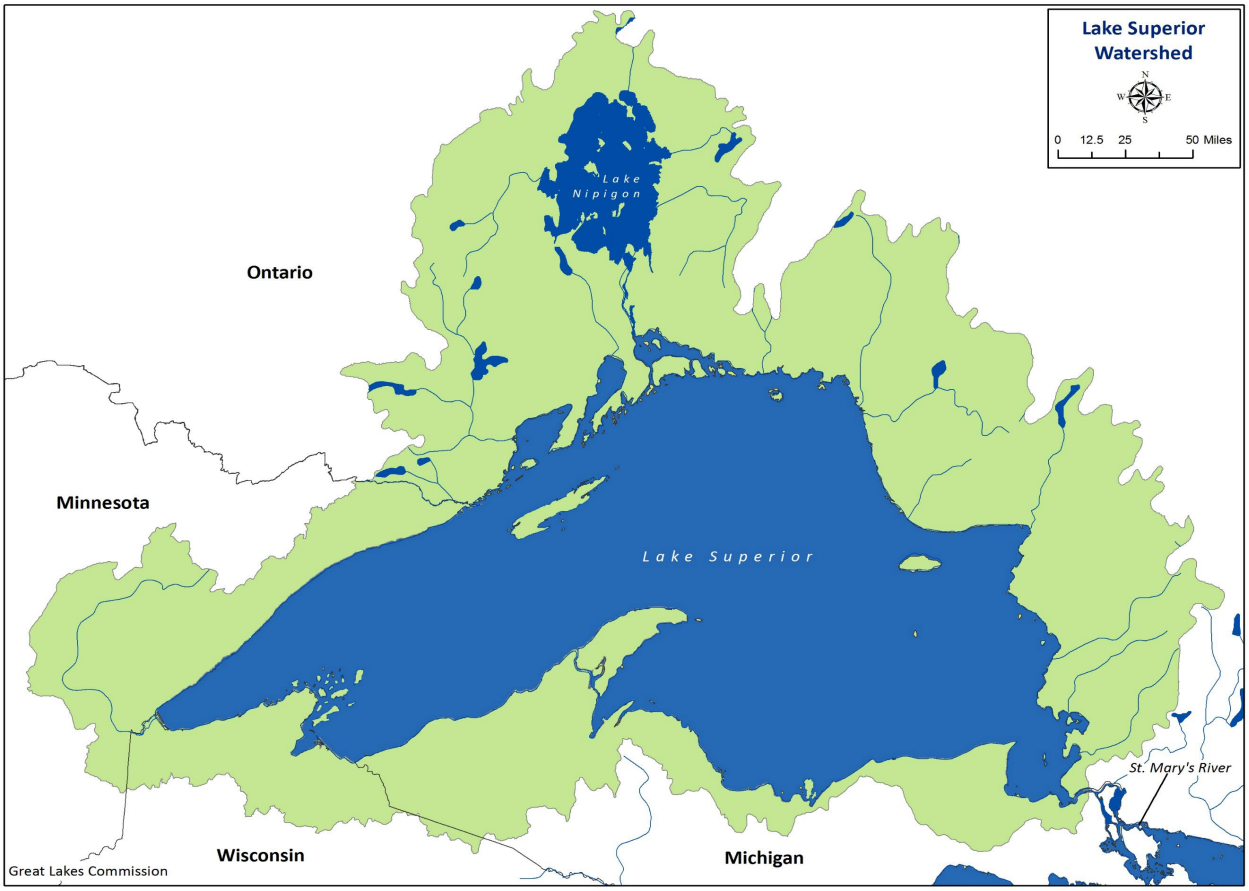

Figure 7. Lake Superior Watershed

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.[10] Its surface area is roughly the size of South Carolina, or approximately 31,700 square miles (82,100 square kilometers).

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 - 424,473; Canada - 169,897; Total - 594,370

[10] Great Lakes Commission, Lake Superior.

Water Withdrawals

Four jurisdictions – Michigan, Minnesota, Ontario and Wisconsin – share the Lake Superior watershed and collectively withdrew 2,098 mgd (7,941 mld) in 2022, excluding the reported in-stream hydroelectric water use of 30,238 mgd (114,464 mld). This represents a 41 percent increase from the 2021 total withdrawal amount of 1,486 mgd (5,624 mld). The off-stream hydroelectric power production sector represented 78 percent of all withdrawals from the watershed at 1,643 mgd (6,218 mld). The self-supply industrial (210 mgd or 794 mld) and self-supply thermoelectric power production (once-through cooling) (152 mgd or 575 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 water used for in-stream hydroelectric power production, 89 percent (1,876 mgd or 7,100 mld) of the total reported withdrawal amount from the watershed came from other surface water. Of the remaining withdrawals, 10 percent came directly from Lake Superior (204 mgd or 773 mld) and less than 1 percent came from groundwater (18 mgd or 67 mld).

Water Diversions and Consumptive Uses

The reported net water gain[11] (3,786 mgd or 14,332 mld) in the Lake Superior watershed in 2022 was largely attributable to the Long Lac and Ogoki interbasin diversions in northern Ontario that diverted 3,831 mgd or 14,501 mld into Lake Superior. On average, these diversions into the basin are about twice the volume of the Illinois Diversion out of the basin, although in 2022 they were over four times the Illinois Diversion volume.

Outgoing interbasin diversions totaling 13 mgd (50 mld) were reported in Minnesota, associated almost exclusively with the self-supply industrial sector. A small amount of the outgoing diversion (0.02 mgd or 0.08 mld) was also reported for the self-supply irrigation sector. Additionally, an incoming intrabasin transfer of 0.28 mgd (1.06 mld) associated with Michigan's public drinking water supply was reported.

The total consumptive use for all four jurisdictions in the Lake Superior watershed was 32 mgd (121 mld). Self-supply industrial use (22 mgd or 83 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 2022 decreased by 4 mgd (17 mld) or 12 percent from 2021, a small difference largely attributed to the decline in the self-supply industrial sector.

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

Table 5a. Lake Superior Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	41	3	13	57	0	0	6
Self-Supply Commercial and Institutional	2	1	0	2	0	0	0
Self-Supply Irrigation	0	0	1	1	0	0	1
Self-Supply Livestock	0	26	3	28	0	0	0
Self-Supply Industrial	68	140	2	210	0	13	22
Self-Supply Thermoelectric Power Production (Once-through cooling)	94	58	0	152	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,643	0	1,643	0	0	0
In-Stream Hydroelectric Water Use	0	30,238	0	30,238	0	-3,831	0
Other Self Supply	0	5	0	5	0	0	0
Total	204	32,114	18	32,336	0	-3,818	32

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	155	11	48	214	-1	0	24
Self-Supply Commercial and Institutional	6	2	0	9	0	0	1
Self-Supply Irrigation	0	1	2	3	0	0	3
Self-Supply Livestock	0	98	10	107	0	0	0
Self-Supply Industrial	257	531	7	794	0	49	83
Self-Supply Thermoelectric Power Production (Once-through cooling)	355	219	1	575	0	0	10
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	6,218	0	6,218	0	0	0
In-Stream Hydroelectric Water Use	0	114,464	0	114,464	0	-14,501	0
Other Self Supply	0	20	0	20	0	0	0
Total	773	121,565	67	122,405	-1	-14,451	121

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

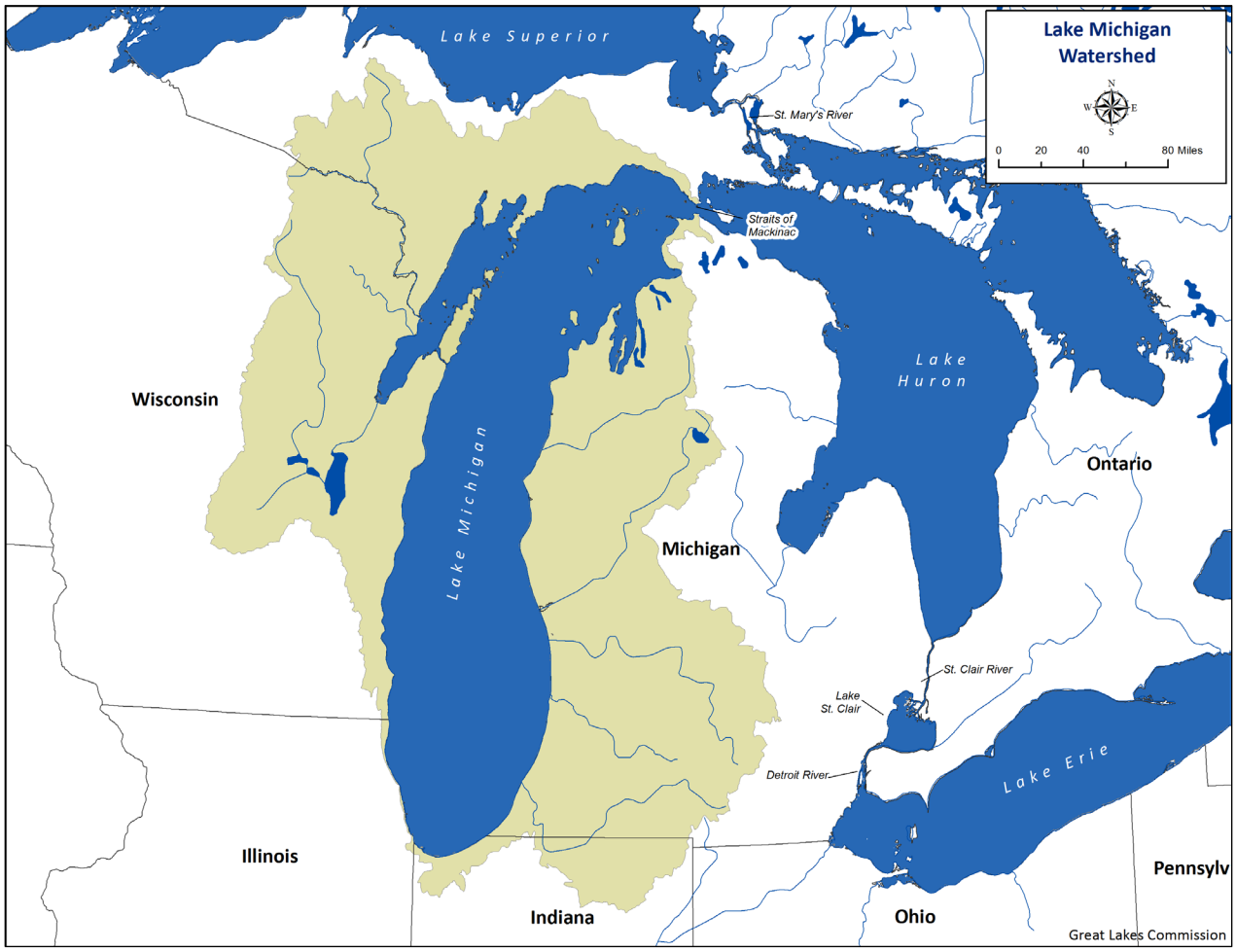

Figure 8. Lake Michigan Watershed

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 8 million people call the Lake Michigan watershed home.[12]

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: 8,011,470

[12] Previous State of the Great Lakes Technical Reports employed an updated methodology to calculate the population within the Lake Michigan watershed, leading to a discrepancy in estimated population from previous Annual Reports. Details on the updated methodology can be found in the State of the Great Lakes 2022 Technical Report.

Water Withdrawals

Four jurisdictions – Illinois, Indiana, Michigan and Wisconsin – share the Lake Michigan watershed and collectively withdrew 10,067 mgd (38,107 mld) in 2022, a 5 percent decrease from the total 2021 withdrawal of 10,607 mgd (40,150 mld). No in-stream or off-stream hydroelectric water use was reported for the watershed. The primary water uses were for self-supply thermoelectric power production (once-through cooling) at 6,424 mgd (24,316 mld), self-supply industrial use at 1,542 mgd (5,839 mld) and public water supply at 1,487 mgd (5,630 mld).

Lake Michigan surface water was the primary source of withdrawals in the watershed, accounting for 89 percent of total withdrawals (9,009 mgd or 34,103 mld). Of the remaining withdrawals, 6 percent came from groundwater (592 mgd or 2,239 mld) and 5 percent came from other surface water (466 mgd or 1,765 mld).

Water Diversions and Consumptive Uses

The reported net water loss from the Lake Michigan watershed totaled 1,718 mgd (6,503 mld) in 2022. This represents 17 percent of total Lake Michigan withdrawals and a 7 percent decrease in water loss from 2021. Water loss primarily consisted of the Illinois Diversion of 965 mgd (3,654 mld) and the watershed's total consumptive use of 678 mgd (2,566 mld).

Diversions, including the Illinois Diversion, decreased slightly from 2021 and consumptive use decreased by 113 mgd (428 mld) or 14 percent. The sectors with the majority of consumptive use in the watershed were self-supply industrial use at 260 mgd (983 mld) and self-supply irrigation at 272 mgd (1,030 mld). The decrease in consumptive use from 2021 to 2022 can be largely attributed to the self-supply thermoelectric power production (recirculated cooling) sector, which saw consumptive use decrease by 86 percent from 129 mgd (487 mld) to 18 mgd (67 mld).

Table 6a. Lake Michigan Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,247	21	220	1,487	0	834	86
Self-Supply Commercial and Institutional	4	7	5	16	0	2	1
Self-Supply Irrigation	0	45	266	311	0	0	272
Self-Supply Livestock	0	16	23	39	0	0	9
Self-Supply Industrial	1,284	192	66	1,542	0	25	260
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,280	143	1	6,424	0	0	33
Self-Supply Thermoelectric Power Production (Recirculated cooling)	15	40	3	59	0	0	18
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	180	1	8	188	0	179	0
Total	9,009	466	592	10,067	0	1,040	678

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,719	79	832	5,630	1	3,158	325
Self-Supply Commercial and Institutional	14	28	19	61	0	7	3
Self-Supply Irrigation	1	170	1,005	1,176	0	0	1,030
Self-Supply Livestock	0	62	86	148	0	0	33
Self-Supply Industrial	4,860	728	250	5,839	0	93	983
Self-Supply Thermoelectric Power Production (Once-through cooling)	23,771	541	4	24,316	0	0	125
Self-Supply Thermoelectric Power Production (Recirculated cooling)	58	153	12	224	0	0	67
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	680	3	30	713	0	678	1
Total	34,103	1,765	2,239	38,107	1	3,936	2,566

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

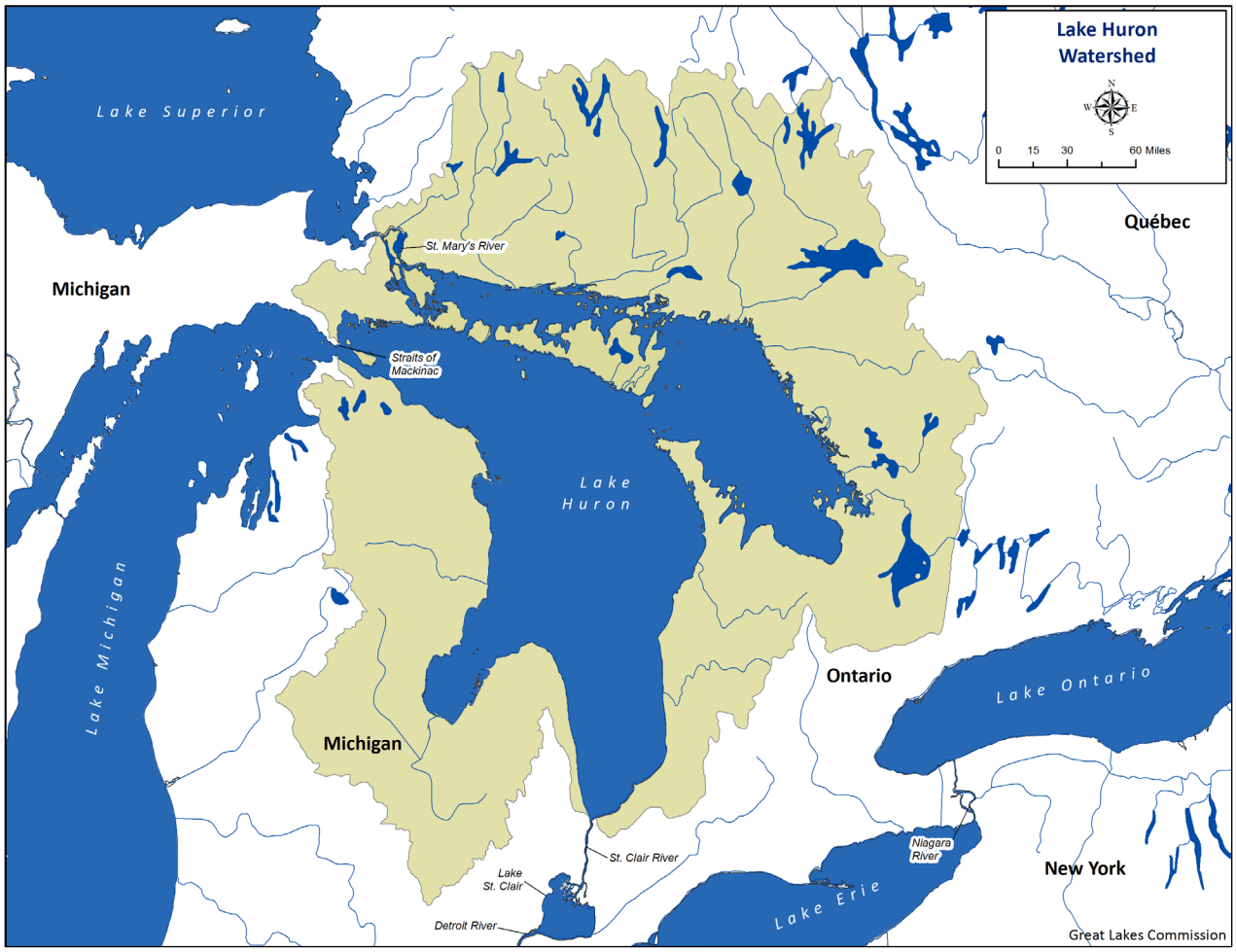

Figure 9. Lake Huron Watershed

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. The latest population estimates represent the first time the Canadian population is greater than the U.S. population within the Lake Huron watershed.[13]

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 - 1,563,597; Canada - 1,636,294; Total - 3,199,891

[13] State of the Great Lakes 2022 – Technical Report.

Water Withdrawals

Only two jurisdictions – Michigan and Ontario – share the Lake Huron watershed and collectively withdrew 11,426 mgd or 43,251 mld in 2022, excluding the reported in-stream hydroelectric water use of 33,998 mgd or 128,697 mld. This constitutes a slight decrease from the 2021 total withdrawal of 12,005 mgd (45,445 mld). The primary water use sector was self-supply thermoelectric power production (once-through cooling) at 10,785 mgd (40,826 mld), accounting for over 94 percent of total withdrawals in the watershed. Withdrawals for self-supply industrial use (370 mgd or 1,401 mld) and public water supply (204 mgd or 771 mld) made up most of the remaining water use.

Excluding in-stream hydroelectric water use, Lake Huron surface water was the primary source of withdrawals in the watershed, accounting for 62 percent of total withdrawals (7,072 mgd or 26,771 mld). Of the remaining withdrawals, 37 percent came from other surface water (4,214 mgd or 15,951 mld) and 1 percent came from groundwater (140 mgd or 530 mld).

Water Diversions and Consumptive Uses

The reported net water loss from the Lake Huron watershed was 228 mgd (864 mld) in 2022. Total consumptive use was 187 mgd or 706 mld, accounting for 82 percent of the net water loss. Self-supply thermoelectric power production (once-through cooling) at 95 mgd (359 mld) and self-supply industrial use at 38 mgd (145 mld) accounted for most of the consumptive use in the watershed. Consumptive use decreased by a negligible amount from 2021, with no major changes in any specific sector.

The remainder of the net water loss consisted of an intrabasin transfer of 42 mgd (157 mld) 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 Lake Ontario watersheds, and thus did not have an impact on the overall Great Lakes-St. Lawrence River basin water balance (i.e., all water diverted remained in the basin). Over 90 percent of the diversion was into the Lake Erie watershed.

Table 7a. Lake Huron Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	124	33	47	204	42	0	25
Self-Supply Commercial and Institutional	1	2	1	4	0	0	0
Self-Supply Irrigation	0	9	19	28	0	0	25
Self-Supply Livestock	0	14	14	28	0	0	1
Self-Supply Industrial	17	296	57	370	0	0	38
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,931	3,855	0	10,785	0	0	95
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	2	1	3	0	0	2
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	1	3	0	0	0
Total	25,933	19,351	140	45,424	42	0	187

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	468	124	179	771	157	0	94
Self-Supply Commercial and Institutional	2	9	3	14	0	0	1
Self-Supply Irrigation	1	33	73	107	0	0	96
Self-Supply Livestock	0	54	54	108	0	0	2
Self-Supply Industrial	63	1,122	216	1,401	0	0	145
Self-Supply Thermoelectric Power Production (Once-through cooling)	26,235	14,591	0	40,826	0	0	359
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	9	3	12	0	0	8
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	9	2	12	0	0	0
Total	98,167	73,252	530	171,949	157	0	706

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

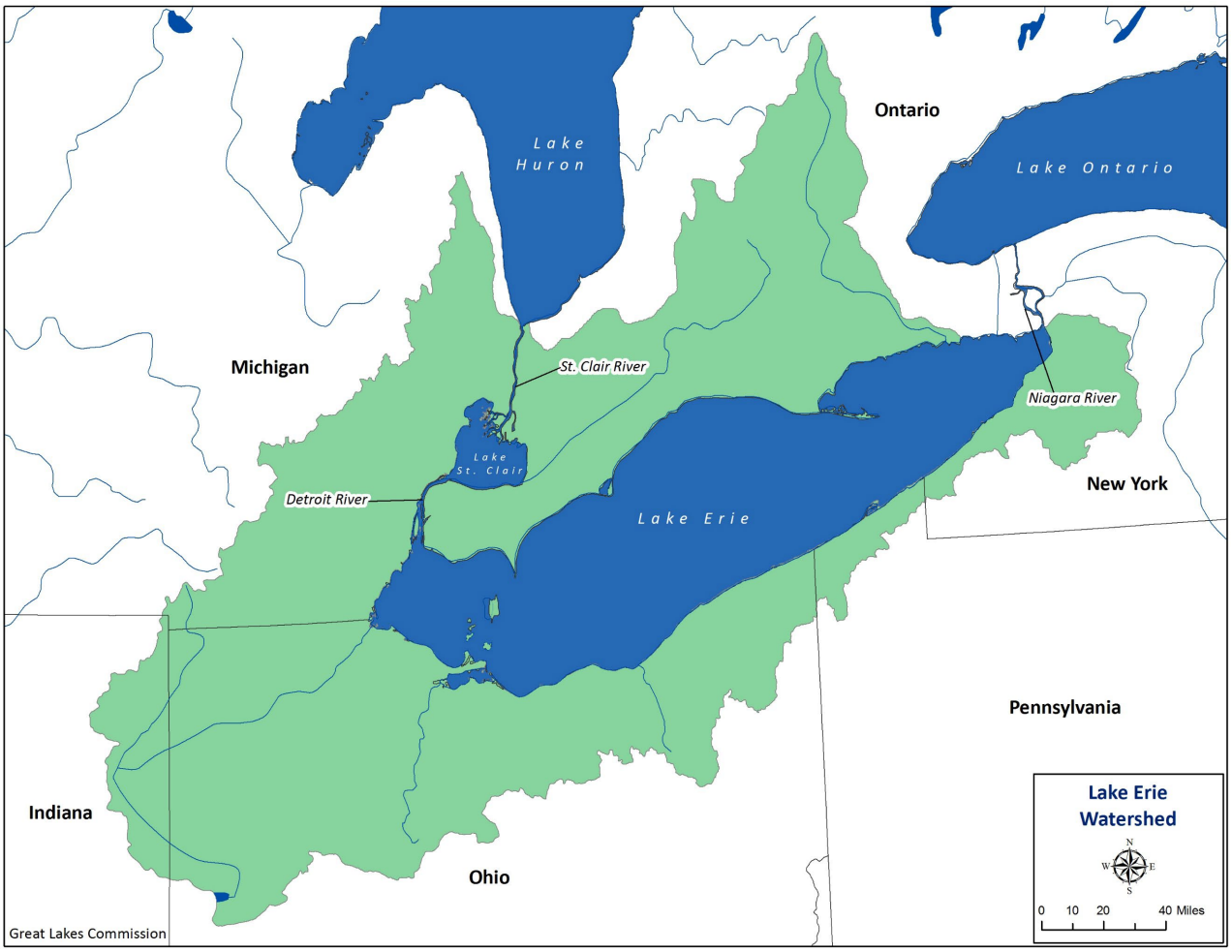

Figure 10. Lake Erie Watershed

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 - 9,946,913; Canada - 2,452,606; Total - 12,399,519

Water Withdrawals

Six jurisdictions – Indiana, Michigan, New York, Ohio, Ontario and Pennsylvania – share the Lake Erie watershed and collectively withdrew 6,036 mgd (22,848 mld) in 2022, excluding the reported in-stream hydroelectric water use of 49,623 mgd (187,844 mld). There was a slight increase in water withdrawals from the 2021 total withdrawal amount of 5,930 mgd (22,448 mld). Excluding in-stream hydroelectric power generation, the primary water use sectors were self-supply thermoelectric power generation (once-through cooling) at 3,189 mgd (12,073 mld), public water supply at 1,505 mgd (5,698 mld) and self-supply industrial at 1,053 mgd (3,987 mld).

Excluding in-stream hydroelectric water use, Lake Erie surface water was the primary source of withdrawals in the watershed, accounting for 72 percent of total withdrawals (4,367 mgd or 16,530 mld). Of the remaining withdrawals, 23 percent came from other surface water (1,380 mgd or 5,224 mld) and 5 percent came from groundwater (289 mgd or 1,094 mld).

Water Diversions and Consumptive Uses

The reported net water loss from the Lake Erie watershed totaled 5,692 mgd (21,548 mld) in 2022. The largest loss from the Lake Erie watershed was from the Welland Canal intrabasin diversion, which diverted 5,320 mgd (20,138 mld) to the Lake Ontario watershed for navigation purposes. Because this diversion is entirely into Lake Ontario, no water is lost 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.

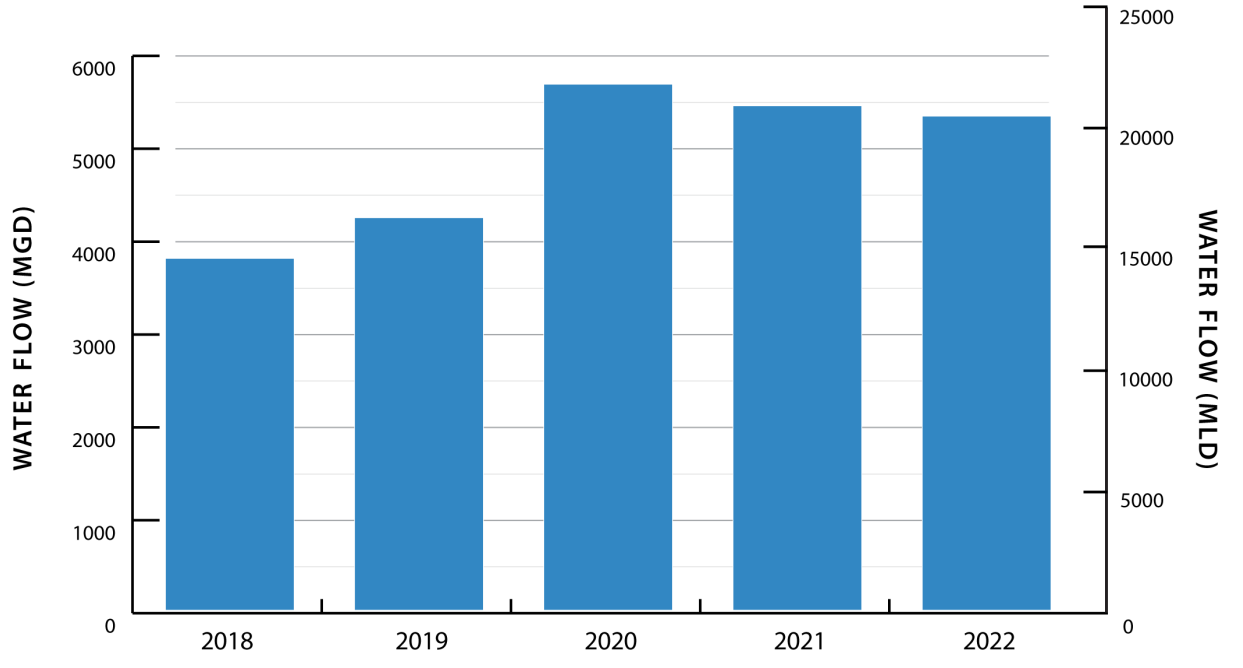

Figure 11. Water flow through the Welland Canal over the past five years

Additionally, incoming intrabasin diversions were reported in Ontario and Michigan for the public water supply sector, totaling 40 mgd or 151 mld, though Michigan's diversion represented a small portion of the total (less than 0.07 mgd or 0.26 mld). Interbasin diversions, both into and out of the basin, were also reported, resulting in a net gain of 17 mgd (63 mld) for the Lake Erie watershed and the Great Lakes-St. Lawrence River basin.[14]

Consumptive use in the Lake Erie watershed totaled 429 mgd (1,623 mld), a 7 percent increase from the 2021 consumptive use of 401 mgd (1,519 mld). The major consumptive uses were from the public water supply (188 mgd or 712 mld) and self-supply industrial (89 mgd or 338 mld) sectors.

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

Table 8a. Lake Erie Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,189	185	131	1,505	-40	9	194
Self-Supply Commercial and Institutional	1	1	0	2	0	0	0
Self-Supply Irrigation	2	46	16	63	0	0	56
Self-Supply Livestock	0	8	8	15	0	0	1
Self-Supply Industrial	290	641	122	1,053	0	0	103
Self-Supply Thermoelectric Power Production (Once-through cooling)	2,723	466	0	3,189	0	0	42
Self-Supply Thermoelectric Power Production (Recirculated cooling)	162	0	0	162	0	0	27
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	49,000	623	0	49,623	0	0	0
Other Self Supply	1	33	12	46	5,320	-26	5
Total	53,367	2,003	289	55,659	5,280	-17	429

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,499	702	498	5,698	-151	36	735
Self-Supply Commercial and Institutional	2	2	2	6	0	0	1
Self-Supply Irrigation	6	172	59	238	0	0	213
Self-Supply Livestock	0	29	29	58	0	-1	3
Self-Supply Industrial	1,099	2,427	461	3,987	0	0	390
Self-Supply Thermoelectric Power Production (Once-through cooling)	10,308	1,764	0	12,073	0	0	160
Self-Supply Thermoelectric Power Production (Recirculated cooling)	612	2	0	614	0	0	102
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	185,485	2,359	0	187,844	0	0	0
Other Self Supply	3	125	46	174	20,138	-98	20
Total	202,016	7,583	1,094	210,692	19,988	-63	1,623

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

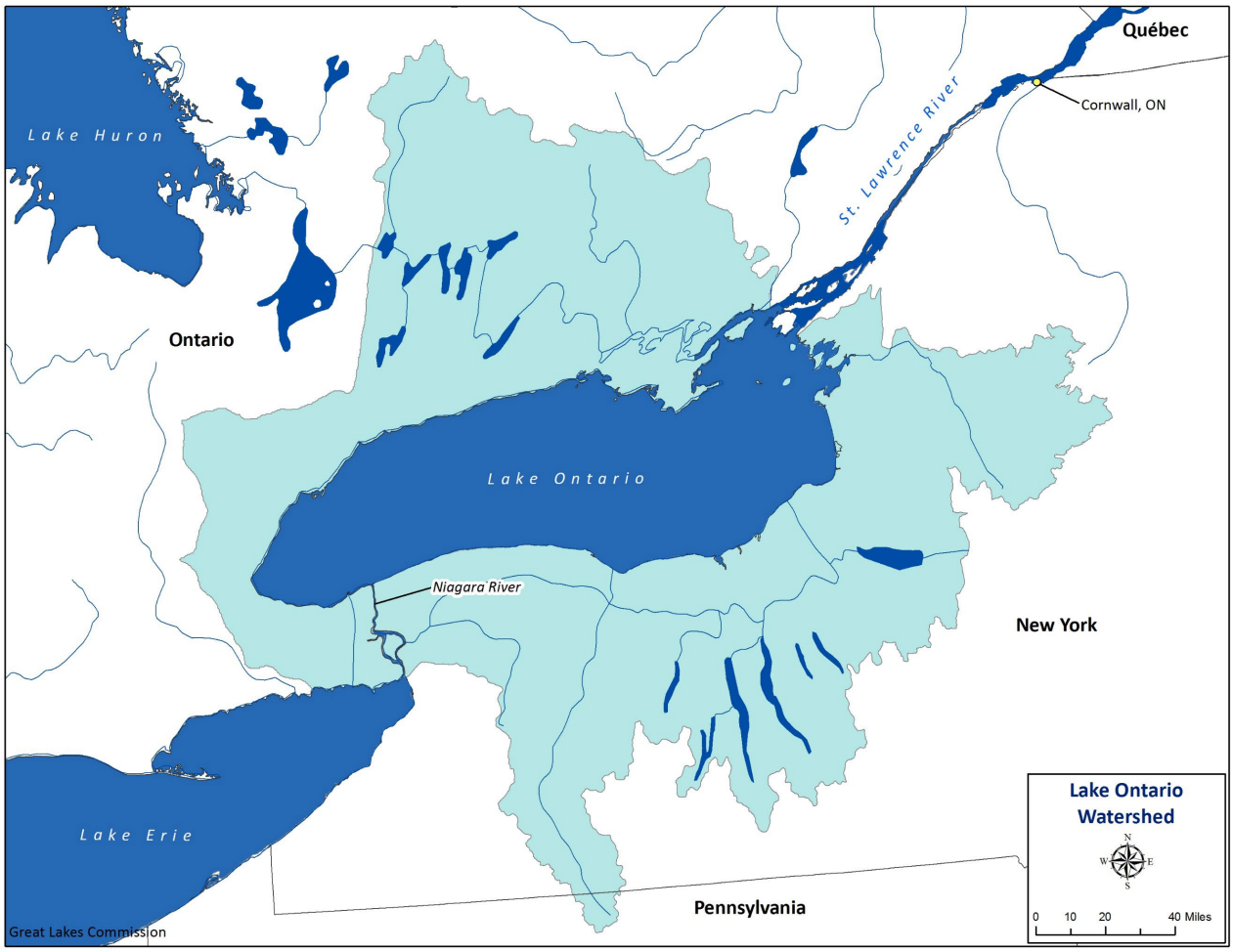

Figure 12. Lake Ontario Watershed

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, it 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 - 2,997,484; Canada - 8,169,080; Total - 11,166,564

Water Withdrawals

Three jurisdictions – New York, Ontario and Pennsylvania – share the Lake Ontario watershed and collectively withdrew 9,544 mgd (36,126 mld) in 2022, excluding the in-stream hydroelectric water use of 139,394 mgd (527,662 mld). This constitutes a 10 percent decrease from the 2021 total withdrawal of 10,602 mgd (40,131 mld). Excluding in-stream hydroelectric power generation, the primary water uses were for self-supply thermoelectric power generation (once-through cooling) at 6,819 mgd (25,814 mld), public water supply at 895 mgd (3,386 mld) and other self-supply at 715 mgd (2,705 mld).

Excluding in-stream hydroelectric water use, Lake Ontario surface water was the primary source of withdrawals in the watershed, accounting for 70 percent of total withdrawals (6,637 mgd or 25,124 mld). Of the remaining withdrawals, 29 percent came from other surface water (2,780 mgd or 10,523 mld) and 1 percent came from groundwater (127 mgd or 480 mld).

Water Diversions and Consumptive Uses

The reported net gain in the Lake Ontario watershed was 4,927 mgd (18,652 mld)[15] in 2022, a negligible decrease from the 2021 net gain. This gain was predominately attributable to the Welland Canal (5,320 mgd or 20,138 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 on the Great Lakes-St. Lawrence River basin. An additional incoming intrabasin diversion of 1.7 mgd (6.4 mld) was reported in the Lake Ontario watershed, associated with the public water supply sector in Ontario.

Outgoing interbasin diversions of 42 mgd (160 mld) from Lake Ontario were reported in New York, associated with the Erie Barge Canal and the City of Rome's public water supply. Consumptive use in the Lake Ontario watershed totaled 352 mgd (1,333 mld), primarily from the public water supply (112 mgd or 423 mld), self-supply industrial (76 mgd or 287 mld) and self-supply thermoelectric power production (once-through cooling) (74 mgd or 281 mld) sectors.

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

Table 9a. Lake Ontario Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	612	264	18	895	-2	10	112
Self-Supply Commercial and Institutional	0	42	1	42	0	0	9
Self-Supply Irrigation	0	18	8	26	0	0	24
Self-Supply Livestock	0	24	4	29	0	0	4
Self-Supply Industrial	271	166	96	533	0	0	76
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,315	1,505	0	6,819	0	0	74
Self-Supply Thermoelectric Power Production (Recirculated cooling)	439	0	0	439	0	0	22
Off-Stream Hydroelectric Power Production	0	46	0	46	0	0	0
In-Stream Hydroelectric Water Use	41,143	98,250	0	139,394	0	0	0
Other Self Supply	0	714	0	715	-5,320	32	32
Total	47,780	101,030	127	148,937	-5,322	42	352

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,317	1,000	69	3,386	-7	39	423
Self-Supply Commercial and Institutional	0	158	2	160	0	0	35
Self-Supply Irrigation	0	70	30	100	0	0	89
Self-Supply Livestock	0	93	16	108	0	0	13
Self-Supply Industrial	1,026	628	363	2,018	0	0	287
Self-Supply Thermoelectric Power Production (Once-through cooling)	20,118	5,696	0	25,814	0	0	281
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,662	0	0	1,662	0	0	83
Off-Stream Hydroelectric Power Production	0	174	0	174	0	0	0
In-Stream Hydroelectric Water Use	155,745	371,917	0	527,662	0	0	0
Other Self Supply	0	2,705	0	2,705	-20,138	121	122
Total	180,869	382,440	480	563,789	-20,146	160	1,333

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

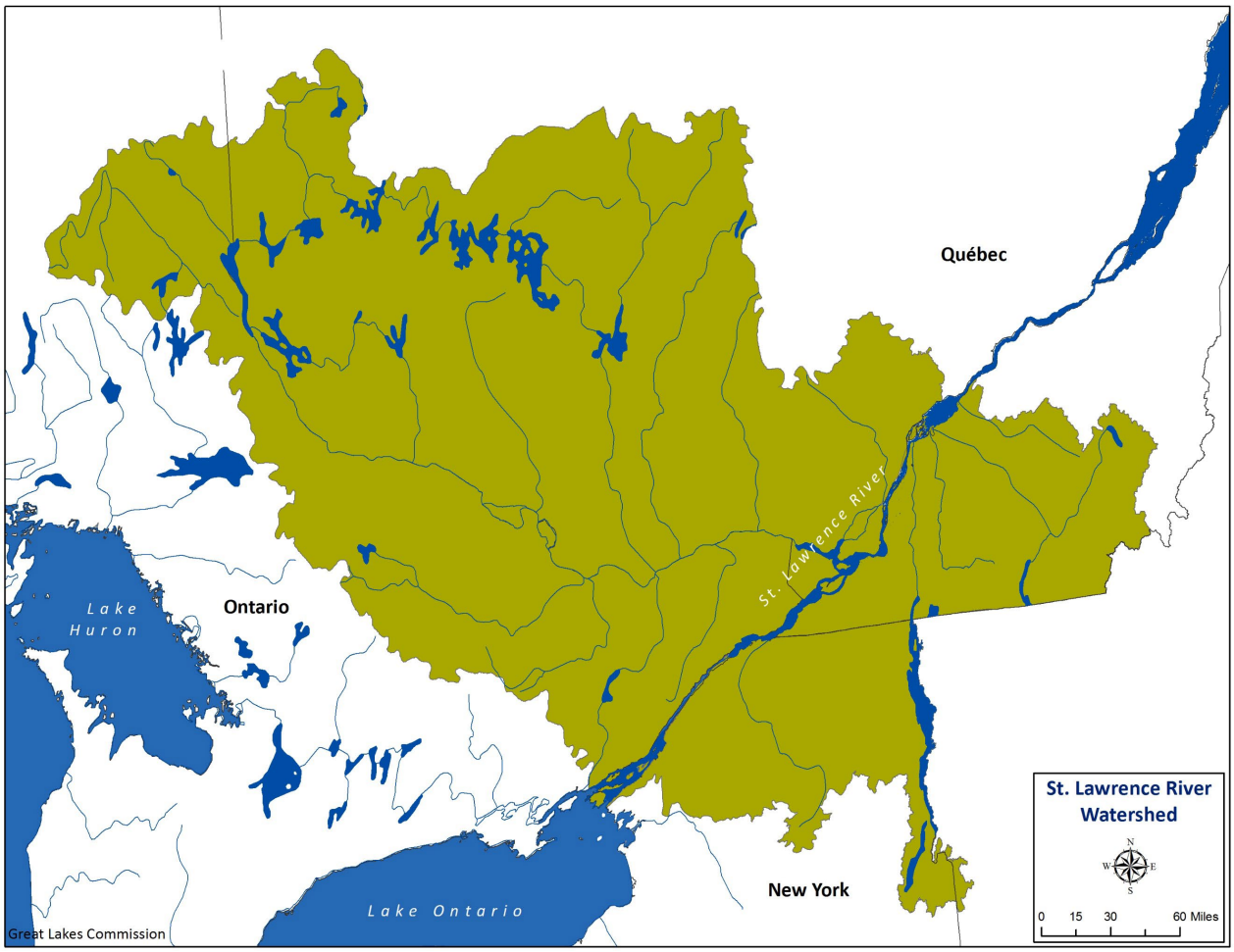

Figure 13. St. Lawrence River Watershed

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

Water Withdrawals

Three jurisdictions – New York, Ontario and Québec – share the St. Lawrence River watershed and collectively withdrew 1,635 mgd (6,190 mld) of water in 2022, excluding the in-stream hydroelectric water use of 222,181 mgd (841,045 mld). St. Lawrence River withdrawals increased by 8 percent from the 2021 withdrawal total of 1,517 mgd (5,743 mld). Excluding in-stream hydroelectric water use, the primary water uses were for public water supply (1,011 mgd or 3,827 mld) and self-supply industrial use (522 mgd or 1,977 mld), collectively making up almost 94 percent of St. Lawrence River withdrawals.

Excluding in-stream hydroelectric water use, St. Lawrence River surface water was the primary source of withdrawals in the watershed, accounting for just over 50 percent of total withdrawals (825 mgd or 3,122 mld). Of the remaining withdrawals, 43 percent came from other surface water (708 mgd or 2,682 mld) and 6 percent came from groundwater (102 mgd or 386 mld).

Water Diversions and Consumptive Uses

The reported net water loss in the St. Lawrence River watershed totaled 206 mgd (780 mld) in 2022, a marginal decrease from the 2021 net water loss. This net loss includes interbasin diversions of 5 mgd (20 mld) for public water supply in New York and Québec and consumptive uses totaling 201 mgd (761 mld). The largest consumptive uses were for public water supply (148 mgd or 562 mld) and self-supply industrial use (33 mgd or 124 mld).

Table 10a. St. Lawrence River Watershed 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	625	334	52	1,011	0	5	148
Self-Supply Commercial and Institutional	0	10	1	11	0	0	2
Self-Supply Irrigation	1	11	2	13	0	0	12
Self-Supply Livestock	0	24	11	35	0	0	1
Self-Supply Industrial	161	326	35	522	0	0	33
Self-Supply Thermoelectric Power Production (Once-through cooling)	32	1	0	33	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	165,879	56,302	0	222,181	0	0	0
Other Self Supply	6	3	1	10	0	0	5
Total	166,704	57,010	102	223,816	0	5	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 10b. St. Lawrence River Watershed 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,365	1,264	198	3,827	0	20	562
Self-Supply Commercial and Institutional	2	38	3	43	0	0	7
Self-Supply Irrigation	3	40	6	49	0	0	44
Self-Supply Livestock	0	90	43	132	0	0	5
Self-Supply Industrial	610	1,235	132	1,977	0	0	124
Self-Supply Thermoelectric Power Production (Once-through cooling)	122	3	0	125	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	627,920	213,125	0	841,045	0	0	0
Other Self Supply	21	12	5	38	0	0	18
Total	631,042	215,806	386	847,235	0	20	761

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.

In 2022, reported water withdrawals from the basin for Illinois totaled 1,299 mgd (4,918 mld), representing a 20 percent decrease from its 2021 withdrawals (1,627 mgd or 6,160 mld). The largest reported water uses were for public water supply at 784 mgd or 2,967 mld (60 percent of the total withdrawal) and self-supply thermoelectric power production (once-through cooling) at 303 mgd or 1,147 mld (23 percent of the total withdrawal). The source for all withdrawals was Lake Michigan surface water, except for a minor groundwater withdrawal in the self-supply irrigation sector.

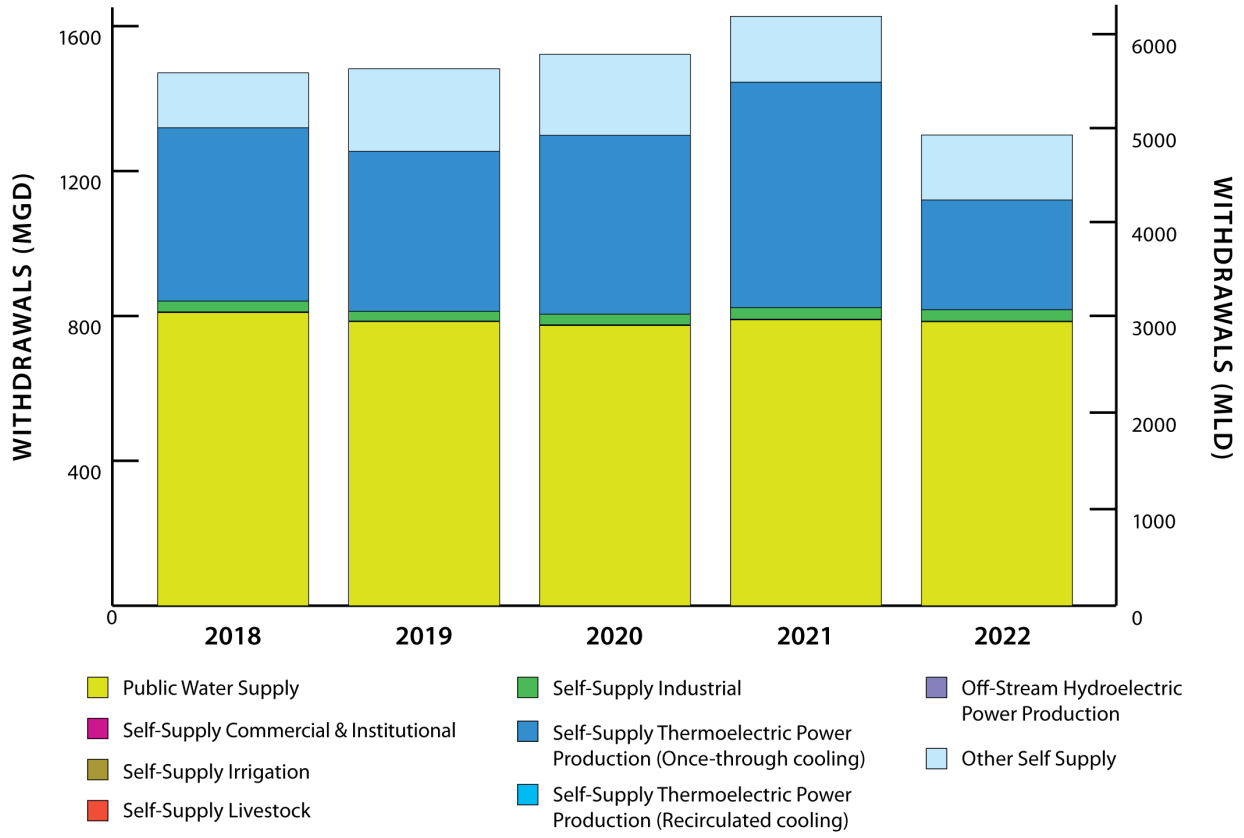

Figure 14. Illinois water withdrawals by sector over the past five years

A total of 965 mgd (3,654 mld) were diverted through the Illinois Diversion in 2022. The Illinois Diversion diverts water from Lake Michigan through the Chicago Area Waterway 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 784 mgd (2,967 mld), with an additional 2.4 mgd (9 mld) diverted for both the self-supply commercial and institutional and the self-supply industrial sectors.

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; 179 mgd (678 mld) were diverted for navigational makeup in 2022. Consumptive use in Illinois is negligible; less than 0.01 percent of water withdrawn is lost through consumptive use, totaling about 0.1 mgd (0.4 mld).

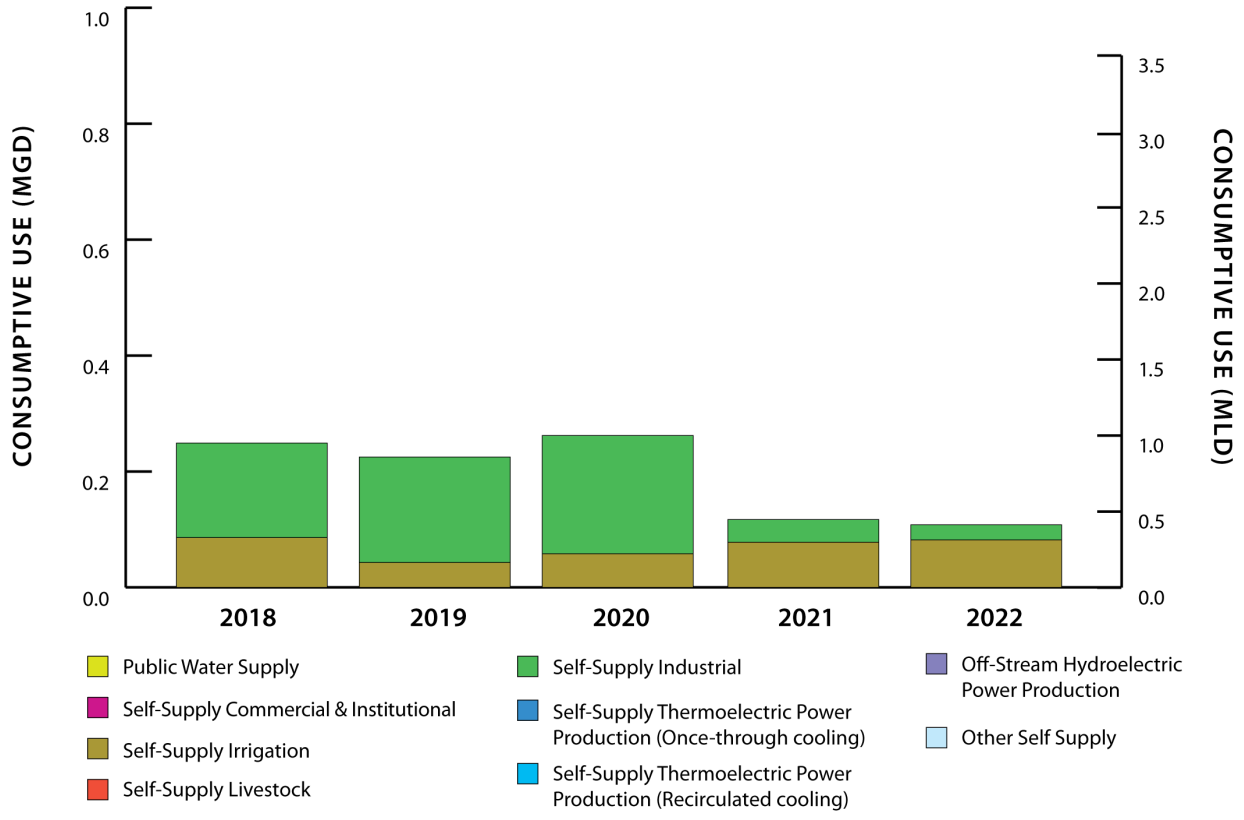

Figure 15. Illinois consumptive use by sector over the past five years

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 a 100 percent reporting compliance rate from permitted water withdrawal facilities.

Year-to-year changes from 2021 water use by Illinois facilities include:

- A 51 percent (320 mgd or 1,210 mld) decrease in water withdrawn for self-supply thermoelectric power production (once-through cooling), mainly because one power plant reported a 50% reduction in water use.
- A 20 percent (328 mgd or 1,242 mld) decrease in total water withdrawn, largely due to the decrease in water withdrawals for the self-supply thermoelectric power production (once-through cooling) sector.

Table 11a. Illinois 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	784	0	0	784	0	784	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	31	0	0	31	0	1	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	303	0	0	303	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	179	0	0	179	0	179	0
Total	1,299	0	0	1,299	0	965	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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,967	0	0	2,967	0	2,967	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	118	0	0	118	0	2	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,147	0	0	1,147	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	678	1	0	679	0	678	0
Total	4,918	1	0	4,919	0	3,654	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.

In 2022, reported water withdrawals from the basin for Indiana totaled 1,486 mgd (5,624 mld), representing a 2 percent decrease from its 2021 withdrawals (1,520 mgd or 5,755 mld). The largest withdrawals were used for the self-supply industrial (1,224 mgd or 4,633 mld) and public water supply (167 mgd or 631 mld) sectors; together, these two sectors made up 94 percent of Indiana's total water withdrawals.

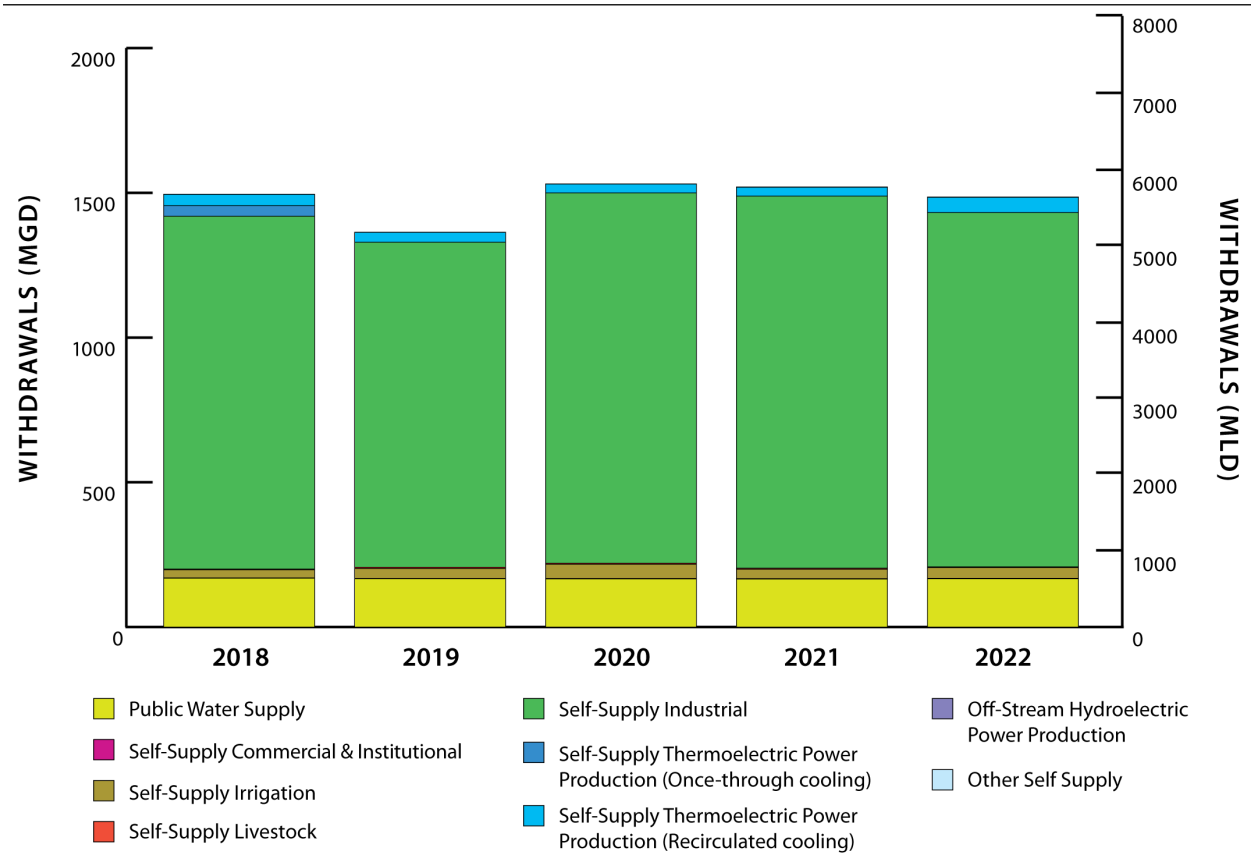

Figure 16. Indiana water withdrawals by sector over the past five years

The reported interbasin diversion amount for Indiana totaled 82 mgd (309 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 (58 mgd or 218 mld) were for public water 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 comprised about 24 mgd (91 mld) of the reported diversion from the Lake Michigan watershed into 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, almost exclusively from other surface water with less than 0.01 percent from groundwater) was reported as a diversion from the Lake Erie watershed.

Consumptive use in Indiana totaled 295 mgd (1,116 mld), with the self-supply industrial sector in the Lake Michigan watershed (226 mgd or 855 mld) representing 77 percent of all consumptive use.

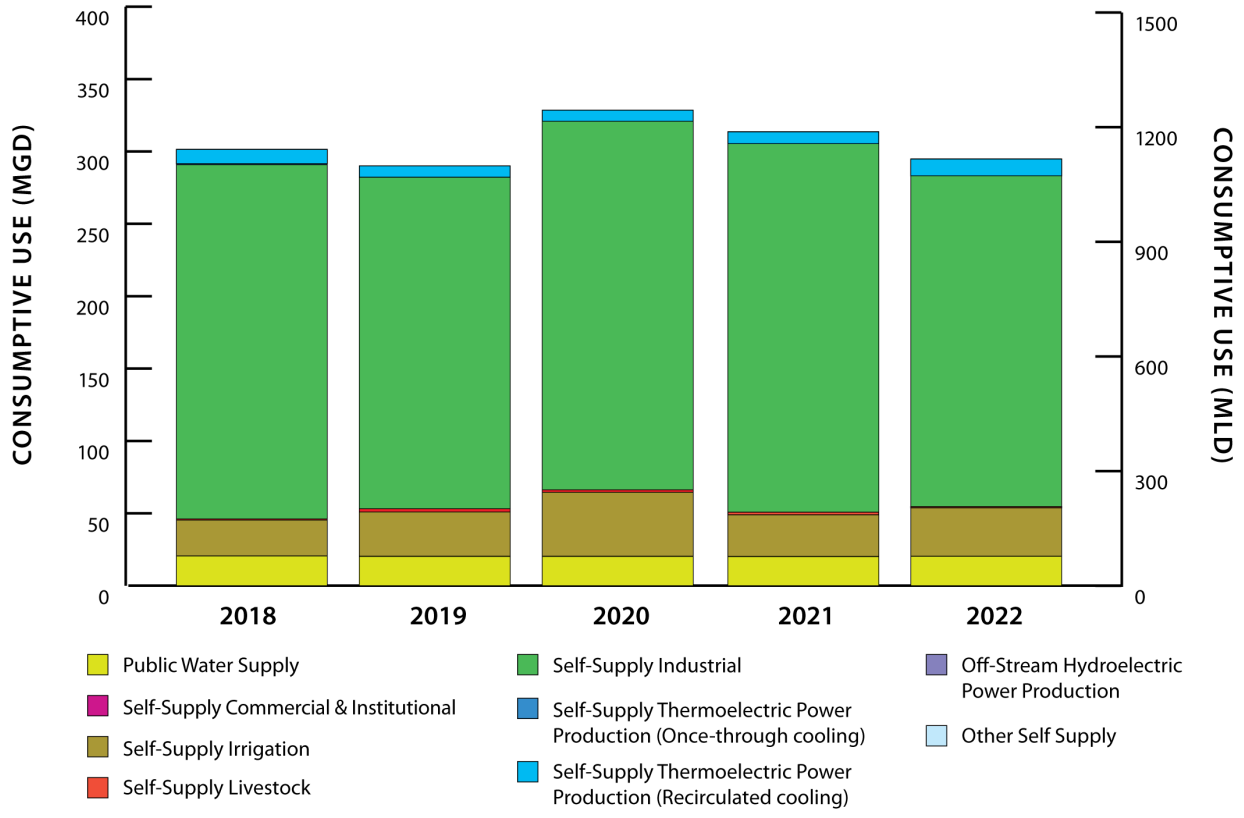

Figure 17. Indiana consumptive use by sector over the past five years

Data collected for this report came from the Indiana Department of Natural Resources. These data were generated from permitted water withdrawal facilities with reporting compliance rates 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 their water use.

Year-to-year changes from 2021 water use by Indiana facilities include:

- A 71 percent (22 mgd or 83 mld) increase in the self-supply thermoelectric power production (recirculated cooling) sector, largely because one facility updated the methodology by which it measures cooling water flows, meaning previous reports likely underestimated these flows.
- A 16 percent (5 mgd or 19 mld) increase in the self-supply irrigation sector, particularly from Lake Michigan groundwater, though this increase is not attributable to any specific facility.
- A 5 percent (62 mgd or 233 mld) decrease in the self-supply industrial sector, mainly because one facility in this sector decreased its withdrawals by about 70 mgd (265 mld).

Table 12a. Indiana 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	84	37	46	167	0	58	20
Self-Supply Commercial and Institutional	0	0	1	1	0	0	0
Self-Supply Irrigation	0	5	32	37	0	0	33
Self-Supply Livestock	0	0	3	3	0	0	1
Self-Supply Industrial	1,208	7	9	1,224	0	24	228
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	11	40	2	53	0	0	12
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	1,304	89	93	1,486	0	82	295

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	318	140	173	631	0	218	77
Self-Supply Commercial and Institutional	0	0	6	6	0	0	1
Self-Supply Irrigation	0	20	121	141	0	0	126
Self-Supply Livestock	0	0	10	10	0	0	3
Self-Supply Industrial	4,573	27	33	4,633	0	91	865
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	42	150	7	199	0	0	44
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	2	0	3	5	0	0	1
Total	4,935	337	352	5,624	0	309	1,116

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]

In 2022, reported water withdrawals from the basin for Michigan totaled 7,924 mgd (29,995 mld), representing a 3 percent decrease from its 2021 withdrawals (8,164 mgd or 30,903 mld). The largest water use was for the self-supply thermoelectric power production (once-through cooling) sector which withdrew 6,039 mgd (22,858 mld), constituting over 76 percent of Michigan's total withdrawal. About 47 percent of the total withdrawal amount (3,761 mgd or 14,235 mld) came from the Lake Erie watershed, mainly used for thermoelectric power production. Another 45 percent of Michigan's total withdrawal amount came from the Lake Michigan watershed (3,554 mgd or 13,455 mld), followed by the Lake Huron watershed at 7 percent (567 mgd or 2,147 mld) and the Lake Superior watershed at 0.5 percent (42 mgd or 159 mld).

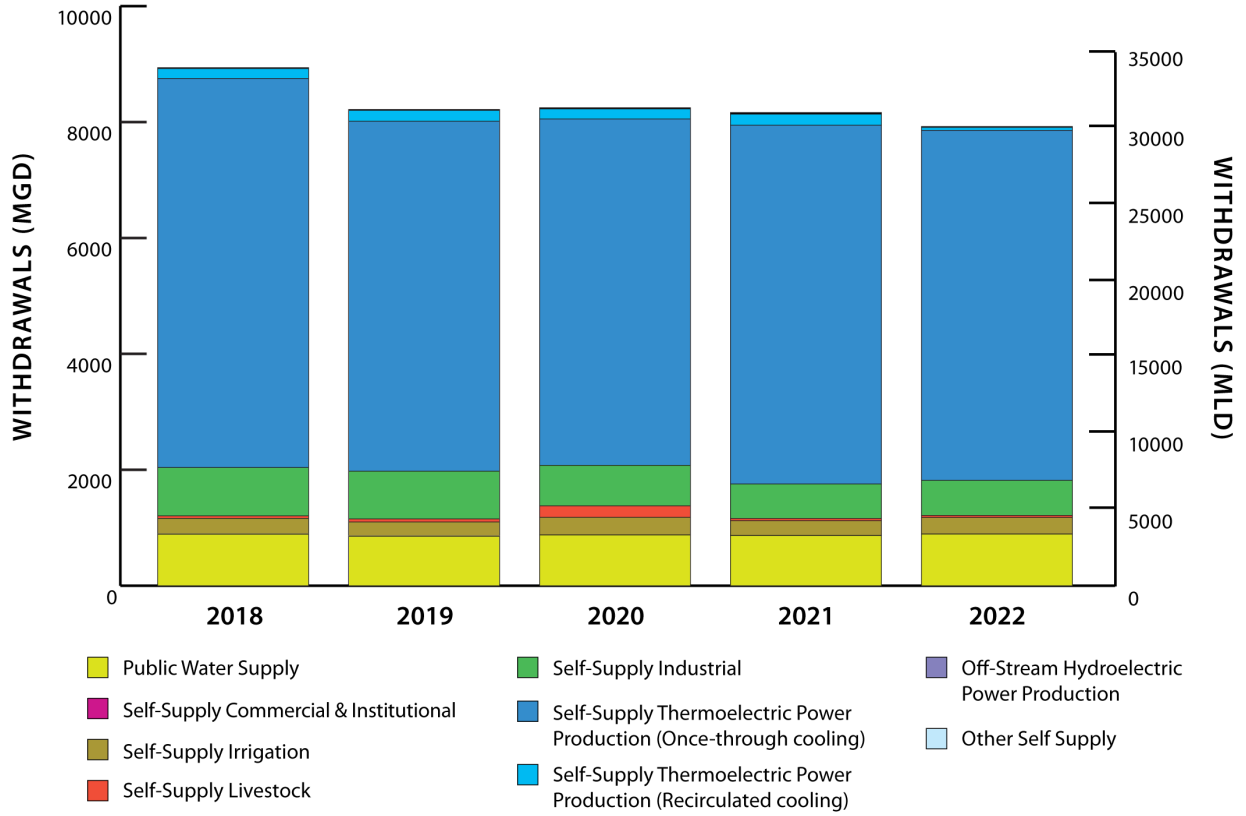

Figure 18. Michigan water withdrawals by sector over the past five years

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

The total consumptive use in Michigan was 492 mgd or 1,863 mld (approximately 6 percent of total withdrawals), with self-supply irrigation being the largest contributor to consumptive use at 255 mgd (967 mld).

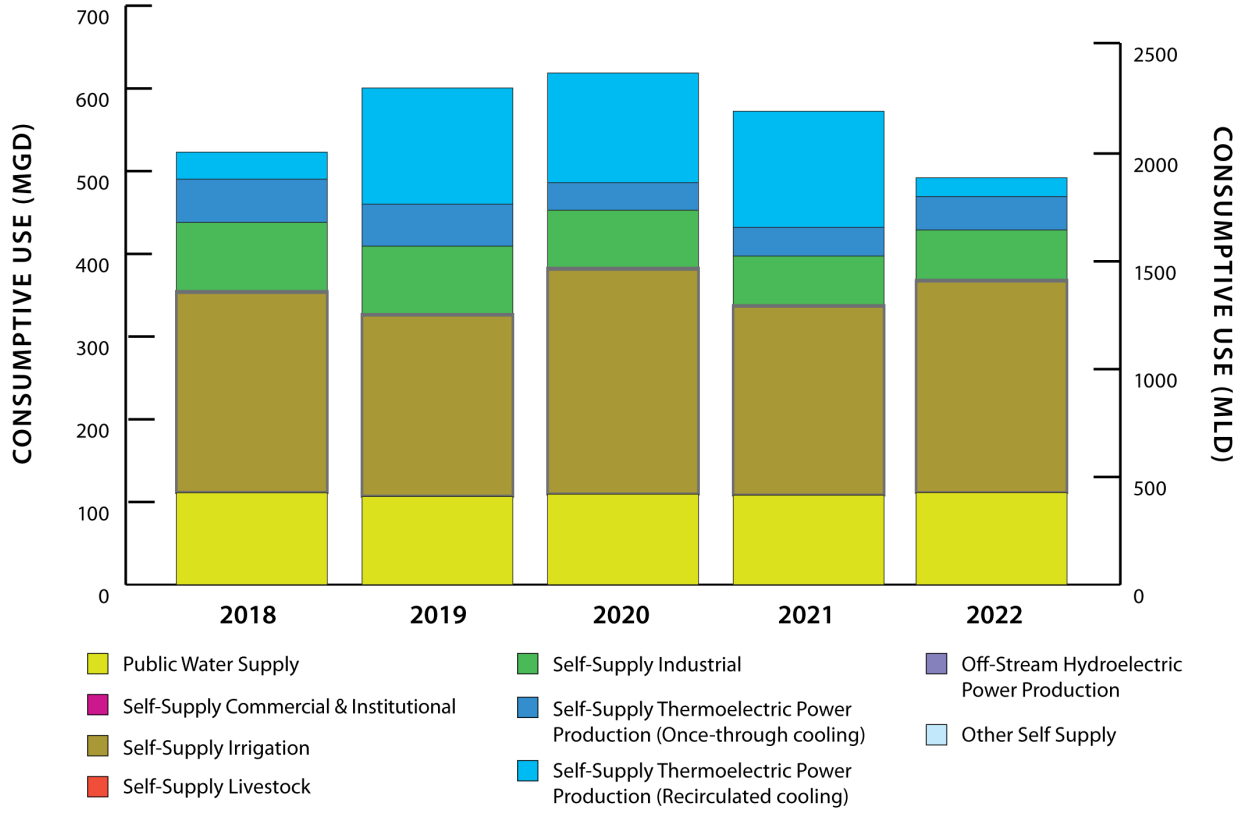

Figure 19. Michigan consumptive use by sector over the past five years

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 75-100 percent of total water users, depending on the water use sector. Water use for both in-stream and off-stream hydroelectric power generation is exempt from reporting requirements under Michigan statute.

Year-to-year changes from 2021 water use by Michigan facilities include:

- A 74 percent (141 mgd or 534 mld) decrease in withdrawals for thermoelectric power production (recirculated cooling), primarily due to the decommissioning of the Palisades nuclear power plant in 2022. This large decrease ends a trend of withdrawals from this sector being at least 170 mgd (644 mld) since 2015.
- A 37 percent (10 mgd or 40 mld) decrease in withdrawals for the other self-supply sector, largely due to the completion of construction projects that required temporary dewatering.

- A 14 percent (80 mgd or 305 mld) decrease in total consumptive use, mainly influenced by the 118 mgd (446 mld) decrease in consumptive uses for the thermoelectric power production (recirculated cooling) sector.
- A 12 percent (31 mgd or 116 mld) increase in self-supply irrigation withdrawals, due to the addition of several thousand new threshold facilities reporting in this sector in 2022.

Table 13a. Michigan 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	687	13	192	891	0	0	111
Self-Supply Commercial and Institutional	0	1	3	4	0	0	0
Self-Supply Irrigation	1	56	228	284	0	0	255
Self-Supply Livestock	0	23	12	35	0	0	1
Self-Supply Industrial	181	325	101	607	0	0	61
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,579	459	1	6,039	0	0	40
Self-Supply Thermoelectric Power Production (Recirculated cooling)	43	3	2	48	0	0	23
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	3	14	17	0	0	0
Total	6,490	882	552	7,924	0	0	492

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,599	48	725	3,372	0	0	422
Self-Supply Commercial and Institutional	1	3	10	14	0	0	0
Self-Supply Irrigation	3	210	861	1,075	0	0	967
Self-Supply Livestock	0	86	46	131	0	0	6
Self-Supply Industrial	685	1,229	383	2,296	0	0	230
Self-Supply Thermoelectric Power Production (Once-through cooling)	21,118	1,736	4	22,858	0	0	153
Self-Supply Thermoelectric Power Production (Recirculated cooling)	161	13	9	183	0	0	86
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	13	52	66	0	0	0
Total	24,568	3,338	2,090	29,995	0	0	1,863

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.

In 2022, excluding in-stream hydroelectric water use (1,782 mgd or 6,746 mld), reported water withdrawals from the basin for Minnesota totaled 1,939 mgd (7,341 mld), representing a 50 percent increase from its 2021 withdrawals (1,291 mgd or 4,887 mld). This large increase is primarily due to an increase in water use for off-stream hydroelectric power production, which was the sector with the greatest withdrawal (1,643 mgd or 6,218 mld). The second largest water use was for the self-supply industrial sector at 150 mgd (568 mld).

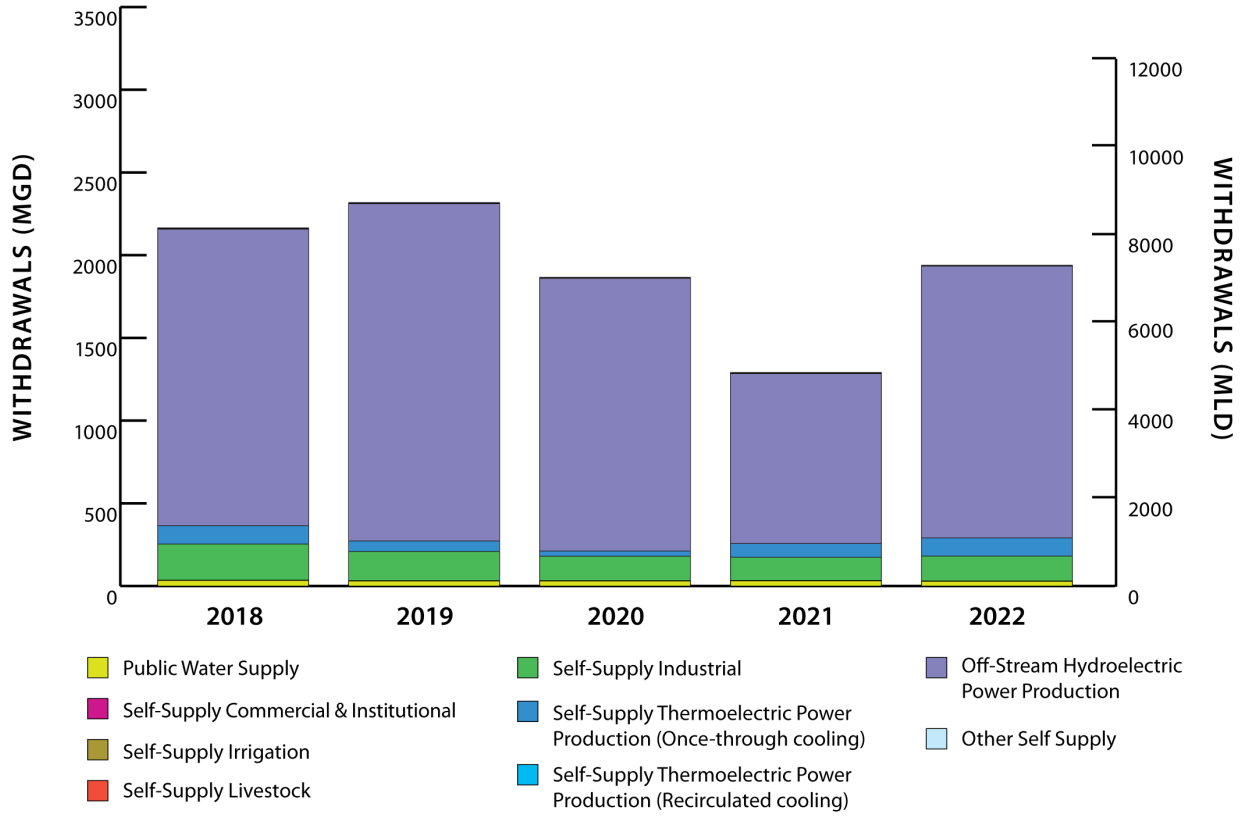

Figure 20. Minnesota water withdrawals by sector over the past five years (excluding in-stream hydroelectric water use)

Over 93 percent of total withdrawals came from other surface water within the Lake Superior watershed (1,811 mgd or 6,857 mld), while just over 6 percent, or 123 mgd (466 mld), came directly from Lake Superior. Less than half of 1 percent of withdrawals (5 mgd or 18 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.

[17] Minnesota Pollution Control Agency, Minnesota watershed information.

The reported total interbasin diversion amount of 13 mgd (50 mld) was almost exclusively for self-supply industrial purposes. A small amount of the outgoing diversion (0.02 mgd or 0.08 mld) was also reported for the self-supply irrigation sector. Total consumptive use was 20 mgd (77 mld), the majority of which was for industrial purposes (15 mgd or 57 mld).

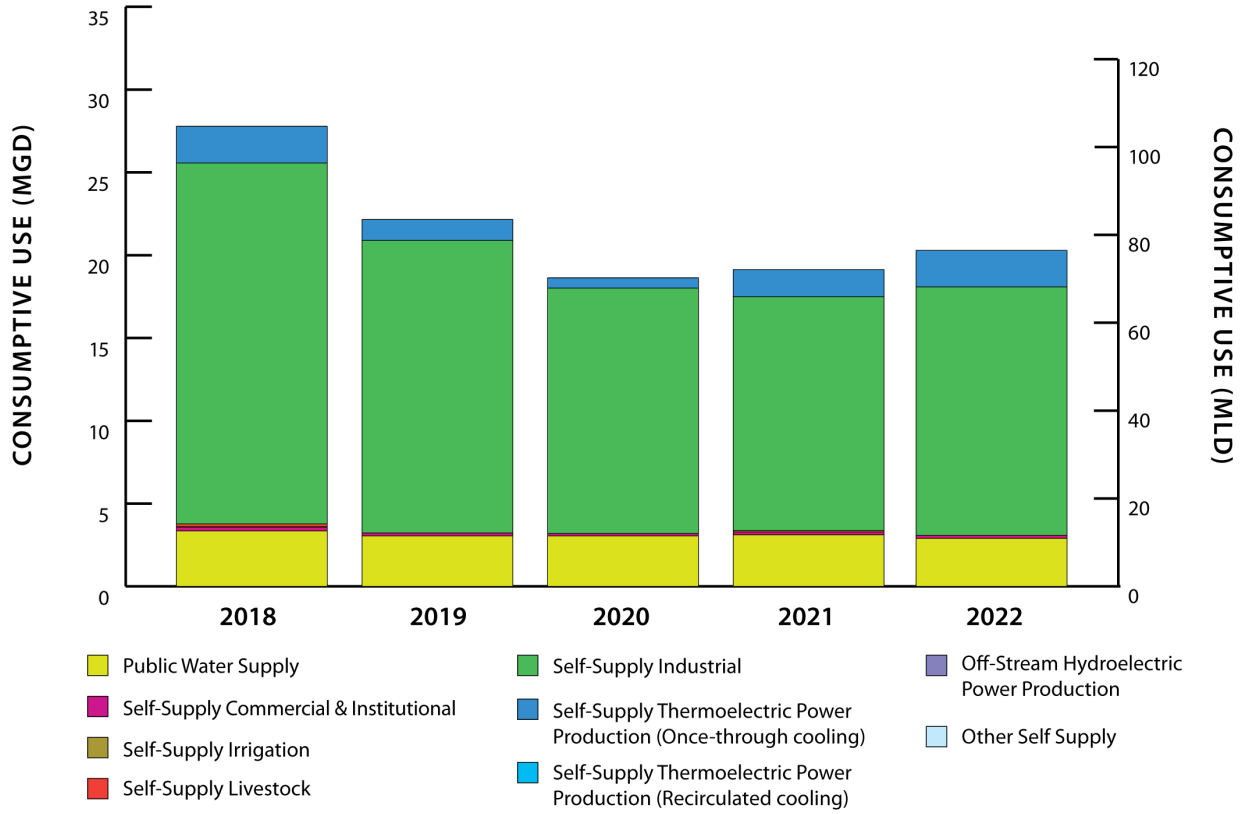

Figure 21. Minnesota consumptive use by sector over the past five years

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.

Year-to-year changes from 2021 water use by Minnesota facilities include:

- A 60 percent (615 mgd or 2,328 mld) increase in water withdrawals for off-stream hydroelectric power production, primarily because 2021 saw drought-like conditions and water withdrawals in this sector returned to expected levels in 2022.
- A 44 percent (548 mgd or 2,074 mld) increase in water use for in-stream hydroelectric power production, effectuated by a greater flow in the St. Louis River.
- A 34 percent (28 mgd or 107 mld) increase in water withdrawals for thermoelectric power production (once-through cooling), mainly due to normal fluctuations at two energy centers.

Table 14a. Minnesota 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	23	1	5	29	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	104	0	150	0	13	15
Self-Supply Thermoelectric Power Production (Once-through cooling)	52	58	0	110	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,643	0	1,643	0	0	0
In-Stream Hydroelectric Water Use	0	1,782	0	1,782	0	0	0
Other Self Supply	0	5	0	5	0	0	0
Total	123	3,593	5	3,721	0	13	20

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	87	6	17	110	0	0	11
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	174	393	1	568	0	49	57
Self-Supply Thermoelectric Power Production (Once-through cooling)	198	219	1	418	0	0	8
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	6,218	0	6,218	0	0	0
In-Stream Hydroelectric Water Use	0	6,746	0	6,746	0	0	0
Other Self Supply	0	20	0	20	0	0	0
Total	466	13,602	18	14,086	0	50	77

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 within 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 drinking water.[18]

In 2022, excluding in-stream hydroelectric water use (218,816 mgd or 828,309 mld), reported water withdrawals from the basin for New York totaled 3,262 mgd (12,349 mld), representing a 2 percent decrease from its 2021 withdrawals (3,335 mgd or 12,623 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 2,794 mgd (10,578 mld).

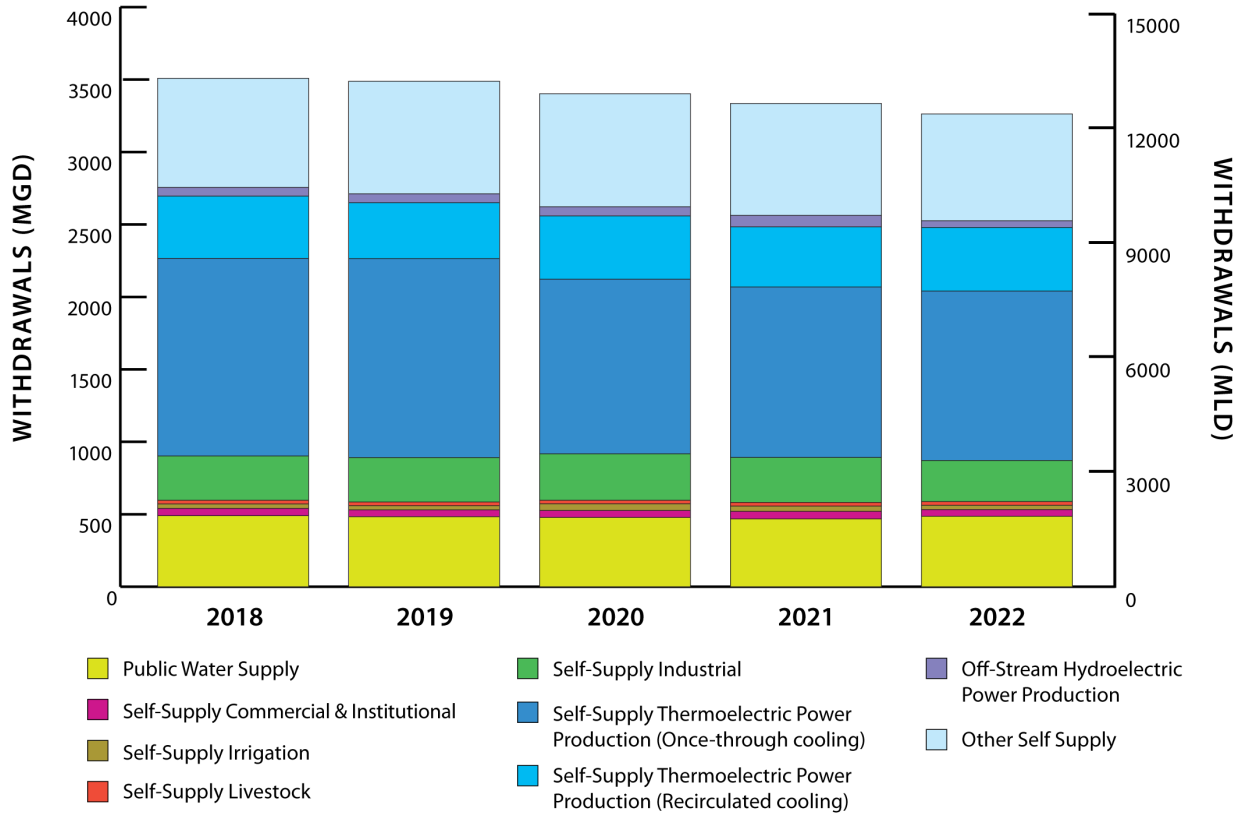

Figure 22. New York water withdrawals by sector over the past five years (excluding in-stream hydroelectric water use)

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

The self-supply thermoelectric power production sectors (both once-through and recirculated cooling) withdrew 1,608 mgd (6,089 mld), constituting 49 percent of the total withdrawal amount. Other self-supply was the next largest water use sector, withdrawing 737 mgd (2,789 mld) and accounting for 23 percent of total withdrawals. Excluding 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 net total interbasin diversion for New York was 45 mgd (169 mld), the majority of which (32 mgd or 121 mld) was from Lake Ontario for the Erie Barge Canal. The balance of the diversion, 13 mgd or 48 mld, was for public supply. The total consumptive use was 246 mgd (929 mld), with the largest uses attributed to the self-supply industrial sector at 64 mgd (244 mld) and public water supply at 60 mgd (228 mld).

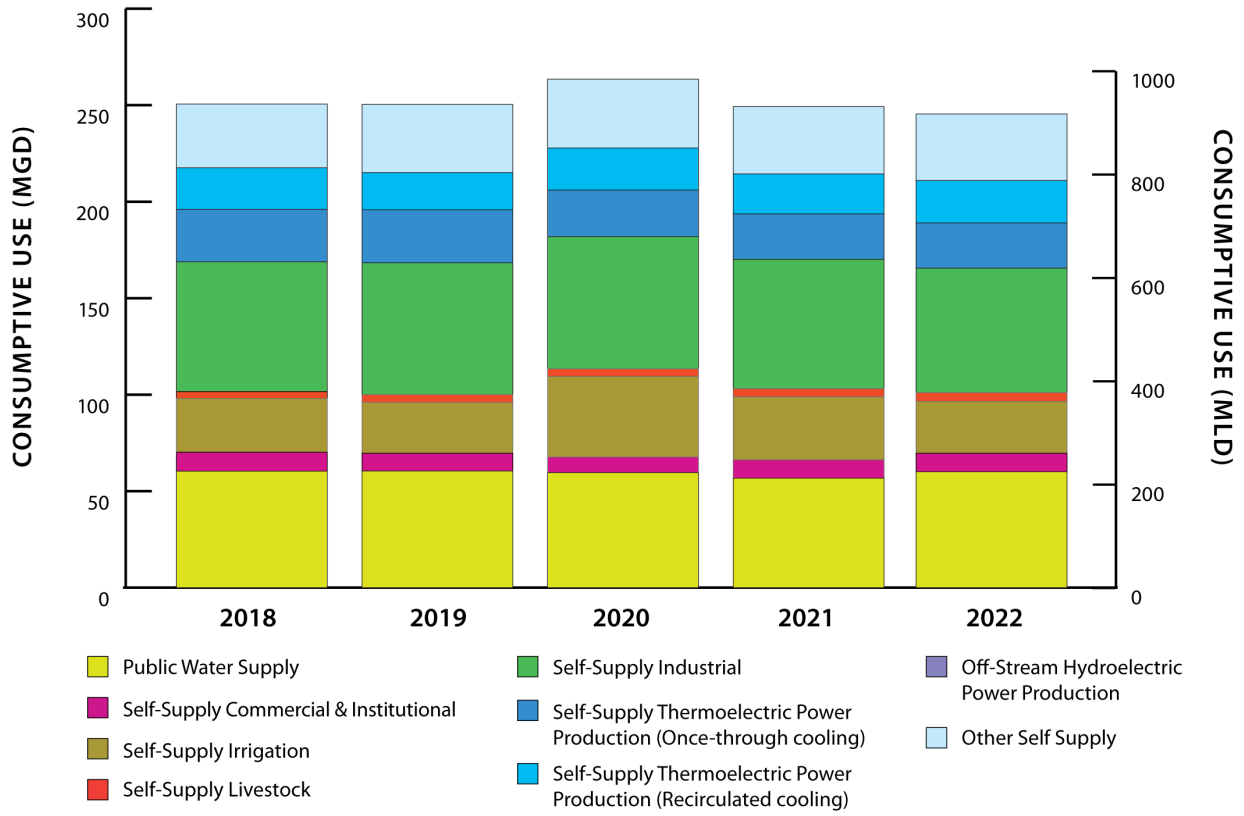

Figure 23. New York consumptive use by sector over the past five years

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 each year since 2020. New York's five-year implementation of water withdrawal permits 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.

Year-to-year changes from 2021 water use by New York facilities include:

- A 42 percent (33 mgd or 125 mld) decrease in water withdrawals for off-stream hydroelectric power production due to regular fluctuations in this sector.
- A 17 percent (6 mgd or 24 mld) decrease in water withdrawals and associated 17 percent (6 mgd or 22 mld) decrease in consumptive use for self-supply irrigation due to regular fluctuations in this sector.
- A 9 percent (27 mgd or 102 mld) decrease in water withdrawals for the self-supply industrial sector. While this decrease is due to normal fluctuations, 2022 is the first year that water withdrawals in this sector have dropped below 300 mgd (1,136 mld) since 2014.

Table 15a. New York 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	299	170	16	486	0	13	60
Self-Supply Commercial and Institutional	0	46	1	46	0	0	10
Self-Supply Irrigation	0	22	7	30	0	0	27
Self-Supply Livestock	0	23	3	25	0	0	5
Self-Supply Industrial	125	152	6	283	0	0	64
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,069	101	0	1,169	0	0	23
Self-Supply Thermoelectric Power Production (Recirculated cooling)	439	0	0	439	0	0	22
Off-Stream Hydroelectric Power Production	0	46	0	46	0	0	0
In-Stream Hydroelectric Water Use	137,908	80,908	0	218,816	0	0	0
Other Self Supply	0	737	0	737	0	32	35
Total	139,841	82,204	33	222,078	0	45	246

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,134	645	62	1,841	0	48	228
Self-Supply Commercial and Institutional	0	172	3	175	0	0	36
Self-Supply Irrigation	1	85	28	113	0	0	102
Self-Supply Livestock	0	86	10	95	0	0	17
Self-Supply Industrial	475	576	22	1,073	0	0	244
Self-Supply Thermoelectric Power Production (Once-through cooling)	4,046	381	0	4,427	0	0	89
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,662	0	0	1,662	0	0	83
Off-Stream Hydroelectric Power Production	0	174	0	174	0	0	0
In-Stream Hydroelectric Water Use	522,039	306,270	0	828,309	0	0	0
Other Self Supply	0	2,789	0	2,789	0	121	131
Total	529,356	311,177	124	840,657	0	169	929

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 Ohio's Lake Erie watershed, 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 another five percent of total land use.[19]

In 2022, reported water withdrawals from the basin for Ohio totaled 1,148 mgd (4,346 mld), representing a 1 percent decrease from its 2021 withdrawals (1,161 mgd or 4,394 mld). The primary water use sectors were public water supply at 515 mgd or 1,949 mld (45 percent of total withdrawals), and self-supply thermoelectric power production (once-through and recirculated cooling) at 376 mgd or 1,423 mld (33 percent of total withdrawals). Lake Erie surface water was the source for 56 percent of Ohio's total withdrawal amount. However, within specific sectors, other surface water was the predominant source, comprising 88 percent of self-supply irrigation withdrawals and 70 percent of self-supply thermoelectric power production (once-through cooling) withdrawals.

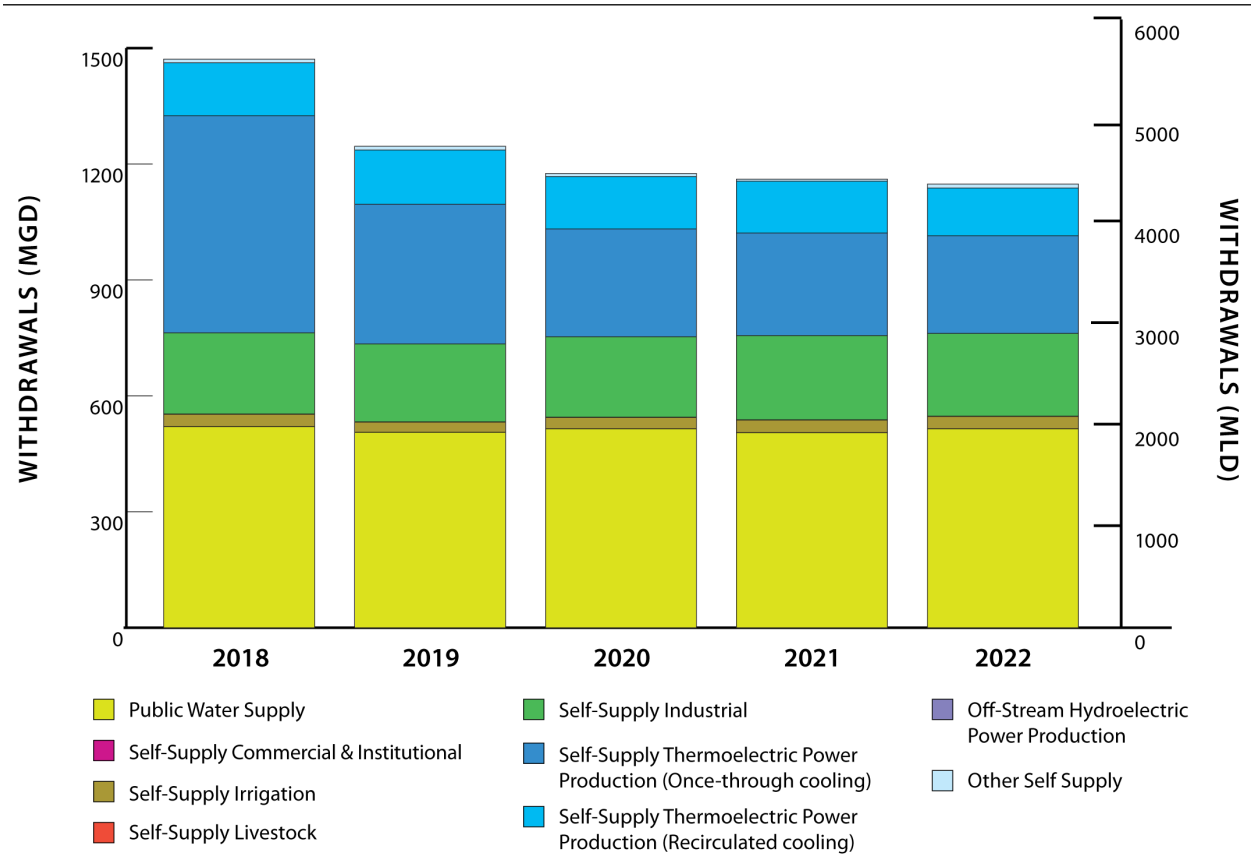

Figure 24. Ohio water withdrawals by sector over the past five years

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

The net total diversion for Ohio was 25 mgd (94 mld) into the Lake Erie watershed.[20] Diversions out of the Lake Erie watershed totaled 11 mgd (43 mld)—all for public water supply purposes—and were offset by 36 mgd (137 mld) of incoming diversions—primarily associated with the other self-supply sector (26 mgd or 98 mld)—and diversion returns. An additional small incoming diversion was reported for the self-supply livestock (0.2 mgd or 0.7 mld) sector. Total consumptive use was 128 mgd (486 mld), with 60 percent attributed to public water supply.

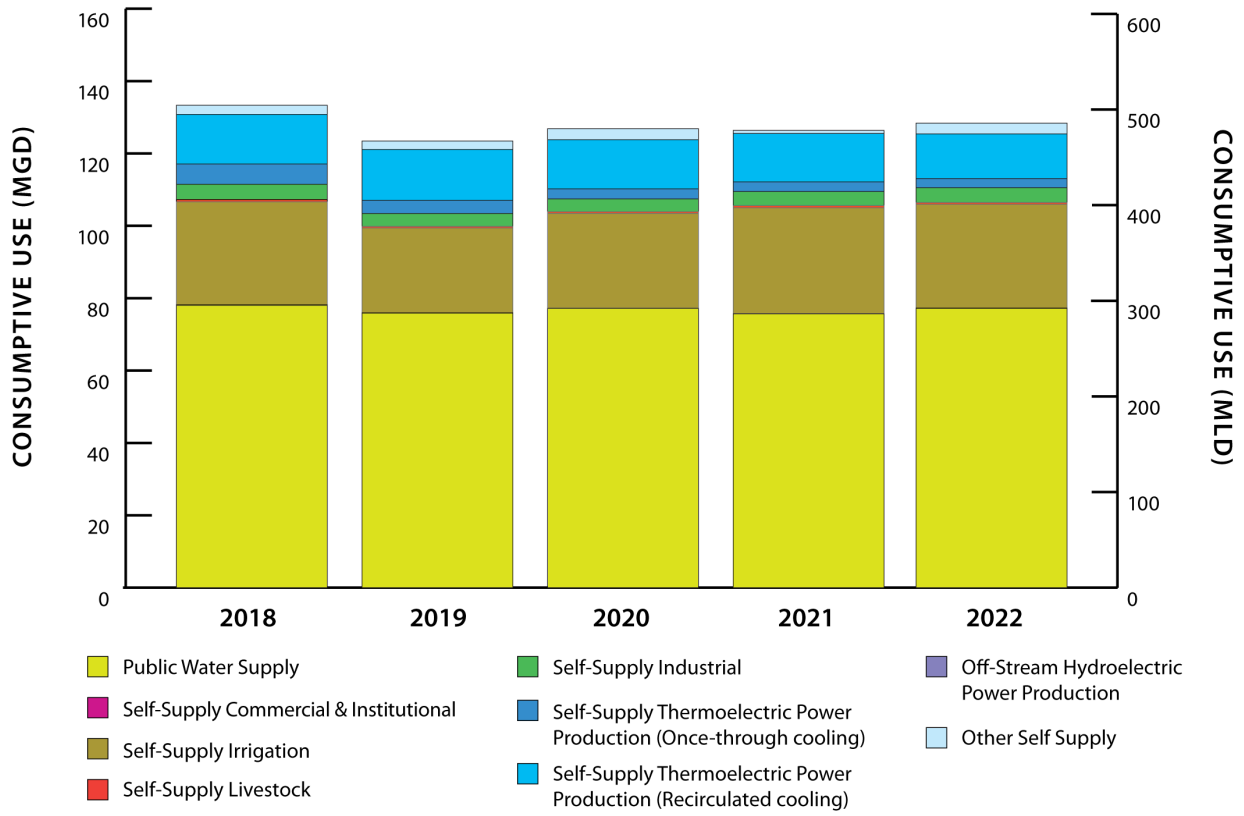

Figure 25. Ohio consumptive use by sector over the past five years

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.

Year-to-year changes from 2021 water use by Ohio facilities include:

- A 99 percent (5 mgd or 19 mld) increase in withdrawals and 259 percent (2 mgd or 8 mld) increase in consumptive use for the other self-supply sector, largely due to the addition of threshold facilities and an updated methodology for estimating consumptive uses in this sector.
- A 5 percent (13 mgd or 48 mld) decrease in the self-supply thermoelectric power production (once-through cooling) sector. While this change is relatively insignificant, it is part of a mostly

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

steady decline of water use in this sector dating back at least to 2012 when withdrawals totaled 1,434 mgd (5,429 mld).

- A 17 percent (13 mgd or 48 mld) decrease in Lake Erie surface water withdrawals and 11 percent (11 mgd or 43 mld) increase in other surface water withdrawals for the self-supply industrial sector. Although these changes are interesting to highlight, it is worth noting that, overall, the self-supply industrial sector changed negligibly from 2021.

Table 16a. Ohio 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	383	101	31	515	0	1	77
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	1	28	3	32	0	0	29
Self-Supply Livestock	0	0	0	1	0	0	0
Self-Supply Industrial	61	110	43	214	0	0	4
Self-Supply Thermoelectric Power Production (Once-through cooling)	77	176	0	253	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	123	0	0	123	0	0	12
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	7	2	10	0	-26	3
Total	647	422	79	1,148	0	-25	128

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,451	382	116	1,949	0	5	292
Self-Supply Commercial and Institutional	1	0	0	1	0	0	0
Self-Supply Irrigation	2	107	12	121	0	0	109
Self-Supply Livestock	0	1	1	2	0	-1	2
Self-Supply Industrial	232	417	161	811	0	0	16
Self-Supply Thermoelectric Power Production (Once-through cooling)	291	665	0	956	0	0	10
Self-Supply Thermoelectric Power Production (Recirculated cooling)	467	0	0	467	0	0	47
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	3	27	9	39	0	-98	11
Total	2,448	1,599	300	4,346	0	-94	486

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.

When the 2021 Annual Report was published, 2021 water use data was not available for the Province of Ontario; therefore, 2020 water use data was re-reported. Ontario's 2021 and 2022 water use data have now been added to the database; the 2022 Annual Report incorporates 2022 water use data and includes updated 2021 data in all relevant figures and analyses.

In 2022, excluding in-stream hydroelectric water use (254,836 mgd or 964,658 mld), reported water withdrawals from the basin for Ontario totaled 18,717 mgd or 70,853 mld, representing a 7 percent decrease from its 2021 withdrawals (20,034 mgd or 75,838 mld). Water used for self-supply thermoelectric power production (once-through cooling) accounted for 87 percent of this total withdrawal amount at 16,212 mgd (61,370 mld). The next largest withdrawals were for the self-supply industrial sector at 1,319 mgd (4,994 mld) and public water supply at 1,104 mgd (4,179 mld).

Water withdrawals from the Lake Huron (10,859 mgd or 41,105 mld) and Lake Ontario (6,749 mgd or 25,548 mld) watersheds collectively accounted for about 94 percent of Ontario's total withdrawal amount. Great Lakes surface water was the primary source for withdrawals in the Lake Huron and Lake Ontario watersheds, while other surface water was the primary source for withdrawals in the Lake Erie, St. Lawrence River, and Lake Superior watersheds.

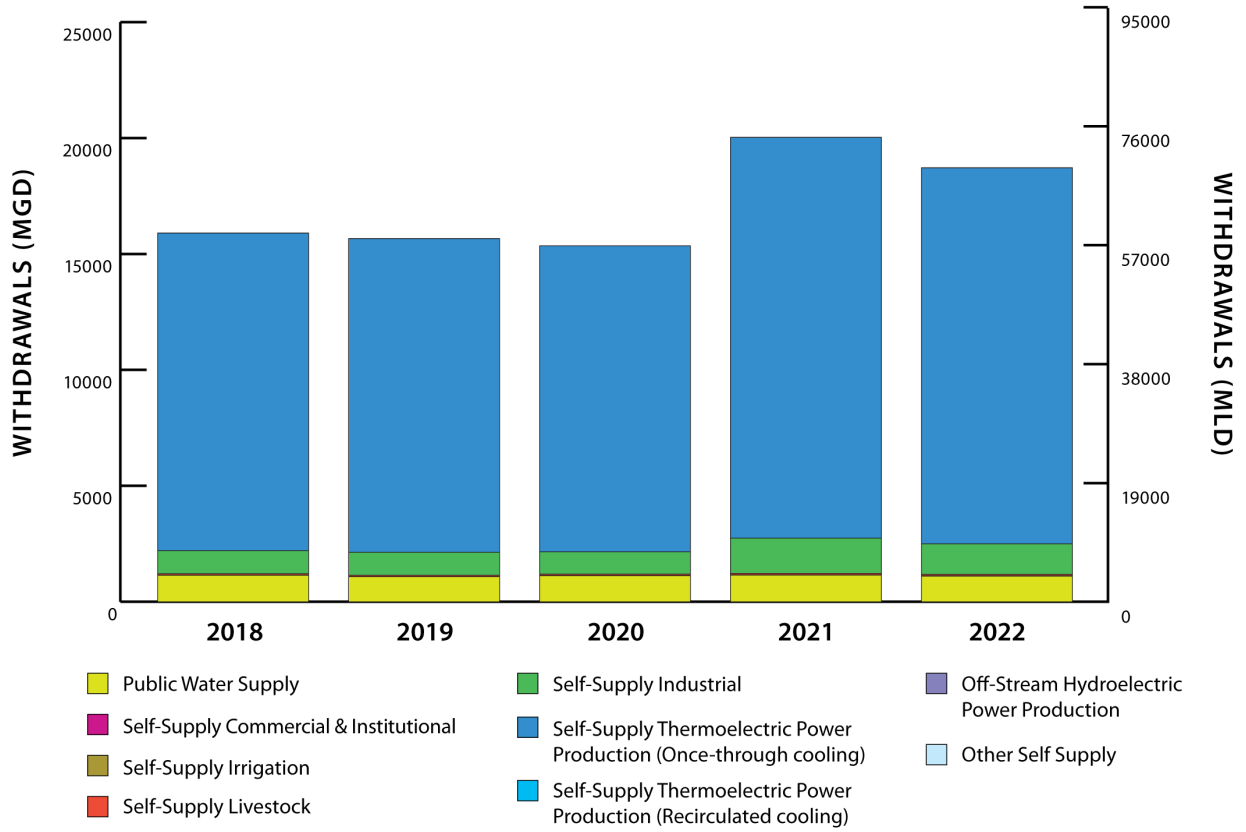

Figure 26. Ontario water withdrawals by sector over the past five years

No diversions out of the Great Lakes-St. Lawrence River basin were reported for Ontario, while 3,831 mgd (14,501 mld) of water were diverted into the Lake Superior basin,[21] associated with the Long Lac and Ogoki diversions. This represents an increase of 20% from Long Lac and Ogoki diversions in 2021 (3,182 mgd or 12,046 mld). 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 (meaning no water is lost from the Great Lakes basin). 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 in 2022 was 404 mgd (1,528 mld). The three water use sectors with the largest consumptive uses were self-supply thermoelectric power production (once-through cooling) at 146 mgd (552 mld), public water supply at 132 mgd (502 mld) and self-supply industrial at 117 mgd (442 mld). Consumptive use associated with intrabasin diversions for public water supply accounted for just over 1 percent of the total consumptive use at 6 mgd (21 mld).

[21] Incoming diversions are reported as negative values in the database and on tables.

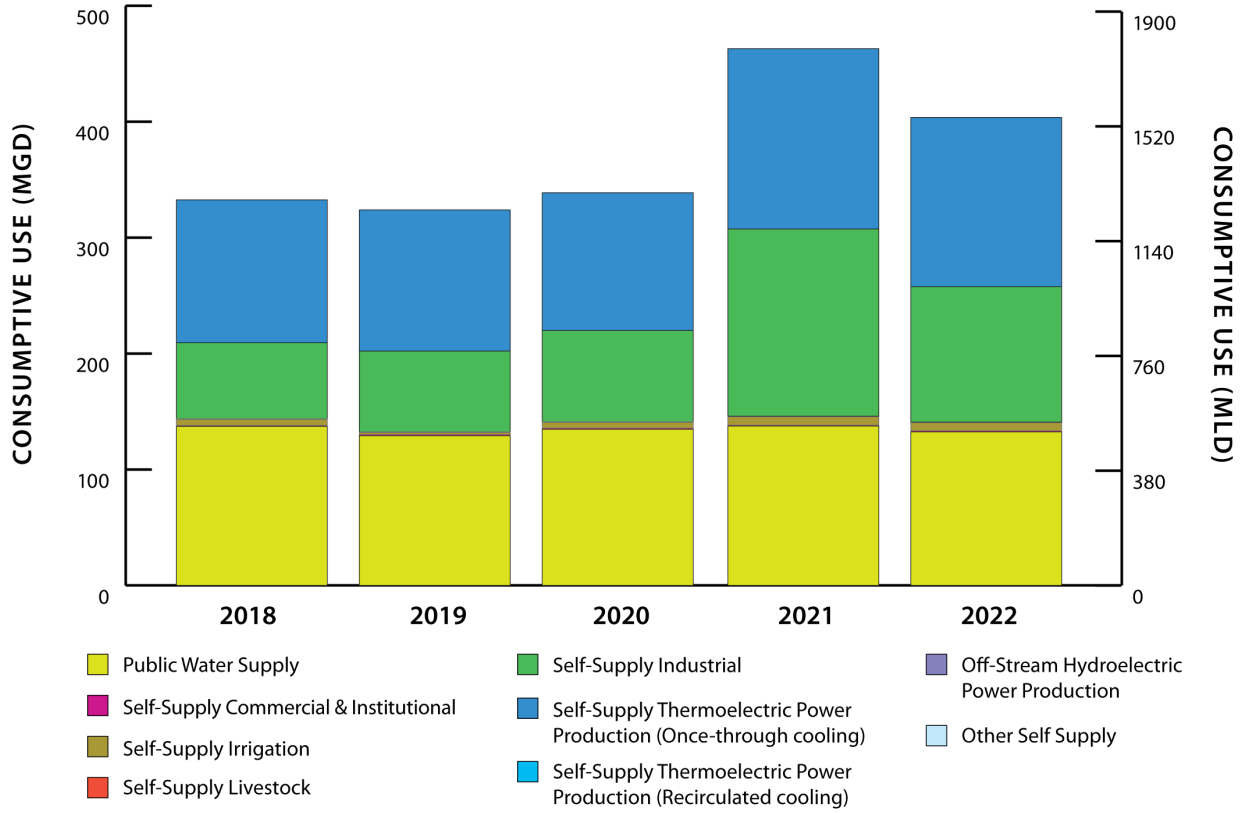

Figure 27. Ontario consumptive use by sector over the past five years

The water use data were provided by the Ontario Ministry of Natural Resources and Forestry and the Ontario Ministry of the Environment, Conservation and Parks and were collected primarily through the provincial water taking and reporting system. Reporting compliance varied among water use sectors from 83-100 percent.

Year-to-year changes from 2021 water use by Ontario facilities include:

- A 56 percent (138 mgd or 524 mld) increase in withdrawals from the St. Lawrence River watershed and a 39 percent (182 mgd or 687 mld) increase in withdrawals from the Lake Erie watershed.
- A 13 percent (203 mgd or 769 mld) decrease in water withdrawals for the self-supply industrial sector, primarily due to facilities in this sector dropping below the threshold level. It is worth noting that withdrawals in this sector held steady below 1,000 mgd (3,785 mld) from 2017 through 2020 before increasing to 1,522 mgd (5,763 mld) in 2021.
- A 13 percent (59 mgd or 225 mld) decrease in total consumptive use, dropping from 463 mgd (1,753 mld) to 404 mgd (1,528 mld).
- A 6 percent (1,071 mgd or 4,053 mld) decrease in withdrawals for the self-supply thermoelectric power production (once-through cooling) sector, primarily due to large decreased takings from registered facilities. However, while withdrawals from Great Lakes-St. Lawrence River surface water *decreased* by 27 percent in this sector, withdrawals from other surface water *increased* by 146 percent.

Table 17a. Ontario 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	706	295	103	1,104	0	0	132
Self-Supply Commercial and Institutional	1	5	1	7	0	0	1
Self-Supply Irrigation	1	4	3	8	0	0	7
Self-Supply Livestock	0	36	24	60	0	0	0
Self-Supply Industrial	305	825	189	1,319	0	0	117
Self-Supply Thermoelectric Power Production (Once-through cooling)	11,121	5,091	0	16,212	0	0	146
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	-3,831	0
Other Self Supply	0	3	3	6	0	0	0
Total	149,110	124,120	324	273,553	0	-3,831	404

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.

**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 Watershed Summaries section above.*

Table 17b. Ontario 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,674	1,115	390	4,179	0	0	502
Self-Supply Commercial and Institutional	2	20	5	27	0	0	3
Self-Supply Irrigation	3	17	12	32	0	0	27
Self-Supply Livestock	0	137	91	228	0	0	2
Self-Supply Industrial	1,155	3,122	717	4,994	0	0	442
Self-Supply Thermoelectric Power Production (Once-through cooling)	42,098	19,272	0	61,370	0	0	552
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	-14,501	0
Other Self Supply	0	12	11	24	0	0	0
Total	564,441	469,845	1,225	1,035,511	0	-14,501	1,528

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.

**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 Watershed Summaries section 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.[22] 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.[23]

In 2022, reported water withdrawals from the basin for Pennsylvania totaled 30 mgd (113 mld), representing a 4 percent increase from its 2021 withdrawals of 29 mgd (109 mld). Water withdrawals for public water supply (27 mgd or 101 mld) accounted for 89 percent of the total withdrawal amount.

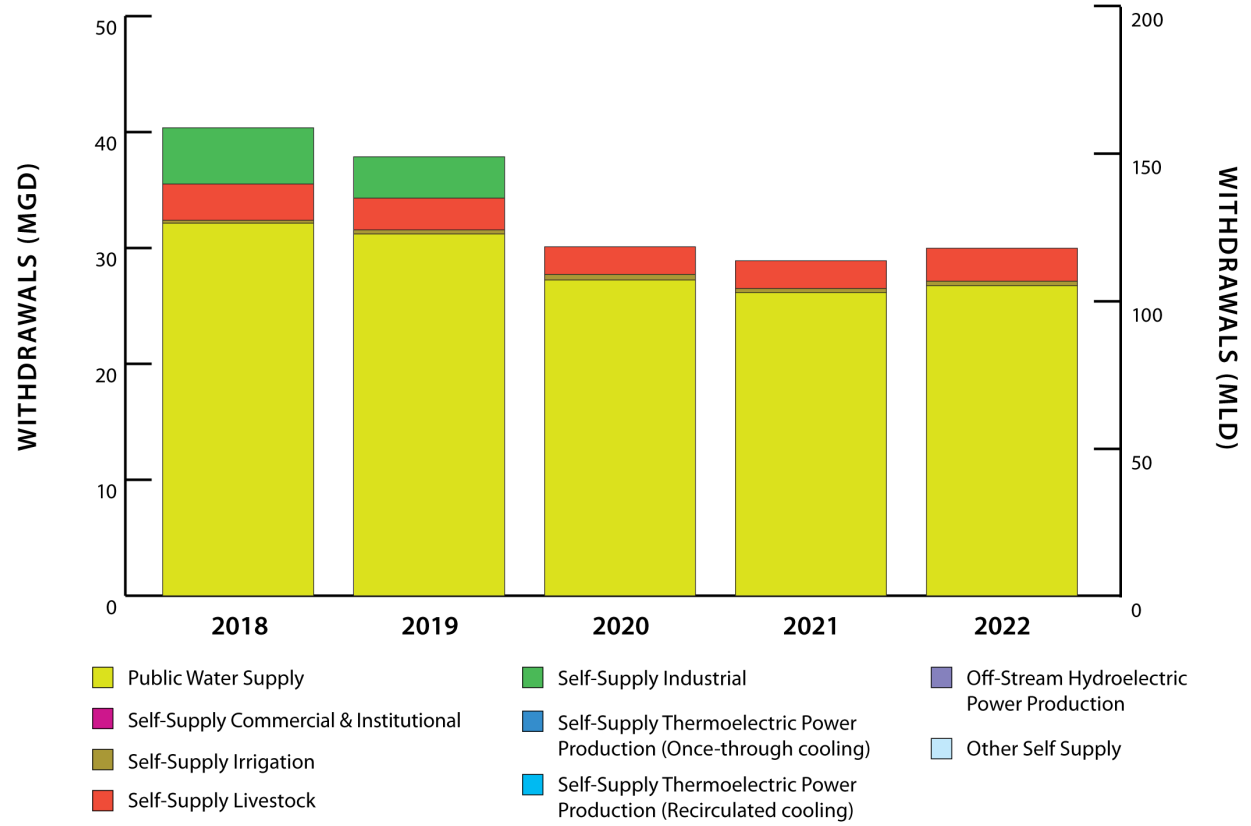

Figure 28. Pennsylvania water withdrawals by sector over the past five years

[22] Pennsylvania Department of Environmental Protection, Coastal Resources Management Program.
[23] Pennsylvania Department of Environmental Protection, Pennsylvania's Watershed Regions: Great Lakes.

No diversions were reported in 2022. The total consumptive use was 3.2 mgd (12 mld). The public water supply sector made up the majority (85 percent) of the total consumptive use.

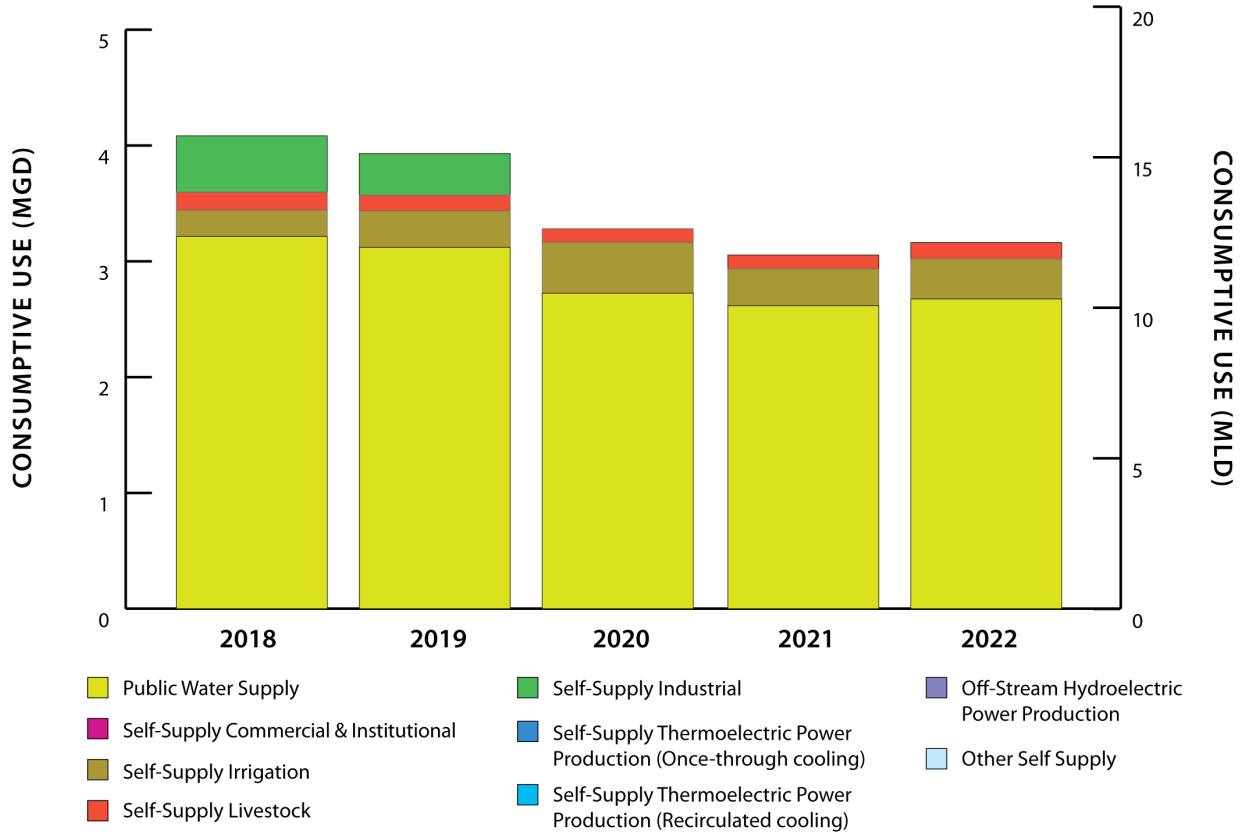

Figure 29. Pennsylvania consumptive use by sector over the past five years

The water use data were provided by the Pennsylvania Department of Environmental Protection, 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.

Year-to-year changes from 2021 water use by Pennsylvania facilities include:

- A 20 percent (0.5 mgd or 1.8 mld) increase in the self-supply livestock sector associated with normal fluctuations in use; while withdrawals from other surface water *increased* by 62 percent in this sector, groundwater withdrawals *decreased* by 26 percent.
- A 49 percent (0.8 mgd or 2.9 mld) increase in the amount of water withdrawn from other surface water, largely due to an increase in other surface water used for the self-supply livestock sector.

Table 18a. Pennsylvania 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	25	0	2	27	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	2	1	3	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	30	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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	95	0	6	101	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	8	3	11	0	0	1
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	95	9	10	113	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 basin. 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 of the tributaries with the greatest flow within that portion are the Outaouais (Ottawa) River, the Richelieu River and the St. François River.

In 2022, reported water withdrawals from the basin for Québec totaled 1,183 mgd (4,477 mld), representing a 2 percent decrease from its 2021 withdrawals of 1,202 mgd (4,550 mld). Public water supply made up 71 percent of total withdrawals at 842 mgd (3,186 mld), while the self-supply industrial sector made up 25 percent of the total at 294 mgd (1,114 mld).

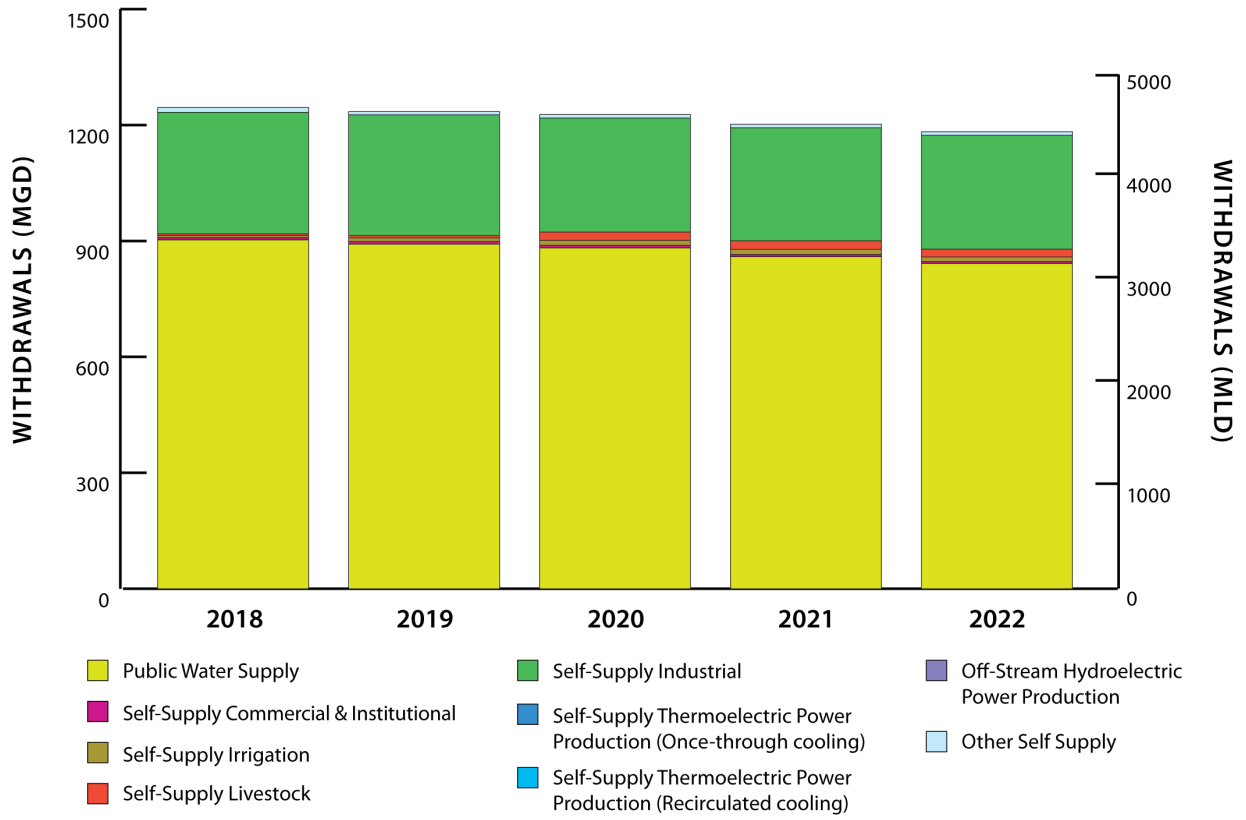

Figure 30. Québec water withdrawals by sector over the past five years

The total diversion amount was 2.7 mgd (10 mld) from the St. Lawrence River for public supply purposes. The total consumptive use was 170 mgd (644 mld), comprising 14 percent of the total withdrawal amount. The primary water use sectors contributing to the total consumptive use were public supply at 126 mgd (478 mld) and self-supply industrial at 27 mgd (103 mld).

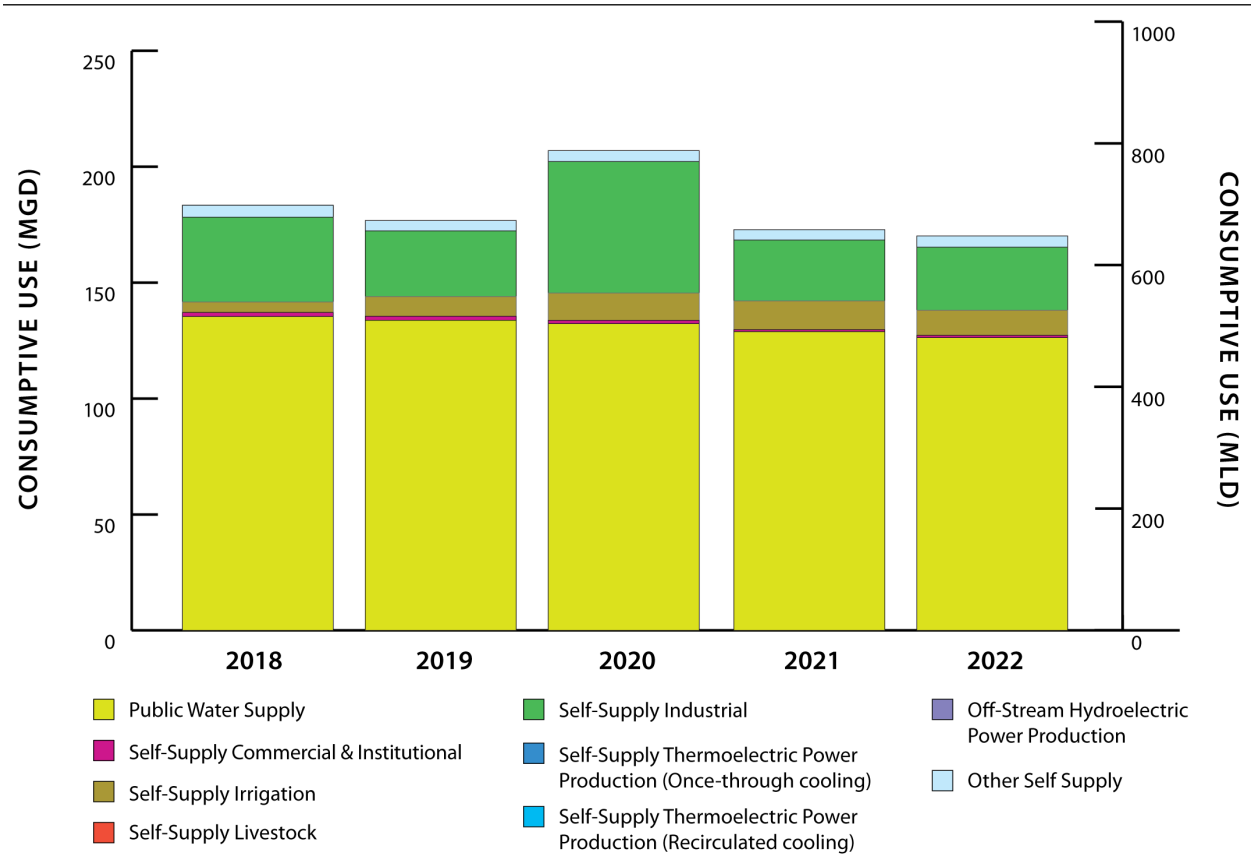

Figure 31. Québec consumptive use by sector over the past five years

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. Québec data quality and compliance rates are a continual focus for improvement. Compliance rates varied among water use sectors from 64 percent for self-supply livestock to 96 percent for public water supply.

Year-to-year changes from 2021 water use by Québec facilities include:

- A 13 percent (1.8 mgd or 6.7 mld) decrease in water withdrawals for the self-supply irrigation sector because of the large year-to-year variation in this sector.
- A 2 percent (17 mgd or 66 mld) decrease in withdrawals for public water supply, mainly due to normal fluctuations in this sector.
- A 1.4 percent (10 mgd or 39 mld) decrease in withdrawals from St. Lawrence River surface water. While this change is relatively minor, such withdrawals have decreased by 7 percent since 2018, declining steadily each year.

Table 19a. Québec 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	597	202	42	842	0	3	126
Self-Supply Commercial and Institutional	0	4	0	5	0	0	1
Self-Supply Irrigation	1	10	1	12	0	0	11
Self-Supply Livestock	0	16	5	21	0	0	0
Self-Supply Industrial	131	146	17	294	0	0	27
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	6	3	1	9	0	0	5
Total	735	381	66	1,183	0	3	170

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,261	766	159	3,186	0	10	478
Self-Supply Commercial and Institutional	2	16	0	18	0	0	4
Self-Supply Irrigation	3	37	5	45	0	0	41
Self-Supply Livestock	0	59	18	78	0	0	0
Self-Supply Industrial	497	552	65	1,114	0	0	103
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	12	3	36	0	0	18
Total	2,783	1,443	250	4,477	0	10	644

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 resides. Over 1.6 million Wisconsin residents get their drinking water from Lake Michigan or Lake Superior.[24]

In 2022, reported water withdrawals from the basin for Wisconsin totaled 3,816 mgd (14,447 mld), representing less than a 1 percent increase from its 2021 withdrawals (3,784 mgd or 14,322 mld). The Lake Michigan watershed comprised 99 percent of total withdrawals, mostly 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.

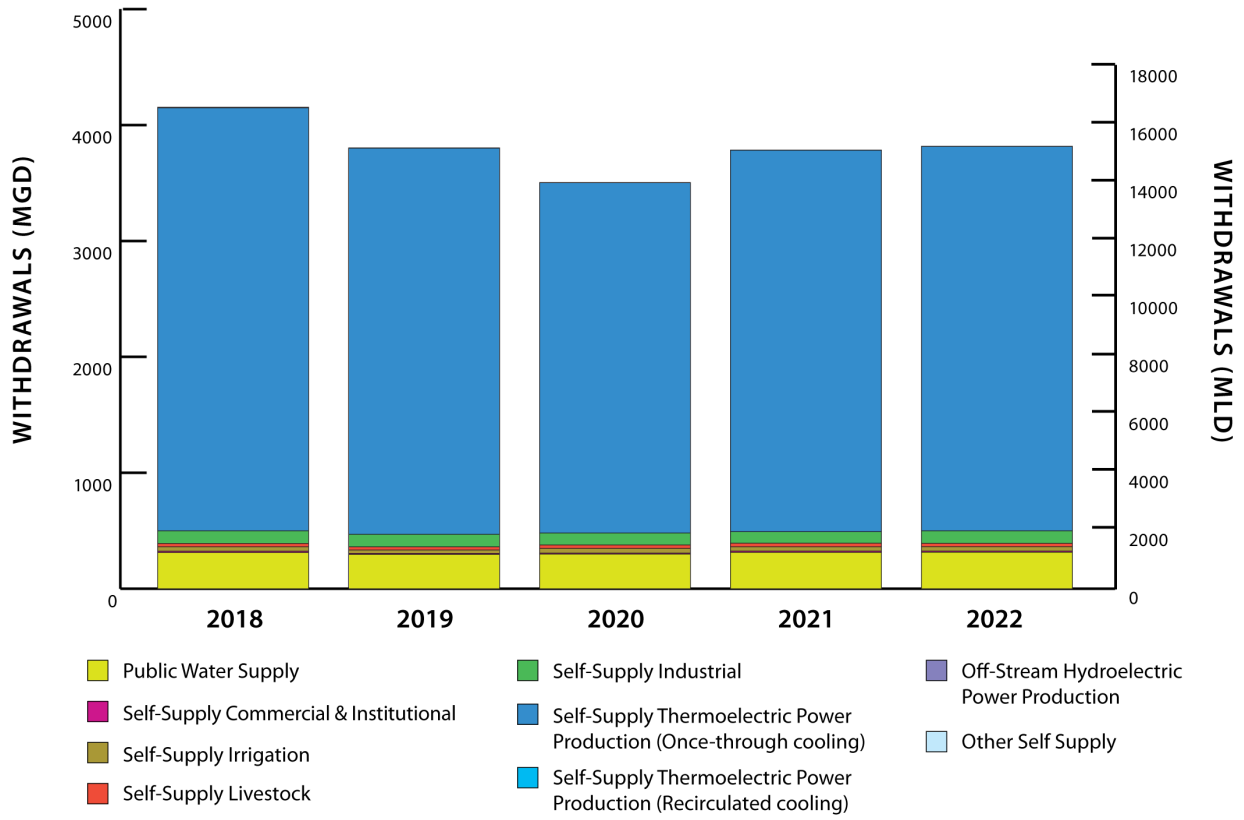

Figure 32. Wisconsin water withdrawals by sector over the past five years

The reported net diversion was less than 1 mgd (3.7 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. Of the total diversion amount, 6 mgd (23 mld) were returned to the Lake Michigan basin.

[24] Wisconsin Department of Natural Resources, A Decade of Wisconsin Water Withdrawals story map.

The total consumptive use was 120 mgd (454 mld), primarily from the public water supply, self-supply thermoelectric power production (once-through cooling) and self-supply irrigation sectors.

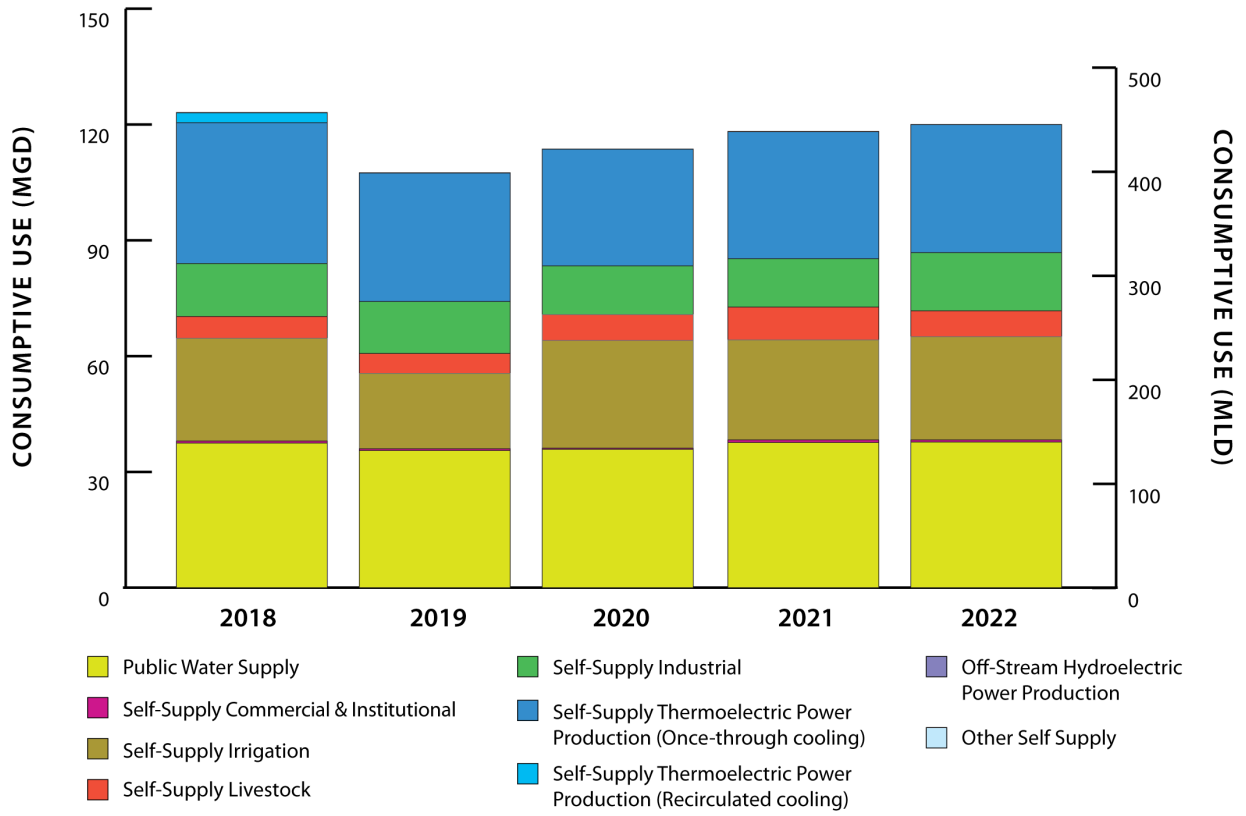

Figure 33. Wisconsin consumptive use by sector over the past five years

The water use data were provided by the Wisconsin Department of Natural Resources. Reporting compliance varied among water use sectors from 95-100 percent. Data were not estimated for the facilities that did not report water use.

Year-to-year changes from 2021 water use by Wisconsin facilities include:

- In 2022, the Village of Somers diversion began, diverting 0.018 mgd from the Lake Michigan basin.
- 2022 saw a return to typical annual precipitation amounts after a period of unusually high precipitation from 2013-2020. Total withdrawals from 2022 represent a decrease of just over 4 percent from the average water withdrawals from this period.

Table 20a. Wisconsin 2022 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	247	21	46	314	0	1	38
Self-Supply Commercial and Institutional	2	7	1	10	0	0	1
Self-Supply Irrigation	0	2	36	38	0	0	27
Self-Supply Livestock	0	13	15	28	0	0	7
Self-Supply Industrial	2	94	13	108	0	0	15
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,173	143	0	3,316	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	3,424	280	113	3,816	0	1	120

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 2022 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	937	79	175	1,190	0	4	143
Self-Supply Commercial and Institutional	7	26	5	39	0	0	2
Self-Supply Irrigation	0	8	136	145	0	0	101
Self-Supply Livestock	0	49	58	107	0	0	25
Self-Supply Industrial	6	354	48	408	0	0	57
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,011	541	0	12,552	0	0	126
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	12,961	1,059	427	14,447	0	4	454

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 water used for mining. Mining water use is that used in the extraction or washing of minerals, including 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. This category also includes water used at Combined Cycle Gas Turbine (CCGT) power plants. 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, this category includes water used for maintaining water levels for navigation, fish and wildlife habitat creation and enhancement (excluding fish hatchery operations included in the self-supply livestock sector), flow augmentation (or diversion), 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.