



# Annual Report of the Great Lakes Regional Water Use Database

Representing 2019 Water Use Data

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



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## Preface

This is the Annual Report of the Great Lakes-St. Lawrence River Regional Water Use Database, representing 2019 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 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 (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 provided maintenance and operation of the database since that time.

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

While the updated data protocols are an important step in support of a more robust regional water management regime, it is recognized that improvements in data collection, reporting, quality, accuracy, and compatibility must continue to occur. The following section describes the progress made in 2020 to improve data quality and describes the quality of data for the 2019 annual report.

## Overview

### Improving Data Quality

Together with the GSGP, the GLC is working with the states and provinces to improve data collection, reporting, quality, accuracy, and compatibility. To guide the preparation of 2019 data and this report, several steps have been made 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, compliance rates by water use sector, the year for which the data is collected, significant changes in the data between the current year and previous years, and reasons for those changes. To achieve this, the GLC created an online data management system that assists in the creation of metadata. For this report, the states and provinces submitted metadata along with associated 2019 water use data to the GLC. Project staff met by phone with representatives from each jurisdiction to discuss changes in compliance and reported water use. Implementing this process has resulted in improvements to the database in both compliance and data quality.

In 2020, GLC staff also convened water use managers to review previously identified discrepancies in diversion reporting methodology, which stemmed from differing uses of positive and negative signs in reporting diversion data. In accordance with the protocol modifications adopted via Compact Council and Regional Body Resolutions in 2016, all outgoing diversions are reported as positive numbers, while water entering the basin (via an incoming transfer or diversion return) is reported as a negative number. Historical data that did not align with the protocols was revised in the database. Additionally, the database was updated to auto-calculate the net diversion value.

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

In compiling this report, the report authors noted specific steps taken by each jurisdiction to improve reporting compliance and data quality. The states and provinces have reporting programs in place that require users to report their water use each year to their jurisdiction. The reporting compliance, (i.e., the percentage of users submitting the required reports to the jurisdiction), varies across the Basin by jurisdiction and sector, affecting the quality of the data. Table 1 summarizes reporting compliance rates by jurisdiction.

Illinois, Minnesota, and Ohio reported 100 percent compliance in data reporting. Ohio's high rate of compliance is supported by cooperation from their Office of the Attorney General, which communicates directly with registered water withdrawal facilities. Similarly, Illinois's and Minnesota's compliance programs successfully emphasize permit holders' obligations to report their water withdrawals.

Several jurisdictions reported compliance challenges associated with the COVID-19 pandemic. Although compliance rates decreased in some jurisdictions, it was not anticipated to result in consequential changes in overall reported water use or water balance. Québec is still developing its reporting program and working to improve compliance among users. Compliance rates in Québec for all water use sectors either increased or stayed the same from 2018.

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

Sector	IL	IN	MI	MN	NY	OH	ON	PA	QC	WI
Public Water Supply	100	97	99	100	94	100	96	97	78	100
Self-Supply Commercial & Institutional	100	79	85	100	85	100	86	100	58	95
Self-Supply Irrigation	100	86	70	100	75	100	84	94	41	97
Self-Supply Livestock	-	90	70	100	92	100	76	90	16	95
Self-Supply Industrial	100	92	85	100	94	100	78	88	72	97
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	100	95	100	100	100	95	100	-	100
Self-Supply Thermoelectric Power Production (Recirculated cooling)	-	100	95	100	92	100	-	-	-	100
Off-Stream Hydroelectric Power Production	-	-	-	100	100	-	-	-	-	-
In-Stream Hydroelectric Water Use	-	-	-	100	100	-	94	-	-	-
Other Self-Supply	100	81	85	100	100	100	95	-	60	97

*\*A blank indicates that the jurisdiction did not report any water use figures for that particular sector.*

Beyond compliance, the number of reported users can also vary from year to year due to changes in status as a threshold facility. Only water use from facilities that withdraw more than 100,000 gallons per day (or 380,00 liters/day) averaged over a 30-day period are included in reporting, per the Compact and Agreement. Some facilities that tend to withdraw water in volumes close to the trigger level may therefore change from being a threshold facility from one year to the next, based on weather conditions, business operations, or other factors. Water use sectors that see more interannual variability in use, like self-supply irrigation, may have greater changes in the number of threshold facilities than other use sectors.

## Great Lakes Regional Water Use for 2019

The Great Lakes-St. Lawrence River Basin – the world’s largest freshwater system – spans an area of 289,600 square miles (750,000 square kilometers). Its total volume is 6.5 quadrillion gallons (25 quadrillion liters), an amount that would fill nine billion Olympic size swimming pools.<sup>1</sup>

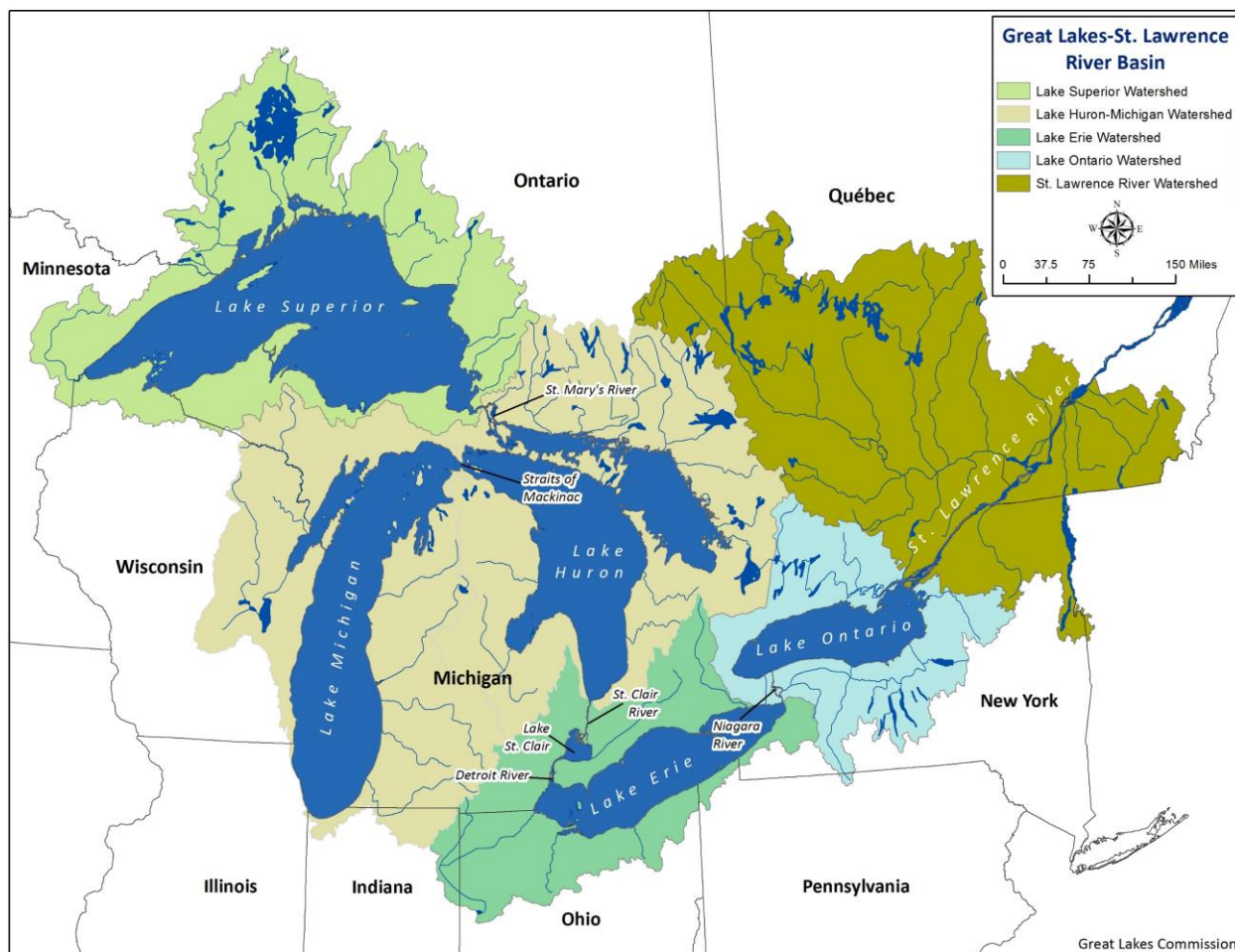


Figure 1. Great Lakes-St. Lawrence River basin

### Water Withdrawals

In 2019, the total reported withdrawal amount for the Great Lakes-St. Lawrence River basin, excluding in-stream hydroelectric water use, was 38,854 million gallons per day (mgd) or 147,078 million liters per day (mld). In-stream hydroelectric power water use accounted for 93 percent of the water use in the region, but is not considered a withdrawal in the traditional sense because it includes “run of the river” use, where the water remains in the water body and has negligible water consumption. Therefore, despite being an important water use for the Great Lakes-St. Lawrence River region (e.g., New York produced more hydroelectric power than any other state east of the Rocky Mountains in 2018<sup>2</sup>), in-stream hydroelectric power use is typically excluded from discussion of water use trends and impacts.

<sup>1</sup> An Olympic size swimming pool holds at least 2.5 million liters.

<sup>2</sup> U.S. Energy Information Administration. 2019. <http://www.eia.gov/state/?sid=NY>

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

The 2019 water withdrawal total represents a decrease of approximately 4 percent from the 2018 reported total withdrawal amount of 40,393 mgd (152,905 mld). It is normal to see some fluctuation in water use from year to year, but some sectors, like self-supply irrigation, may exhibit greater variability due to the influence of weather patterns that increase or decrease seasonal use. It should be noted withdrawals are not a measure of water consumed or lost to the Basin, as much of the withdrawn water is returned to the Basin after use. Less than five percent of the total reported amount withdrawn (1,892 mgd or 7,161 mld) was consumed or otherwise lost to 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. Thermoelectric power production, public water supply, and self-supply industrial use are the primary water use sectors, (i.e., those withdrawing the largest volumes of water).

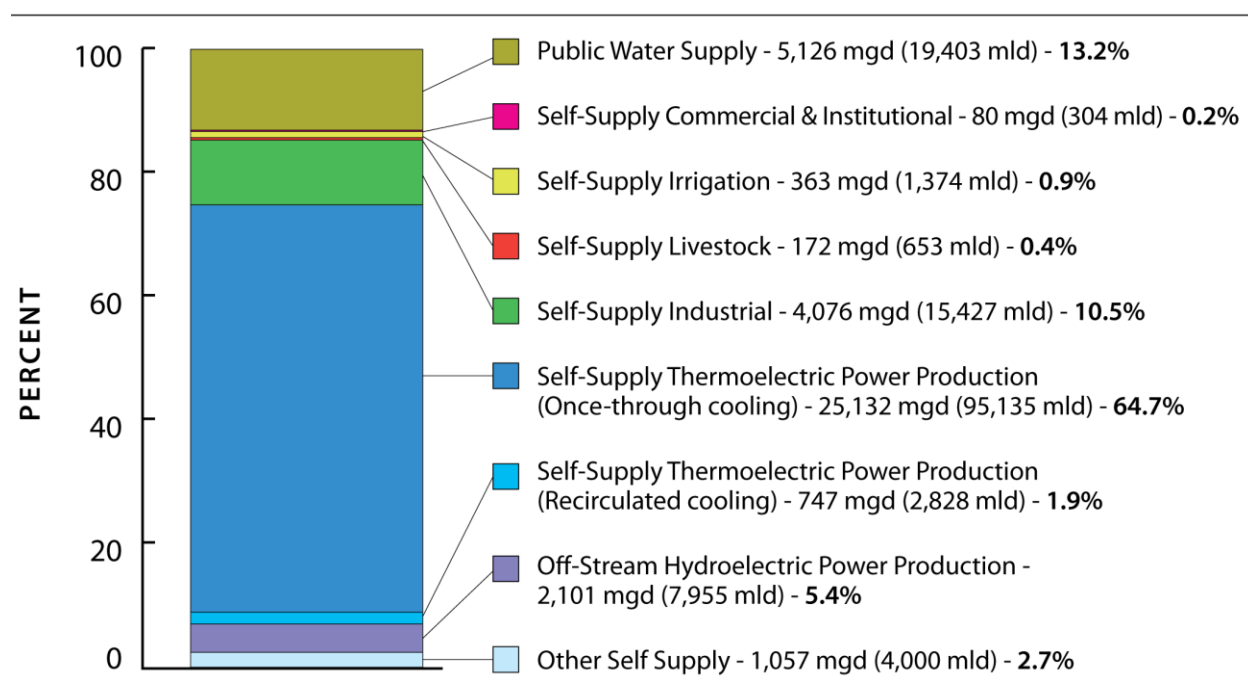


Figure 2. Water withdrawals by water use sector (excluding in-stream hydroelectric water use)

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

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

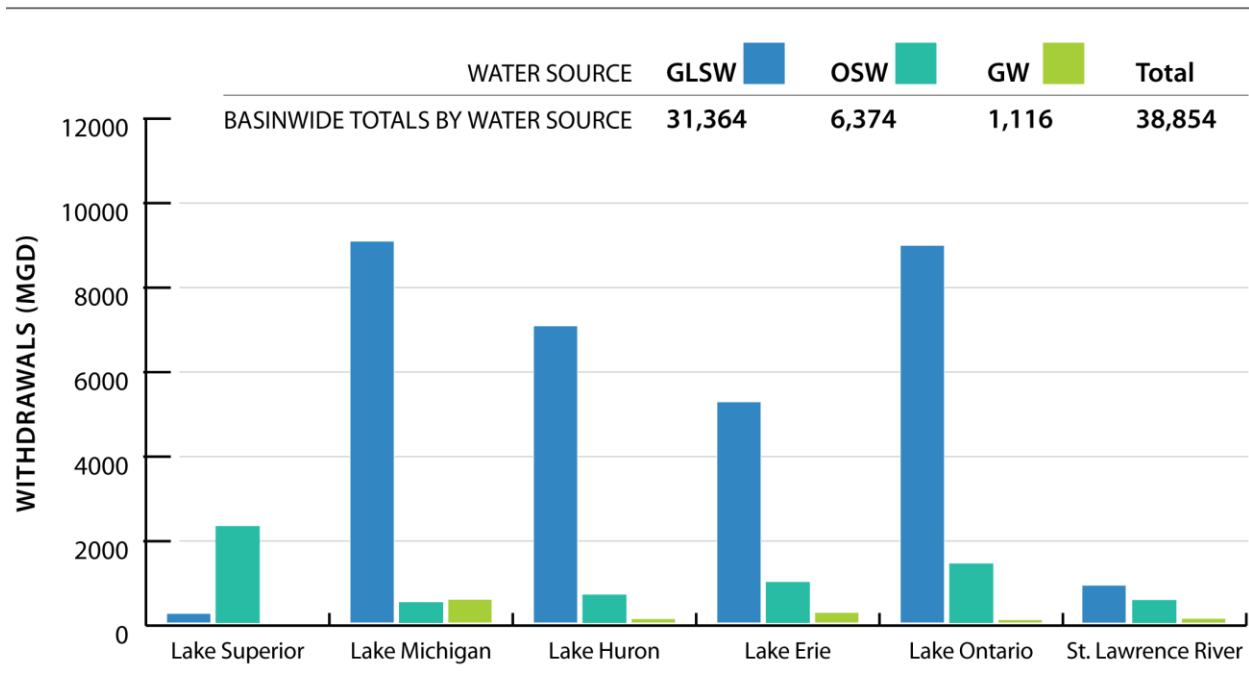


Figure 3. Water withdrawals by watershed in mgd (excludes in-stream hydroelectric water use)

Figure 4 shows total withdrawals, excluding in-stream hydroelectric water use, by jurisdiction. Ontario, which has the largest land area of the 10 jurisdictions (108,680 square miles or 281,377 square kilometers in the basin over five watersheds), was the largest withdrawer of Great Lakes water. Facilities in Ontario withdrew 15,667 mgd (59,305 mld) or 40 percent of the total withdrawal amount across all jurisdictions. In contrast, Pennsylvania, which has the least land area (508 square miles or 1316 square kilometers), withdrew just 38 mgd (143 mld).



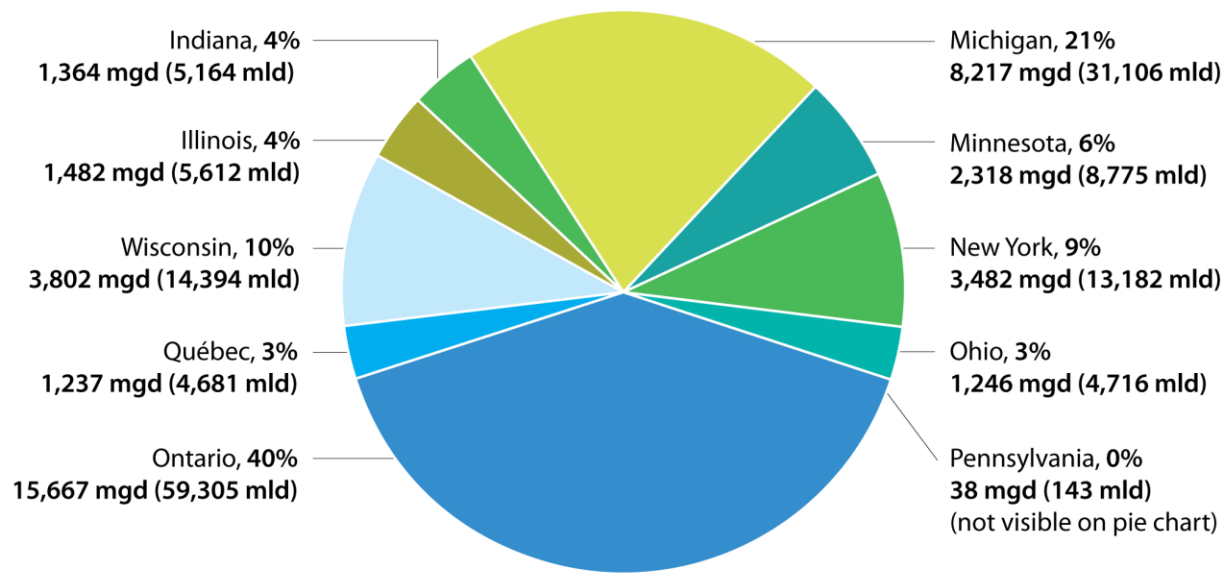


Figure 4. Water withdrawals by jurisdiction (excludes in-stream hydroelectric water use)

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

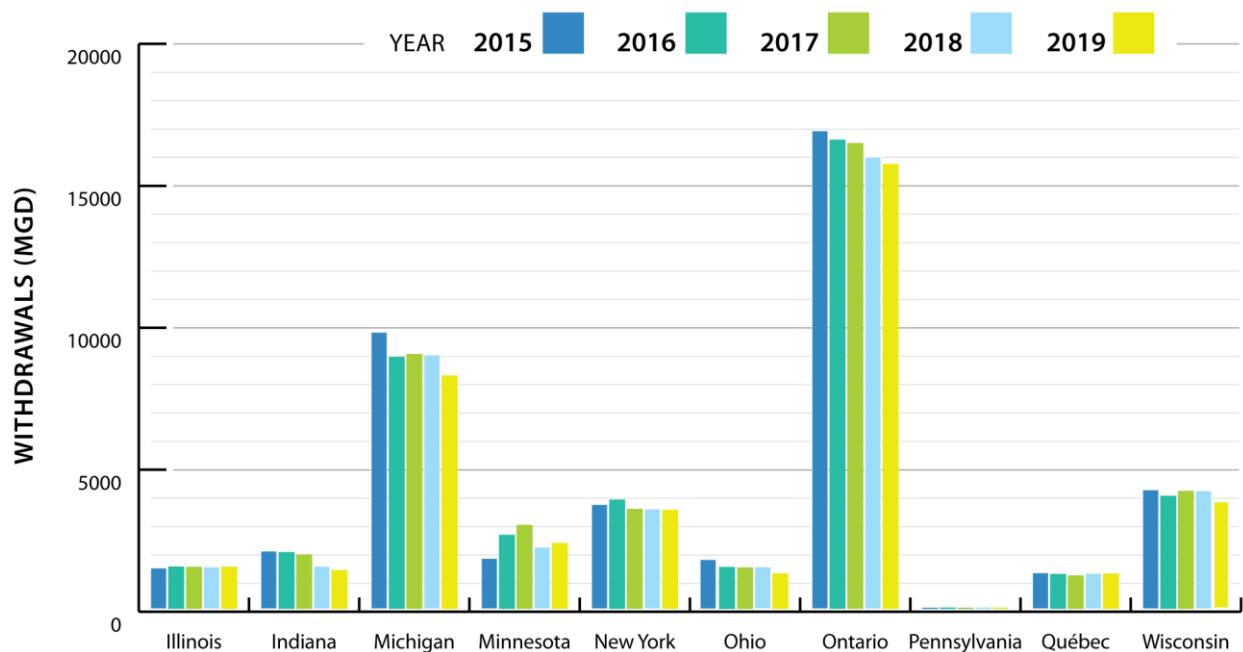


Figure 5. Water withdrawals by jurisdiction over the past five years (excludes in-stream hydroelectric water use)

## Diversions and Consumptive Uses

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

The total reported 2019 diversion out of the Great Lakes-St. Lawrence River Basin was 1,174 mgd or 4,444 mld. More than 85 percent (1,015 mgd, 3,841 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 increased by 5 percent compared to the 2018 reported amount of 963 mgd (3,646 mld). Smaller diversions throughout the region make up the balance of the total, and some of the diverted water is returned to the source watershed as return flow.

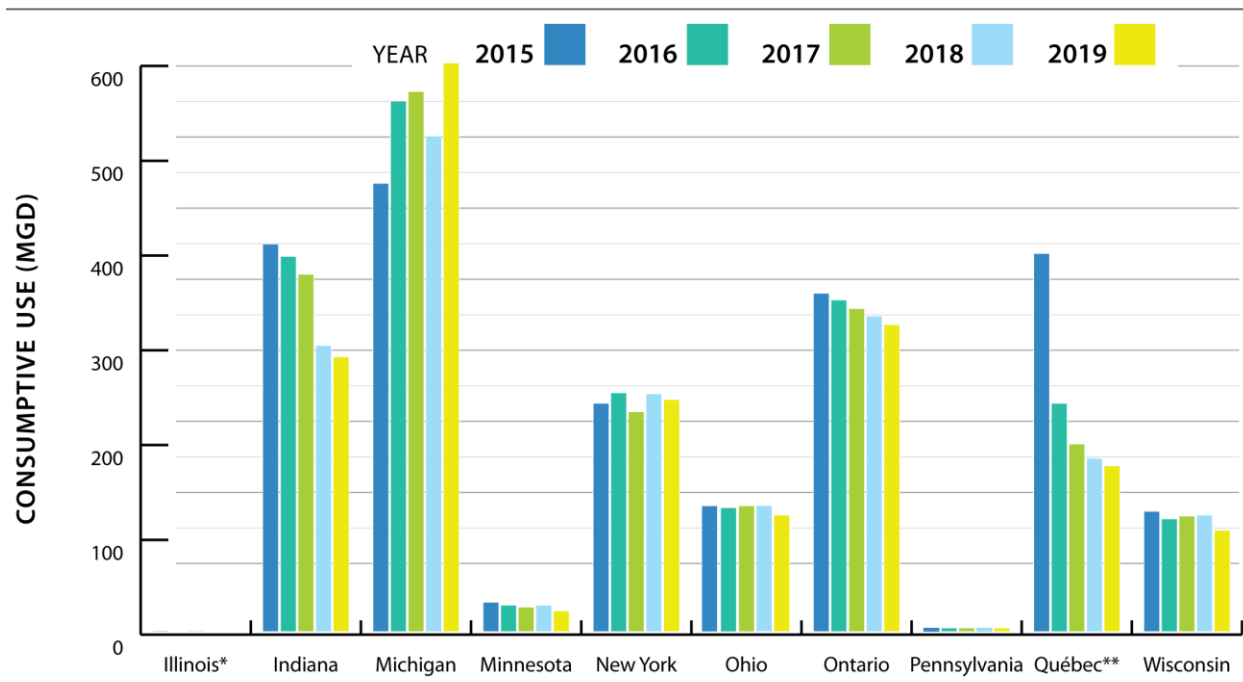
There are also diversions into the Basin<sup>4</sup>, including the Long Lac and Ogoki diversions (incoming diversions from the Hudson Bay watershed into northern Lake Superior), which contributed 3,473 mgd (13,147 mld) to the Basin in 2019. This is an increase from the 2018 reported amount of 3,119 mgd (11,808 mld). Despite this increase, the inflow from the Long Lac and Ogoki diversions is 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).<sup>5</sup> When conditions in the Long Lac and Nipigon (downstream of Ogoki) watersheds are wet, the diversions are often reduced, and water that otherwise would have been diverted into Lake Superior is instead directed through natural outlets that flow toward Hudson Bay. Conversely, when conditions are dry in the downstream watersheds, the diversion flow may be higher. Overall, the net diversion, or outgoing diversions plus incoming diversions and returns (reported as negative numbers), was a gain of 2,343 mgd (8,871 mld), meaning that more water was diverted into the Basin than was diverted out of the Basin.

Consumptive use is the 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. Consumptive use is most often calculated by applying a consumptive use coefficient to the reported withdrawal amount. The database documents the consumptive use coefficient used for each water withdrawal and the consumptive use that was determined through measurement. Figure 6 shows total consumptive use by jurisdiction over the past five years. Consumptive use in each jurisdiction follows a similar steady trend seen in overall water use. Québec's more variable trend in consumptive use reflects updates and improvements to reporting accuracy and consumptive coefficients. Because each water use sector has different consumptive use factors, changes in the makeup of each jurisdiction's water withdrawals can impact consumptive use.

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<sup>4</sup> The Great Lakes Regional Water Use Database records incoming diversions with a negative sign and outgoing diversions with a positive sign.

<sup>5</sup> Information on the flow variability of the Long Lac and Ogoki diversions was provided by Ontario Power Generation.



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

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

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

The total reported consumptive use for the Basin for 2019 was 1,892 mgd (7,161 mld) – a minor (less than one percent) drop from the 2018 total consumptive use amount of 1,880 mgd (7,115 mld). The public water supply and industrial sectors had the greatest consumptive use, accounting for over half of total consumptive use. At 752 mgd (2,846 mld), the Lake Michigan watershed had the largest consumptive use of watersheds.

Considering both consumptive use and diversions, the Basin gained a total of 452 mgd (1,710 mld) in 2019. By comparison, the Basin gained a total of 155 mgd (588 mld) in 2018. Tables 2a to 4b summarize water withdrawals, diversions, and consumptive uses by watershed, sector, and jurisdiction for 2019.

**Table 2a.** Basin 2019 Water Use Data Summary by Watershed in mgd

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	225	33,108	18	33,352	0	-3,460	39
Lake Michigan	9,038	489	559	10,086	0	1,089	752
Lake Huron	25,895	16,172	102	42,169	42	0	128
Lake Erie	59,677	1,584	250	61,511	4,187	-19	416
Lake Ontario	50,081	99,352	77	149,510	-4,228	42	352
St. Lawrence River	174,467	55,484	110	230,061	0	5	204
<b>Total</b>	<b>319,383</b>	<b>206,190</b>	<b>1,116</b>	<b>526,689</b>	<b>0</b>	<b>-2,343</b>	<b>1,892</b>

*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 2019 Water Use Data Summary by Watershed in mld

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	853	125,329	68	126,249	-1	-13,098	146
Lake Michigan	34,214	1,852	2,115	38,181	1	4,121	2,846
Lake Huron	98,022	61,217	388	159,627	157	0	486
Lake Erie	225,902	5,996	948	232,846	15,848	-72	1,576
Lake Ontario	189,576	376,088	292	565,955	-16,006	158	1,334
St. Lawrence River	660,430	210,031	416	870,877	0	19	773
<b>Total</b>	<b>1,208,998</b>	<b>780,512</b>	<b>4,225</b>	<b>1,993,735</b>	<b>0</b>	<b>-8,871</b>	<b>7,161</b>

*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 2019 Water Use Data Summary by Sector in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,915	754	457	5,126	0	859	568
Self-Supply Commercial and Institutional	7	64	9	80	0	2	13
Self-Supply Irrigation	2	107	254	363	0	0	320
Self-Supply Livestock	0	103	69	172	0	0	14
Self-Supply Industrial	2,472	1,296	307	4,076	0	37	515
Self-Supply Thermoelectric Power Production (Once-through cooling)	24,018	1,112	2	25,132	0	0	238
Self-Supply Thermoelectric Power Production (Recirculated cooling)	715	29	3	747	0	0	182
Off-Stream Hydroelectric Power Production	0	2,101	0	2,101	0	0	0
In-Stream Hydroelectric Water Use	288,019	199,816	0	487,835	0	-3,473	0
Other Self Supply	236	806	15	1,057	0	232	42
<b>Total</b>	<b>319,383</b>	<b>206,190</b>	<b>1,116</b>	<b>526,689</b>	<b>0</b>	<b>-2,343</b>	<b>1,892</b>

*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 2019 Water Use Data Summary by Sector in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	14,818	2,856	1,730	19,403	0	3,253	2,150
Self-Supply Commercial and Institutional	25	244	35	304	0	7	49
Self-Supply Irrigation	7	404	963	1,374	0	0	1,213
Self-Supply Livestock	0	391	262	653	0	-1	51
Self-Supply Industrial	9,359	4,906	1,163	15,427	0	139	1,948
Self-Supply Thermoelectric Power Production (Once-through cooling)	90,920	4,209	6	95,135	0	0	901
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,705	112	11	2,828	0	0	688
Off-Stream Hydroelectric Power Production	0	7,955	0	7,955	0	0	0
In-Stream Hydroelectric Water Use	1,090,271	756,386	0	1,846,657	0	-13,147	0
Other Self Supply	892	3,051	56	4,000	0	878	160
<b>Total</b>	<b>1,208,998</b>	<b>780,512</b>	<b>4,225</b>	<b>1,993,735</b>	<b>0</b>	<b>-8,871</b>	<b>7,161</b>

*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 2019 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	1,482	0	0	1,482	0	1,015	0
Indiana	1,201	73	91	1,364	0	80	290
Michigan	6,768	929	520	8,217	0	0	600
Minnesota	115	4,656	6	4,776	0	13	22
New York	153,147	82,250	37	235,434	0	44	245
Ohio	822	349	75	1,246	0	-27	123
Ontario	151,582	117,308	202	269,092	0	-3,473	324
Pennsylvania	33	2	3	38	0	0	4
Québec	776	380	81	1,237	0	3	175
Wisconsin	3,458	243	102	3,802	0	2	107
<b>Total</b>	<b>319,383</b>	<b>206,190</b>	<b>1,116</b>	<b>526,689</b>	<b>0</b>	<b>-2,343</b>	<b>1,892</b>

*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 2019 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mld

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	5,611	0	0	5,612	0	3,841	1
Indiana	4,545	276	343	5,164	0	304	1,098
Michigan	25,620	3,519	1,968	31,106	0	0	2,273
Minnesota	435	17,624	21	18,079	0	49	84
New York	579,726	311,350	141	891,216	0	167	926
Ohio	3,111	1,322	284	4,716	0	-101	467
Ontario	573,800	444,059	765	1,018,624	0	-13,147	1,226
Pennsylvania	125	7	11	143	0	0	15
Québec	2,936	1,438	307	4,681	0	11	663
Wisconsin	13,089	919	385	14,394	0	7	407
<b>Total</b>	<b>1,208,998</b>	<b>780,512</b>	<b>4,225</b>	<b>1,993,735</b>	<b>0</b>	<b>-8,871</b>	<b>7,161</b>

*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

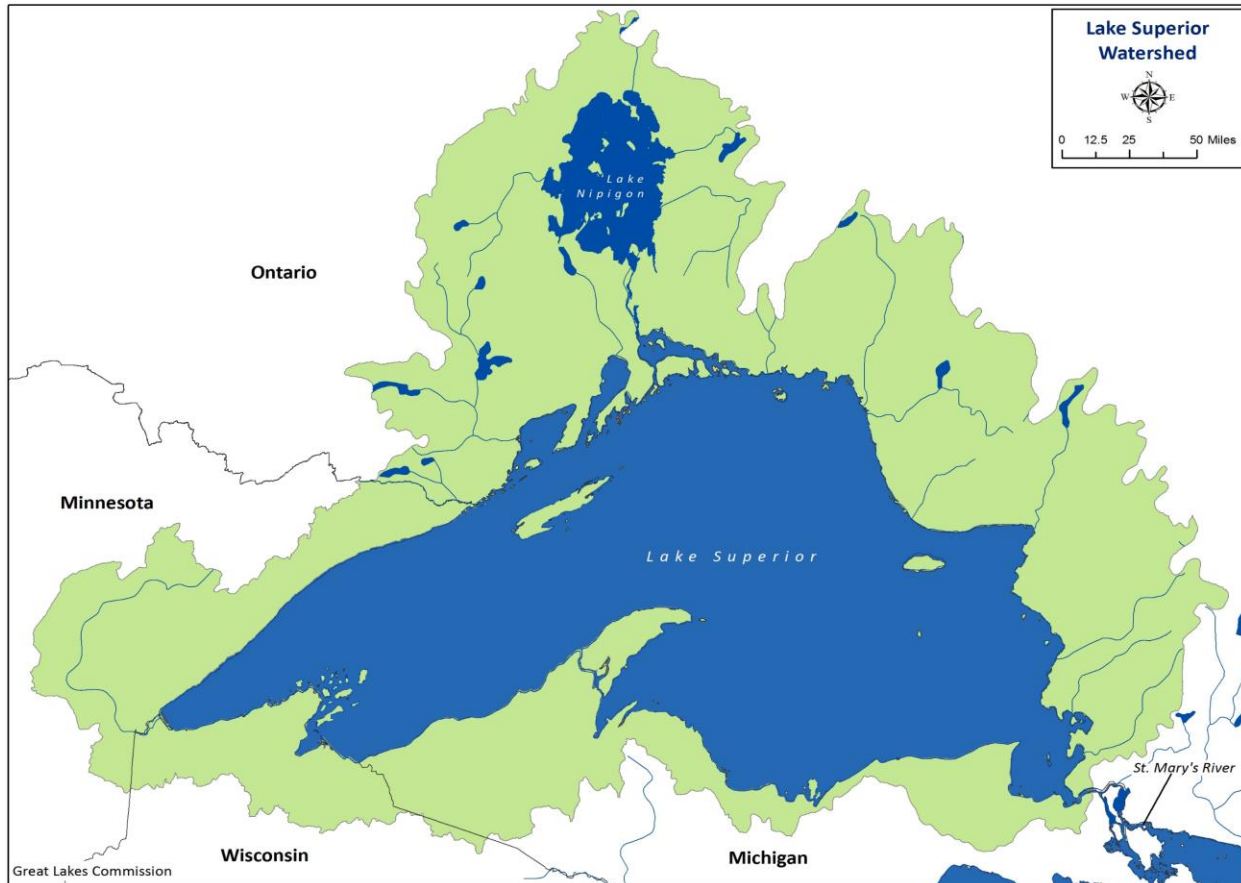


Figure 7. Lake Superior Watershed

### Overview of Watershed Characteristics

Lake Superior is the largest of the Great Lakes and the world's third-largest freshwater lake by volume, holding about 2,900 cubic miles (12,100 cubic kilometers) of water. Lake Superior can hold all the water in the other Great Lakes, plus three more Lake Eries.<sup>6</sup> Its surface area is roughly the size of South Carolina, or approximately 31,700 square miles (82,103 square kilometers).

<sup>6</sup>Minnesota Sea Grant. 2017.  
<http://www.seagrants.umn.edu/superior/facts>

### Basic Stats of Lake Superior

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

## Water Withdrawals

Four jurisdictions – Michigan, Minnesota, Ontario, and Wisconsin – share the Lake Superior watershed and collectively withdrew 2,535 mgd (9,596 mld) in 2019, excluding reported in-stream hydroelectric water use of 30,816 mgd (116,653 mld). This represents a nominal (less than one percent) increase from the 2018 total withdrawal amount of 2,519 mgd (9,536 mld). The off-stream hydroelectric power production sector represents 80 percent of all withdrawals from the watershed excluding in-stream hydroelectric power production, with 2,039 mgd or 7,720 mld withdrawn for off-stream hydroelectric power. The self-supply industrial sector (274 mgd or 1,036 mld) and thermoelectric power production, once-through cooling sector (128 mgd or 485 mld) made up the bulk of remaining water use.

Other surface waters within the Lake Superior watershed were primarily used to generate electricity with in-stream hydroelectric power. Excluding in-stream hydroelectric water use, 90 percent (2,292 mgd or 8,676 mld) of the total reported withdrawal amount from the watershed came from other surface waters. The remaining withdrawals came directly from Lake Superior (9 percent: 225 mgd or 853 mld) and groundwater (1 percent: 18 mgd or 68 mld).

## Water Diversions and Consumptive Uses

The reported net water gain<sup>7</sup> (3,422 mgd or 12,952 mld) in the Lake Superior watershed was largely attributable to the Long Lac and Ogoki diversions in Northern Ontario, incoming interbasin diversions that totaled 3,473 mgd or 13,147 mld. On average, these diversions into the basin are about twice the volume of the Illinois diversion out of the Basin, though in 2019 they were over three times the Illinois diversion volume. Outgoing interbasin diversions totaling 13 mgd (49 mld) were reported in Minnesota, associated almost exclusively with the self-supply industrial sector. A small amount of the outgoing diversion (0.002 mgd or 0.008 mld) was also reported for the self-supply irrigation sector. Additionally, an outgoing intrabasin transfer of less than 1 mgd was reported, associated with Ontario's public drinking water supply.

The total watershed consumptive use for all four jurisdictions was 39 mgd (146 mld). Self-supply industrial use (30 mgd or 114 mld) was the largest contributor to total consumptive use for the watershed, followed by public water supply (6 mgd or 23 mld). Total consumption in 2019 decreased by 13 percent (6 mgd or 22 mld) from 2018, likely due to decreased industrial water use.

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<sup>7</sup> Incoming diversions are reported as negative values in the database and on tables in this report.



**Table 5a.** Lake Superior Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	40	3	13	56	0	0	6
Self-Supply Commercial and Institutional	2	0	0	2	0	0	0
Self-Supply Irrigation	0	0	1	1	0	0	1
Self-Supply Livestock	0	26	3	28	0	0	0
Self-Supply Industrial	105	168	1	274	0	13	30
Self-Supply Thermoelectric Power Production (Once-through cooling)	79	49	0	128	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	2,039	0	2,039	0	0	0
In-Stream Hydroelectric Water Use	0	30,816	0	30,816	0	-3,473	0
Other Self Supply	0	7	0	7	0	0	0
<b>Total</b>	<b>225</b>	<b>33,108</b>	<b>18</b>	<b>33,352</b>	<b>0</b>	<b>-3,460</b>	<b>39</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	153	10	48	211	-1	0	23
Self-Supply Commercial and Institutional	6	1	0	8	0	0	1
Self-Supply Irrigation	0	1	2	3	0	0	3
Self-Supply Livestock	0	97	11	107	0	0	0
Self-Supply Industrial	396	635	4	1,036	0	49	114
Self-Supply Thermoelectric Power Production (Once-through cooling)	298	186	2	485	0	0	6
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	7,720	0	7,720	0	0	0
In-Stream Hydroelectric Water Use	0	116,653	0	116,653	0	-13,147	0
Other Self Supply	0	26	0	26	0	0	0
<b>Total</b>	<b>853</b>	<b>125,329</b>	<b>68</b>	<b>126,249</b>	<b>-1</b>	<b>-13,098</b>	<b>146</b>

*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

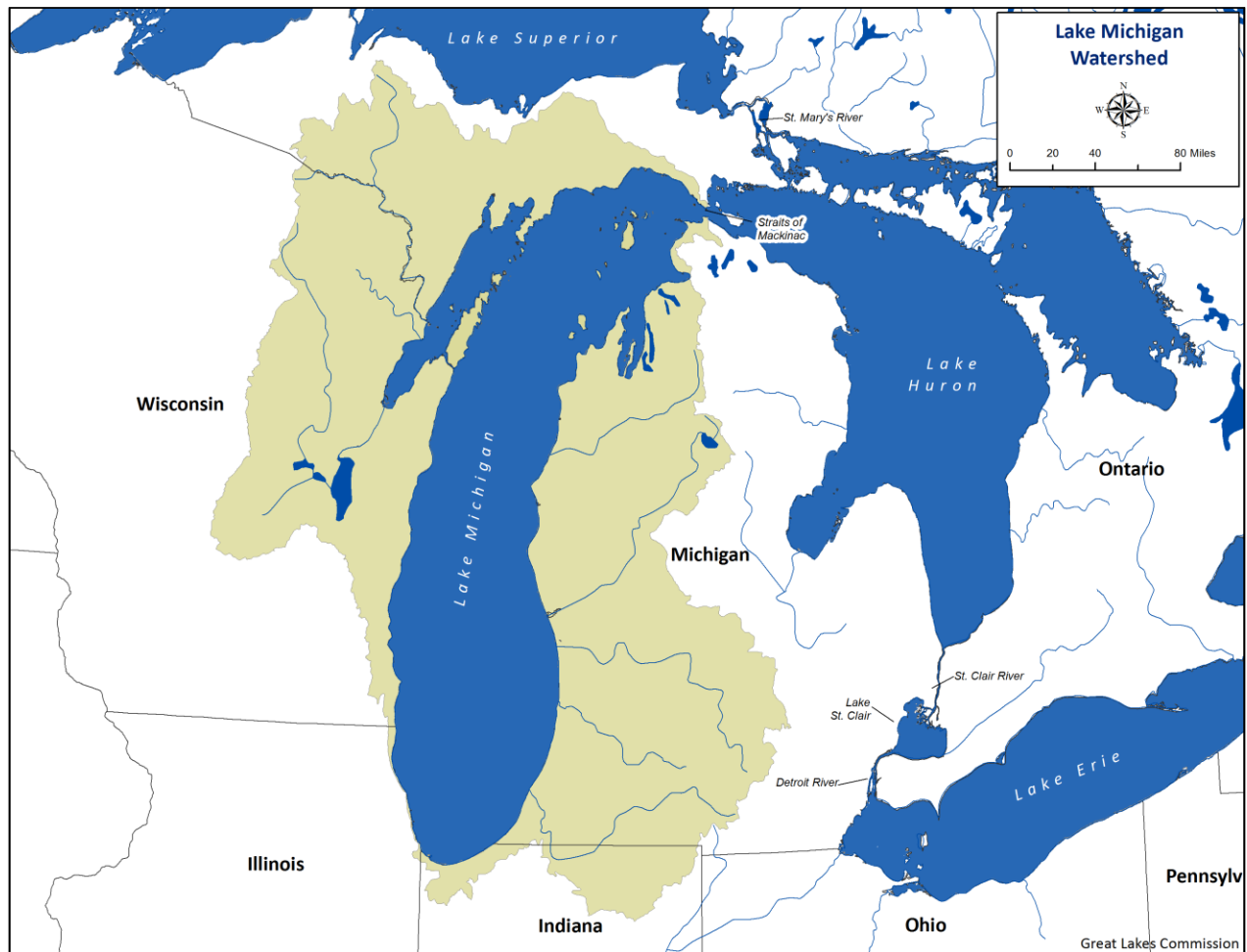


Figure 8. Lake Michigan Watershed

### Overview of Watershed Characteristics

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

#### Basic Stats of Lake Michigan

**Length:** 307 mi/494 km

**Breadth:** 118 mi/190 km

**Elevation:** 577.5 ft/176 m

**Depth:** 279 ft/85 m average, 923 ft/281 m maximum

**Volume:** 1,180 cubic mi/4,918 cubic km

**Lake surface area:** 22,300 square mi/57,753 square km

**Watershed drainage area:** 45,600 square mi/118,095 square km

**Outlet:** Straits of Mackinac to Lake Huron

**Retention/replacement time:** 62 years

**Approximate population in watershed:** 13,325,057

## Water Withdrawals

Four jurisdictions share the Lake Michigan watershed – Illinois, Indiana, Michigan, and Wisconsin – and collectively withdrew 10,086 mgd (38,181 mld) in 2019, a 7 percent decrease from the 10,893 mgd (40,892 mld) water withdrawal in 2018. No in-stream hydroelectric use was reported. The primary water uses were thermoelectric power, once-through cooling (6,422 mgd or 24,311 mld); public water supply (1,464 mgd or 5,542 mld); and self-supply industrial use (1,452 mgd or 5,496 mld). Surface water from Lake Michigan was the primary source of water withdrawals in the watershed, accounting for 90 percent of total withdrawals (9,038 mgd or 34,214 mld).

## Water Diversions and Consumptive Uses

Reported net water loss from the Lake Michigan watershed totaled 1,841 mgd (6,969 mld). This represents 18 percent of total withdrawals and a 6 percent increase in Lake Michigan water loss from 2018. Water loss primarily consisted of the Illinois diversion of 1,015 mgd or 3,841 mld and consumptive use, which totaled 752 mgd (2,846 mld) between the four Lake Michigan jurisdictions. The sectors that represent the majority of consumptive use in the watershed were self-supply industrial use (260 mgd or 986 mld), self-supply irrigation (232 mgd or 879 mld), and thermoelectric power production, recirculated cooling (129 mgd or 488 mld).

**Table 6a.** Lake Michigan Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,225	21	219	1,464	0	835	83
Self-Supply Commercial and Institutional	3	7	5	15	0	2	1
Self-Supply Irrigation	0	43	221	265	0	0	232
Self-Supply Livestock	0	25	31	55	0	0	8
Self-Supply Industrial	1,179	203	70	1,452	0	24	260
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,260	161	1	6,422	0	0	38
Self-Supply Thermoelectric Power Production (Recirculated cooling)	143	27	2	172	0	0	129
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	228	3	9	241	0	228	0
<b>Total</b>	<b>9,038</b>	<b>489</b>	<b>559</b>	<b>10,086</b>	<b>0</b>	<b>1,089</b>	<b>752</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,635	79	828	5,542	1	3,161	314
Self-Supply Commercial and Institutional	13	25	19	58	0	7	4
Self-Supply Irrigation	1	164	837	1,002	0	0	879
Self-Supply Livestock	0	94	116	210	0	0	32
Self-Supply Industrial	4,462	767	266	5,496	0	90	986
Self-Supply Thermoelectric Power Production (Once-through cooling)	23,697	610	4	24,311	0	0	144
Self-Supply Thermoelectric Power Production (Recirculated cooling)	543	101	9	652	0	0	488
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	863	13	35	911	0	863	0
<b>Total</b>	<b>34,214</b>	<b>1,852</b>	<b>2,115</b>	<b>38,181</b>	<b>1</b>	<b>4,121</b>	<b>2,846</b>

*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 (59,600 square kilometers), making it the third largest freshwater lake on Earth by surface area. By volume however, Lake Huron is only the third largest of the Great Lakes.

#### Basic Stats of Lake Huron

**Length:** 206 mi/332 km  
**Breadth:** 183 mi/295 km  
**Elevation:** 577.5 ft/176 m  
**Depth:** 195 ft/59 m average, 750 ft/229 m maximum  
**Volume:** 849 cubic mi/3,538 cubic km  
**Lake Surface Area:** 23,000 square mi/59,565 square km  
**Watershed Drainage Area:** 50,700 square mi/131,303 square km  
**Outlet:** St. Clair River to Lake Erie  
**Retention/replacement time:** 21 years  
**Approximate population in watershed:**  
 United States - 1,642,289; Canada - 1,486,864. Total: 3,129,153

## Water Withdrawals

Only two jurisdictions – Michigan and Ontario – share the Lake Huron watershed and collectively withdrew 7,807 mgd (29,555 mld) in 2019, excluding the reported in-stream hydroelectric water use (34,362 mgd or 130,072 mld). This is a 6 percent decrease from the 2018 water withdrawal amount of 8,342 mgd (31,577 mld).

The primary water uses were thermoelectric power, once-through cooling (7,396 mgd or 27,997 mld); public water supply (195 mgd or 739 mld); and self-supply industrial use (149 mgd or 564 mld). Excluding in-stream hydroelectric water use, Lake Huron surface water was the source of 90 percent of the total withdrawals in the watershed.

## Water Diversions and Consumptive Uses

Reported net water loss from the Lake Huron watershed was 170 mgd (643 mld), a 7 percent decrease from net water loss in 2018. Total consumptive use was 128 mgd or 486 mld, accounting for over 75 percent of the net water loss. Thermoelectric power production, once-through cooling (65 mgd or 246 mld) and public water supply (24 mgd or 90 mld) were the main consumptive uses in the watershed.

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

**Table 7a.** Lake Huron Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	110	51	34	195	42	0	24
Self-Supply Commercial and Institutional	0	4	0	5	0	0	1
Self-Supply Irrigation	0	8	16	25	0	0	22
Self-Supply Livestock	0	21	12	33	0	0	0
Self-Supply Industrial	15	95	39	149	0	0	15
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,908	488	0	7,396	0	0	65
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	2	1	3	0	0	1
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	18,861	15,501	0	34,362	0	0	0
Other Self Supply	0	2	0	2	0	0	0
<b>Total</b>	<b>25,895</b>	<b>16,172</b>	<b>102</b>	<b>42,169</b>	<b>42</b>	<b>0</b>	<b>128</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	416	193	129	739	157	0	90
Self-Supply Commercial and Institutional	2	14	2	17	0	0	2
Self-Supply Irrigation	0	32	61	93	0	0	84
Self-Supply Livestock	0	79	46	125	0	0	1
Self-Supply Industrial	55	361	148	564	0	0	58
Self-Supply Thermoelectric Power Production (Once-through cooling)	26,150	1,847	0	27,997	0	0	246
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	9	3	12	0	0	5
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	71,396	58,676	0	130,072	0	0	0
Other Self Supply	2	6	0	8	0	0	0
<b>Total</b>	<b>98,022</b>	<b>61,217</b>	<b>388</b>	<b>159,627</b>	<b>157</b>	<b>0</b>	<b>486</b>

*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

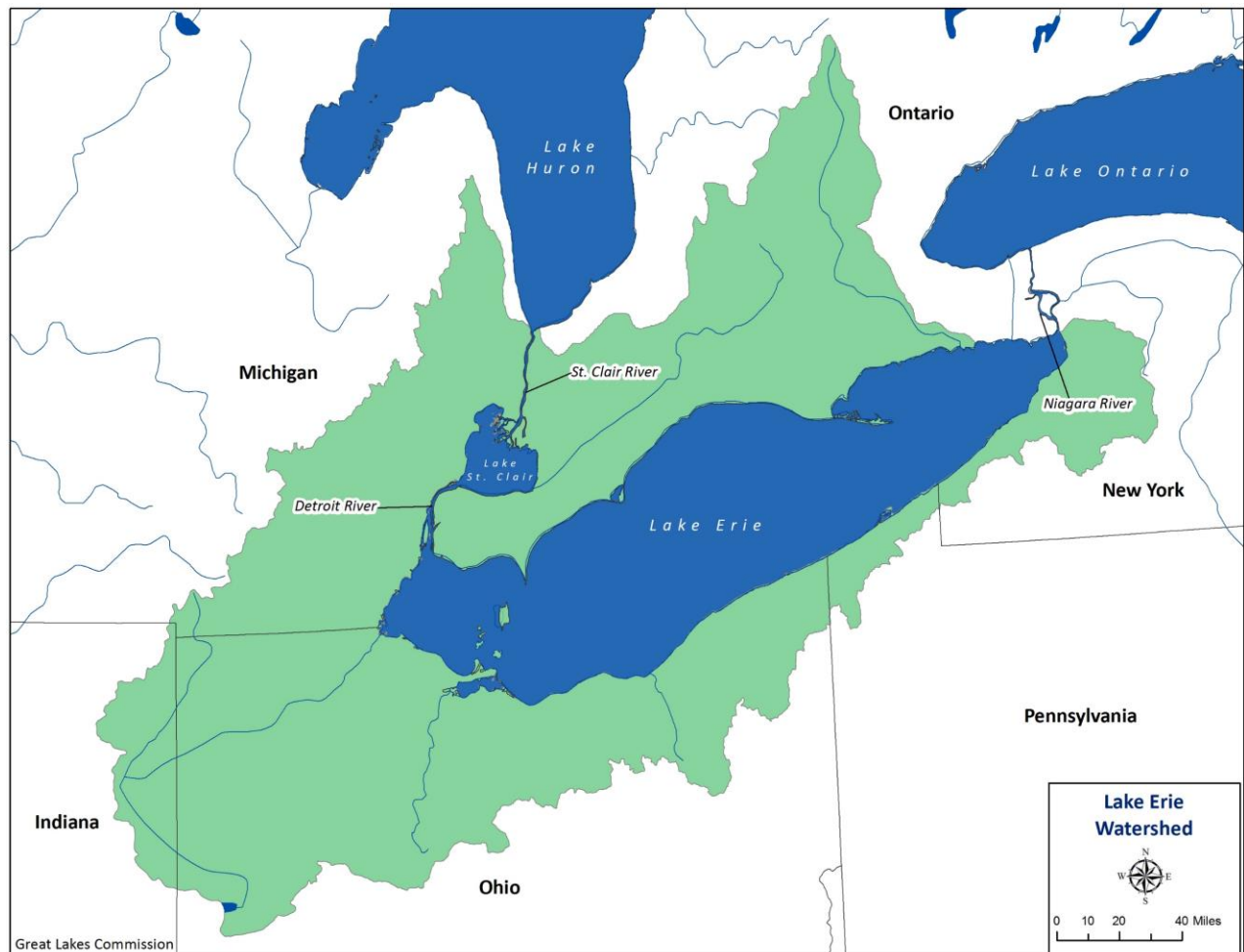


Figure 10. Lake Erie Watershed

### 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 and a maximum depth of 210 feet. The lake holds about 116 cubic miles (4,863 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:** 569.2 ft/173.5 m

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

**Volume:** 116 cubic mi/483 cubic km

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

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

**Outlets:** Niagara River and Welland Canal

**Retention/replacement time:** 2.7 years

**Approximate population in watershed:**

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



## Water Withdrawals

Six jurisdictions – Indiana, Michigan, New York, Ohio, Ontario and Pennsylvania – share the Lake Erie watershed and collectively withdrew 6,455 mgd (24,433 mld) in 2019, excluding reported in-stream hydroelectric water use, which accounted for an additional 55,057 mgd (208,412 mld). There was a 6 percent decrease in water withdrawals from the 2018 total withdrawal amount of 6,884 mgd (26,057 mld). Aside from water used for in-stream hydroelectric power generation purposes, the primary water uses were thermoelectric power generation, once-through cooling (totaling 3,513 mgd or 13,297 mld); public water supply (1,469 mgd or 5,560 mld), and self-supply industrial use (1,179 mgd or 4,462 mld).

Lake Erie surface water was the source of 81 percent of the total withdrawals in the watershed. However, Lake Erie surface water was not used in Indiana, with other surface water and groundwater making up the water sources, primarily supporting the public water supply sector.

## Water Diversions and Consumptive Uses

Reported net water loss from the Lake Erie watershed totaled 4,584 mgd (17,352 mld). The largest loss from the Lake Erie watershed is due to the Welland Canal intrabasin diversion, which diverted 4,226 mgd (15,998 mld) to the Lake Ontario watershed for navigation purposes. Because the diversion is entirely to Lake Ontario, there is no net change or water loss from the Great Lakes-St. Lawrence River basin. The Welland Canal was constructed in 1830 as a ship canal connecting Lake Erie to Lake Ontario. Figure 11 shows the flow through the Welland Canal over the past five years.

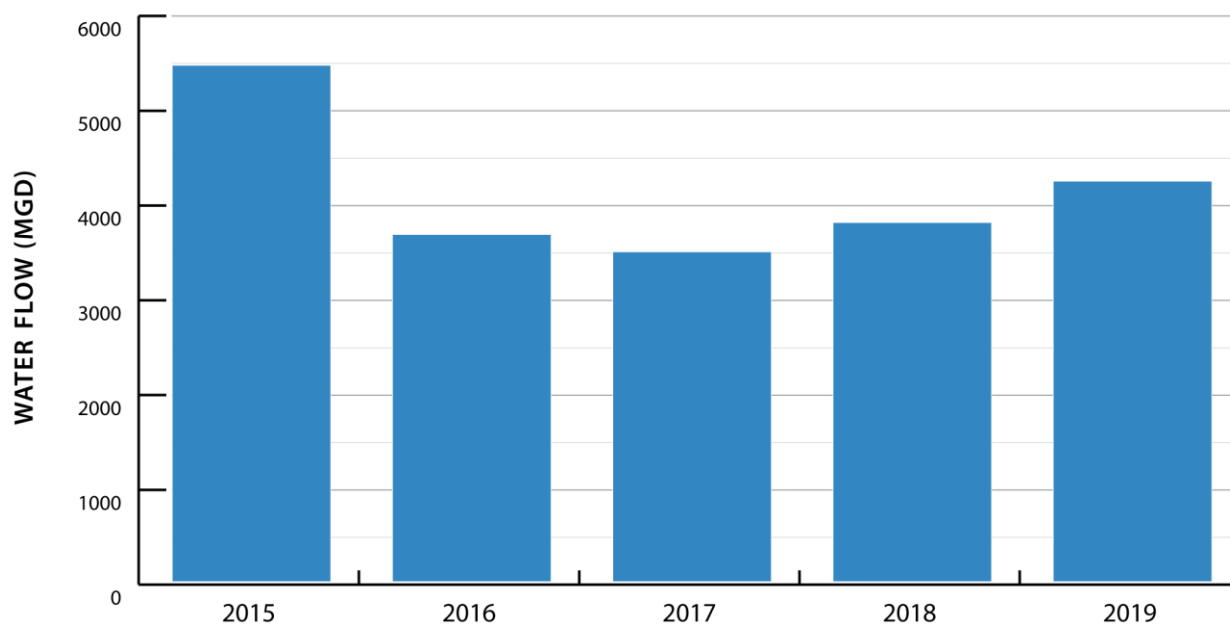


Figure 11. Flow through the Welland Canal over the past five years.

Additionally, incoming intrabasin diversions were reported in Ontario and Michigan for the public water sector, totaling 40 mgd (150 mld), though Michigan's diversion represented a small portion of the total (less than 1 mld).

Interbasin diversions, both into and out of the Basin, were also reported, resulting in a gain (for the Lake Erie watershed and Great Lakes-St. Lawrence River basin) of 19 mgd (72 mld).

Consumptive use in the Lake Erie watershed totaled 416 mgd (1,576 mld). The major consumptive uses were for public water supply (189 mgd or 716 mld) and the self-supply industrial sector (98 mgd or 369 mld).

**Table 8a.** Lake Erie Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,191	169	109	1,469	-40	9	189
Self-Supply Commercial and Institutional	0	3	1	4	0	0	0
Self-Supply Irrigation	1	33	12	46	0	0	41
Self-Supply Livestock	0	5	7	12	0	0	1
Self-Supply Industrial	673	390	117	1,179	0	0	98
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,182	331	0	3,513	0	0	49
Self-Supply Thermoelectric Power Production (Recirculated cooling)	186	0	0	186	0	0	32
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	54,443	614	0	55,057	0	0	0
Other Self Supply	2	40	5	46	4,226	-28	5
<b>Total</b>	<b>59,677</b>	<b>1,584</b>	<b>250</b>	<b>61,511</b>	<b>4,187</b>	<b>-19</b>	<b>416</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,509	639	412	5,560	-150	35	716
Self-Supply Commercial and Institutional	2	10	5	17	0	0	2
Self-Supply Irrigation	3	125	45	174	0	0	156
Self-Supply Livestock	0	18	25	44	0	-1	3
Self-Supply Industrial	2,546	1,475	441	4,462	0	0	369
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,044	1,253	0	13,297	0	0	187
Self-Supply Thermoelectric Power Production (Recirculated cooling)	702	2	0	704	0	0	122
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	206,089	2,323	0	208,412	0	0	0
Other Self Supply	6	151	19	176	15,998	-106	20
<b>Total</b>	<b>225,902</b>	<b>5,996</b>	<b>948</b>	<b>232,846</b>	<b>15,848</b>	<b>-72</b>	<b>1,576</b>

*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

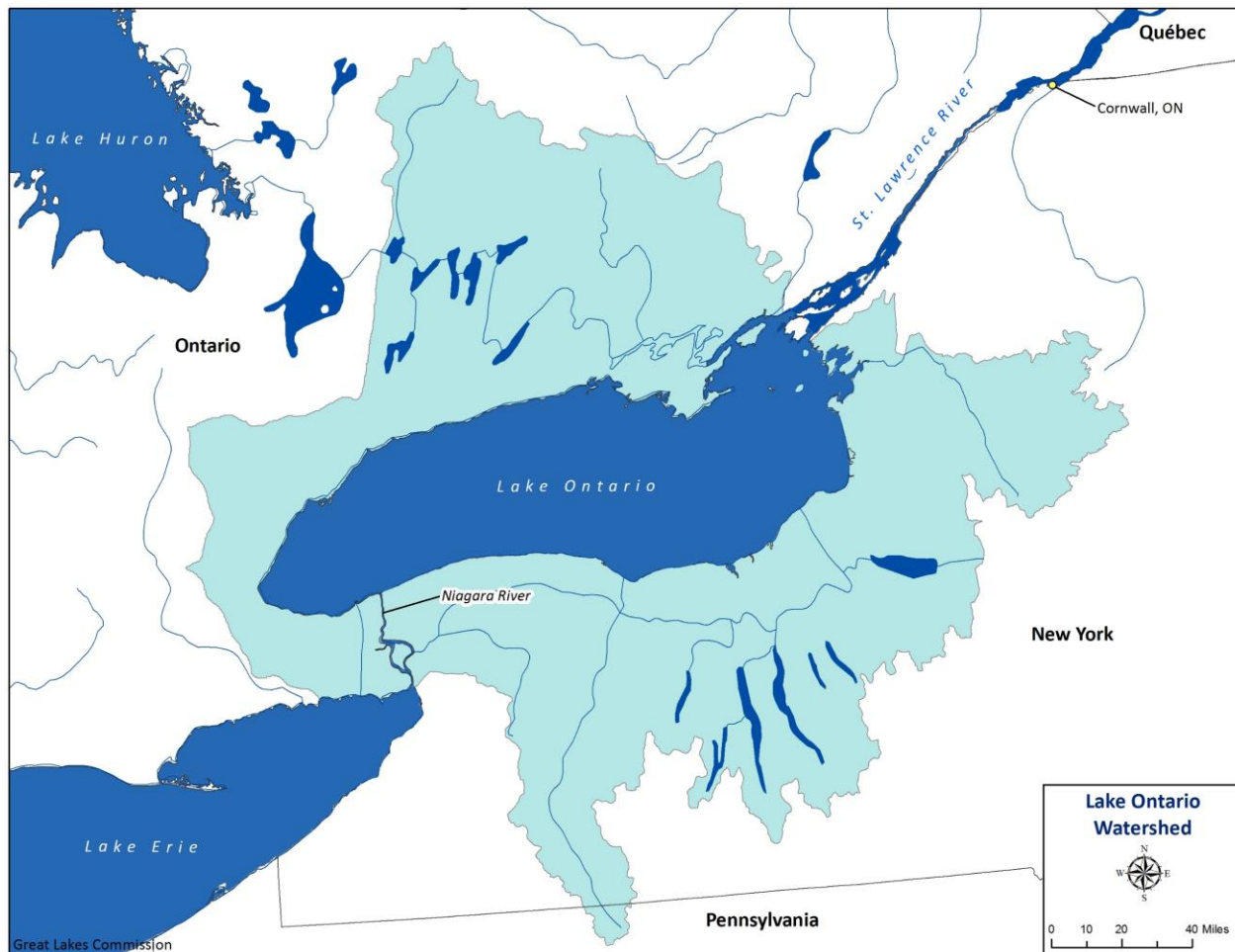


Figure 12. Lake Ontario Watershed

### Overview of Watershed Characteristics

Lake Ontario is the easternmost of the Great Lakes and the smallest in surface area (covering 7,340 square miles, 18,960 square kilometers). It is extremely deep (802 feet maximum) and while smaller than Lake Erie in surface area, exceeds it in volume by nearly three and a half times (393 cubic miles, 1,639 cubic kilometers). By surface area, Lake Ontario is the 14th largest lake in the world and the 11th largest lake in the world by volume.

#### Basic Stats of Lake Ontario

**Length:** 193 mi/311 km  
**Breadth:** 53 mi/85 km  
**Elevation:** 243.3 ft/74.2 m  
**Depth:** 283 ft/86 m average, 802 ft/244 m maximum  
**Volume:** 393 cubic mi/1,639 cubic km  
**Lake surface area:** 7,340 square mi/19,009 square km  
**Watershed drainage area:** 23,400 square mi/60,601 square km  
**Outlet:** St. Lawrence River to the Atlantic Ocean  
**Retention/replacement time:** 6 years  
**Approximate population in watershed:** United States - 2,783,742; Canada – 7,385,657. Total: 10,169,399

## Water Withdrawals

Three jurisdictions – New York, Ontario, and Pennsylvania – share the Lake Ontario watershed and collectively withdrew 10,421 mgd (39,446 mld) of water in 2019, excluding in-stream hydroelectric water use. Reported in-stream hydroelectric water use accounted for an additional 139,089 mgd (526,509 mld). There was a slight (less than 2 percent) increase in water withdrawn from the 2018 withdrawal amount of 10,276 mgd (38,898 mld). Aside from withdrawals for in-stream hydroelectric power generation purposes, the primary water uses were for thermoelectric power generation, once-through cooling (7,626 mgd or 28,866 mld); public water supply (878 mgd or 3,323 mld), and other self-supply uses (752 mgd or 2,846 mld).

Excluding the in-stream hydroelectric power sector, Lake Ontario surface water was the source of 86 percent of the total withdrawals in the watershed, with 13 percent of withdrawals coming from other surface water and less than 1 percent from groundwater.

## Water Diversions and Consumptive Uses

The Lake Ontario watershed reported a net water gain of 3,834 mgd (14,513 mld)<sup>8</sup> in 2019, up 13 percent from the 2018 water gain of 3,791 mgd or 12,818 mld. The net water gain in the Lake Ontario watershed was predominately attributable to the Welland Canal (4,226 mgd or 15,998 mld), which diverts water into Lake Ontario from the Lake Erie watershed for navigation purposes. While this represents a net gain for the Lake Ontario watershed, it has a net zero effect for the Great Lakes-St. Lawrence River basin. An additional incoming intrabasin diversion of 2 mgd (7 mld) was reported in the Lake Ontario watershed, associated with the public water supply sector in Ontario.

Outgoing interbasin diversions of 42 mgd (158 mld) from Lake Ontario were reported in New York, associated with the Erie Barge Canal and public water supply for the City of Rome. Consumptive use in the Lake Ontario watershed totaled 352 mgd (1,334 mld), which is comprised primarily by consumptive use for public water supply (109 mgd or 414 mld); thermoelectric power production, once-through cooling (84 mgd or 317 mld); and self-supply industrial use (77 mgd or 293 mld).

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<sup>8</sup> Incoming diversions are reported as negative values in the database and on tables in this report.

**Table 9a.** Lake Ontario Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	672	193	13	878	-2	10	109
Self-Supply Commercial and Institutional	0	40	1	41	0	0	9
Self-Supply Irrigation	0	16	4	20	0	0	18
Self-Supply Livestock	0	16	12	28	0	0	3
Self-Supply Industrial	335	246	48	628	0	0	77
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,544	82	0	7,626	0	0	84
Self-Supply Thermoelectric Power Production (Recirculated cooling)	386	0	0	386	0	0	19
Off-Stream Hydroelectric Power Production	0	62	0	62	0	0	0
In-Stream Hydroelectric Water Use	41,143	97,946	0	139,089	0	0	0
Other Self Supply	1	751	0	752	-4,226	32	32
<b>Total</b>	<b>50,081</b>	<b>99,352</b>	<b>77</b>	<b>149,510</b>	<b>-4,228</b>	<b>42</b>	<b>352</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,544	730	49	3,323	-7	37	414
Self-Supply Commercial and Institutional	0	153	3	155	0	0	33
Self-Supply Irrigation	2	61	14	77	0	0	69
Self-Supply Livestock	0	60	44	104	0	0	12
Self-Supply Industrial	1,266	931	181	2,379	0	0	293
Self-Supply Thermoelectric Power Production (Once-through cooling)	28,556	311	0	28,866	0	0	317
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,460	0	0	1,460	0	0	73
Off-Stream Hydroelectric Power Production	0	235	0	235	0	0	0
In-Stream Hydroelectric Water Use	155,745	370,764	0	526,509	0	0	0
Other Self Supply	3	2,843	0	2,846	-15,998	121	123
<b>Total</b>	<b>189,576</b>	<b>376,088</b>	<b>292</b>	<b>565,955</b>	<b>-16,006</b>	<b>158</b>	<b>1,334</b>

*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 (1,198 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/74.7 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 watershed and collectively withdrew 1,550 mgd (5,867 mld) of the water in 2019, excluding in-stream hydroelectric water use, which accounted for an additional 228,512 mgd (865,010 mld). The 2019 withdrawals are a slight (less than 2 percent) increase from the 2018 withdrawal total of 1,571 mgd (5,945 mld). Aside from in-stream hydroelectric, the primary water uses were public water supply (1,064 mgd or 4,027 mld) and self-supply industrial use (394 mgd or 1,491 mld).

Excluding in-stream hydroelectric use, St. Lawrence River surface water was the source for 58 percent of the watershed's total withdrawal amount. Other surface water within the St. Lawrence River watershed accounted for 35 percent of the total, with remaining portion of the total withdrawal amount (7 percent) coming from groundwater sources.

## **Water Diversions and Consumptive Uses**

Reported net water loss in the St. Lawrence River watershed in 2019 totaled 209 mgd (792 mld), a 4 percent decrease from 2018 water loss of 219 mgd or 828 mld. This net loss includes a diversion amount of 5 mgd (19 mld) for public supply purposes in New York and Québec and a combined consumptive use amount of 204 mgd (773 mld). The largest consumptive uses were the for the public water supply sector at 156 mgd (592 mld) and self-supply industrial sector at 34 mgd (128 mld).



**Table 10a.** St. Lawrence River Watershed 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	676	318	69	1,064	0	5	156
Self-Supply Commercial and Institutional	1	11	2	13	0	0	2
Self-Supply Irrigation	0	6	1	7	0	0	6
Self-Supply Livestock	0	11	5	17	0	0	1
Self-Supply Industrial	167	195	32	394	0	0	34
Self-Supply Thermoelectric Power Production (Once-through cooling)	46	1	0	47	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	173,572	54,940	0	228,512	0	0	0
Other Self Supply	5	3	0	9	0	0	4
<b>Total</b>	<b>174,467</b>	<b>55,484</b>	<b>110</b>	<b>230,061</b>	<b>0</b>	<b>5</b>	<b>204</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,560	1,205	263	4,027	0	19	592
Self-Supply Commercial and Institutional	2	41	6	50	0	0	8
Self-Supply Irrigation	1	22	3	25	0	0	22
Self-Supply Livestock	0	42	21	63	0	0	3
Self-Supply Industrial	633	736	121	1,491	0	0	128
Self-Supply Thermoelectric Power Production (Once-through cooling)	175	3	0	178	0	0	2
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	657,041	207,969	0	865,010	0	0	0
Other Self Supply	18	13	2	33	0	0	17
<b>Total</b>	<b>660,430</b>	<b>210,031</b>	<b>416</b>	<b>870,877</b>	<b>0</b>	<b>19</b>	<b>773</b>

*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.

The total withdrawal amount from the basin for Illinois in 2019 was 1,482 mgd (5,612 mld), a marginal decrease from 2018 (1,471 mgd or 5,569 mld). The largest uses of reported water were public water supply at 784 mgd or 2,968 mld (53 percent of the total withdrawal amount) and thermoelectric power production, once-through cooling at 442 mgd or 1,673 mld (30 percent of the total withdrawal amount). The source for all withdrawals was Lake Michigan surface water.

A total of 1,015 mgd (3,841 mld) were diverted through the Illinois Diversion. The Illinois Diversion diverts water from Lake Michigan through the Chicago Area Water System (CAWS) into the Mississippi River watershed and is comprised of three elements: public water supply, stormwater runoff, and direct diversion. The amount of water diverted for public water supply was 784 mgd (2,968 mld), with an additional 2.4 mgd (9 mld) diverted for the industrial and commercial and institutional 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. The total direct diversion was 228 mgd (863 mld).

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. This data was generated with a 100 percent reporting compliance from permitted water withdrawal facilities.

Notable changes from 2018 water use by Illinois facilities include:

- A 12 percent (3 mgd or 13 mld) decrease in water withdrawal for industrial use, likely attributable to decreased production at a facility.
- An 8 percent (37 mgd or 138 mld) decrease in water withdrawal for thermoelectric power production (one-through cooling) due to the decommissioning of a power plant.
- A 51 percent (77 mgd or 290 mld) increase in direct diversions to operate and maintain the CAWS. This increase was due to wet weather conditions, which necessitate more frequent lowering and refilling of the waterway system, and high water levels that result in more water entering through locks as vessels pass through.

**Table 11a.** Illinois 2019 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	26	0	0	26	0	1	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	442	0	0	442	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	228	0	0	228	0	228	0
<b>Total</b>	<b>1,482</b>	<b>0</b>	<b>0</b>	<b>1,482</b>	<b>0</b>	<b>1,015</b>	<b>0</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,968	0	0	2,968	0	2,968	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	100	0	0	100	0	2	1
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,673	0	0	1,673	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	863	0	0	863	0	863	0
<b>Total</b>	<b>5,611</b>	<b>0</b>	<b>0</b>	<b>5,612</b>	<b>0</b>	<b>3,841</b>	<b>1</b>

*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 Lake Michigan encompasses a total of 241 square miles. Four Indiana counties lie partially within Indiana's portion of the Lake Michigan watershed, but three (Lake, Porter and LaPorte counties) constitute more than 99.5 percent 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 2019, the total reported water withdrawal amount from the Basin for Indiana was 1,364 mgd (5,164 mld), a 9 percent decrease from the 2018 reported withdrawals (1,495 mgd or 5,659 mld). The largest uses were self-supply industrial (1,123 mgd or 4,250 mld) and public water supply (167 mgd or 631 mld).

The total reported diversion amount for Indiana was 80 mgd (304 mld). Because a 65-square-mile portion of Indiana drains into the Illinois River (as a result of the Illinois Diversion), water transferred from the Lake Michigan watershed into this area is considered a diversion of water from the Great Lakes-St. Lawrence River Basin. Most reported diversions for Indiana (48 mgd or 182 mld) were distributed for public supply purposes from Lake Michigan surface water and discharged to the "Illinois Diversion" area, with approximately 1 mgd (4 mld) reported as a diversion from groundwater for public supply. The industrial sector was responsible for about 23 mgd (88 mld) of the reported diversion from the Lake Michigan watershed to the Illinois River.

In the Lake Erie watershed, a portion of the city of Fort Wayne's public water supply distribution system is outside of the Great Lakes Basin in the Upper Wabash watershed. The water distributed through that portion of the system (about 8 mgd or 30 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 290 mgd (1,098 mld), with the industrial sector in the Lake Michigan watershed (229 mgd or 867 mld or 79 percent) as the primary contributor to the total.

Data collected for this report came from the Indiana Department of Natural Resources. These data were generated with reporting compliance rates from permitted water withdrawal facilities ranging from 81 to 100 percent depending on the water use sector. Data was not estimated for facilities that did not report. Indiana does not require in-stream hydroelectric water users to register or report this use.

Notable changes from 2018 water use by Indiana facilities include:

- A 100 percent (36 mgd or 136 mld) decrease in water withdrawal for self-supply thermoelectric power production (once-through cooling), as a power plant that was retired in May 2018 did not report any water use for 2019.
- A 22 percent (4 mgd or 25 mld) increase in self-supply irrigation water withdrawal and similar (24 percent) increase in consumption, due to approximately 30 new facilities reporting water use after a fieldwork effort to improve reporting.
- An 8 percent (96 mgd or 365 mld) decrease in self-supply industrial water withdrawal amount, which follows a trend of decreasing industrial water use.

**Table 12a.** Indiana 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	86	36	45	167	0	57	20
Self-Supply Commercial and Institutional	0	0	1	1	0	0	0
Self-Supply Irrigation	0	4	30	34	0	0	31
Self-Supply Livestock	0	1	3	4	0	0	2
Self-Supply Industrial	1,107	7	9	1,123	0	23	229
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	8	25	2	34	0	0	8
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	1	1	0	0	0
<b>Total</b>	<b>1,201</b>	<b>73</b>	<b>91</b>	<b>1,364</b>	<b>0</b>	<b>80</b>	<b>290</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	326	135	170	631	0	216	77
Self-Supply Commercial and Institutional	0	0	4	4	0	0	0
Self-Supply Irrigation	0	16	114	130	0	0	116
Self-Supply Livestock	0	3	13	16	0	0	8
Self-Supply Industrial	4,189	27	33	4,250	0	88	867
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	30	94	7	130	0	0	30
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	2	2	0	0	0
<b>Total</b>	<b>4,545</b>	<b>276</b>	<b>343</b>	<b>5,164</b>	<b>0</b>	<b>304</b>	<b>1,098</b>

*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 9.9 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.<sup>9</sup>

In 2019, the total reported water withdrawal amount from the Basin for Michigan was 8,217 mgd (31,106 mld), a decrease of 8 percent from the 2018 total water withdrawal amount of 8,937 mgd (33,832 mld). The largest use was thermoelectric power production, once-through cooling, with 6,036 mgd (22,850 mld) withdrawn, nearly 75 percent of Michigan’s total withdrawal. 51 percent of Michigan’s total withdrawal amount came from the Lake Erie watershed (4,212 mgd or 15,944 mld), mainly used for thermoelectric power production. 42 percent of total withdrawal amount (3,526 mgd or 13,348 mld) came from the Lake Michigan watershed, followed by the Lake Huron watershed at 413 mgd or 1,564 mld (5 percent) and the Lake Superior watershed at 66 mgd or 250 mld (1 percent).

The total amount of consumptive use in Michigan was 600 mgd or 2,273 mld (approximately seven percent of the total withdrawal amount), with self-supply irrigation being the largest contributor to consumptive use at 218 mgd (827 mld).

Data collected for this report came from user reports to the Michigan Department of Environment, Great Lakes, and Energy, either directly or via the Michigan Department of Agriculture and Rural Development. These data were generated with estimated reporting compliance rates ranging from 70 to 99 percent of total water use reporters, depending on the water use sector. Water use for hydroelectric power generation are exempt from reporting requirements under Michigan statute.

Notable changes from 2018 water use by Michigan facilities include:

- A 9 percent (25 mgd or 96 mld) decrease in self-supply irrigation withdrawals, which is a normal fluctuation due to weather conditions.
- A 10 percent (676 mgd or 2561 mld) decrease in withdrawal for self-supply thermoelectric power production (once-through cooling), largely due to reduced power plant production or decommissioning power plants, though one power plant’s reported 2018 use was erroneously high
- A 328 percent (107 mgd or 408 mld) increase in consumptive use for self-supply thermoelectric power production (recirculated cooling), with a 9 percent (16 mgd or 60 mld) increase in water withdrawal for the sector. The increase in water withdrawal falls within normal fluctuation, but the increase in consumption is attributable to erroneously low reporting of one power plant’s consumptive use in 2018.
- A 27 percent (11 mgd or 42 mld) increase in livestock, primarily due to three fish hatcheries that failed to report 2018 water use but came into compliance for 2019 water use reporting.

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<sup>9</sup> National Oceanic and Atmospheric Administration (NOAA) Shoreline Website. <https://shoreline.noaa.gov/faqs.html?faq=2>

Table 13a. Michigan 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	647	14	193	853	0	0	107
Self-Supply Commercial and Institutional	0	1	3	4	0	0	1
Self-Supply Irrigation	0	51	192	243	0	0	218
Self-Supply Livestock	0	38	15	53	0	0	1
Self-Supply Industrial	334	386	104	824	0	0	82
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,605	431	1	6,036	0	0	51
Self-Supply Thermoelectric Power Production (Recirculated cooling)	181	5	1	187	0	0	140
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	6	11	17	0	0	0
<b>Total</b>	<b>6,768</b>	<b>929</b>	<b>520</b>	<b>8,217</b>	<b>0</b>	<b>0</b>	<b>600</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,449	52	729	3,230	0	0	404
Self-Supply Commercial and Institutional	1	3	12	16	0	0	2
Self-Supply Irrigation	2	192	725	919	0	0	827
Self-Supply Livestock	0	143	58	200	0	0	5
Self-Supply Industrial	1,265	1,461	394	3,120	0	0	312
Self-Supply Thermoelectric Power Production (Once-through cooling)	21,216	1,630	4	22,850	0	0	192
Self-Supply Thermoelectric Power Production (Recirculated cooling)	686	18	4	708	0	0	532
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	2	21	41	63	0	0	0
<b>Total</b>	<b>25,620</b>	<b>3,519</b>	<b>1,968</b>	<b>31,106</b>	<b>0</b>	<b>0</b>	<b>2,273</b>

*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 6,200 square miles.<sup>10</sup> Major river watersheds in the basin include the Cloquet, Nemadji and St. Louis River systems, as well as the north shore tributaries to Lake Superior.

Excluding in-stream hydroelectric water use (2,458 mgd or 9,304 mld), the total withdrawal amount from the basin for Minnesota was 2,318 mgd (8,775 mld), an increase of 7 percent from the total withdrawn amount for 2018 (2,165 mgd or 8,195 mld). However, the combined withdrawals for all non-hydropower use sectors (279 mgd or 1056 mld) is a 25 percent reduction compared to 2018 (372 mgd or 1408 mld). This is due to significant reductions in withdrawals in the self-supply industrial and self-supply thermoelectric power production (once-through cooling) sectors. The sector with the greatest water use was off-stream hydroelectric power production, accounting for 2,039 mgd (7,729 mld). The second largest use sector is self-supply industrial at 177 mgd (668 mld).

95 percent of total withdrawals came from other surface water within the Lake Superior watershed (2,198 mgd or 8,320 mld), while only 5 percent, or 115 mgd (435 mld), came from Lake Superior. The large relative use of ‘other surface water’ to ‘Great Lakes surface water’ comes from water use for hydroelectric power production on the St. Louis River.

The total reported diversion amount of 13 mgd (49 mld) was almost exclusively for self-supply industrial purposes. A small amount of the outgoing diversion (0.002 mgd or 0.008 mld) was also reported for the self-supply irrigation sector. Total consumptive use was 22 mgd (84 mld), the majority of which was for industrial purposes (18 mgd or 67 mld).

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

Notable changes from 2018 water use by Minnesota facilities include:

- A 14 percent (247 mgd or 935 mld) increase in water use for off-stream hydroelectric power production, which is considered typical fluctuation (the 2018 water use was 31 percent lower than the preceding year).
- A 43 percent (48 mgd or 181 mld) decrease in withdrawal for self-supply thermoelectric power production (once-through cooling), with two power plants decreasing power production.
- A 19 percent (41 mgd or 157 mld) decrease in self-supply industrial sector water withdrawals, due to reduced water use for mining.

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<sup>10</sup> Minnesota Sea Grant, 2016. <http://www.seagrant.umn.edu/superior/minnesota>



**Table 14a.** Minnesota 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	24	1	5	30	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	76	101	0	177	0	13	18
Self-Supply Thermoelectric Power Production (Once-through cooling)	14	49	0	63	0	0	1
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	2,039	0	2,039	0	0	0
In-Stream Hydroelectric Water Use	0	2,458	0	2,458	0	0	0
Other Self Supply	0	7	0	7	0	0	0
<b>Total</b>	<b>115</b>	<b>4,656</b>	<b>6</b>	<b>4,776</b>	<b>0</b>	<b>13</b>	<b>22</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	91	5	19	115	0	0	12
Self-Supply Commercial and Institutional	6	1	0	7	0	0	1
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	287	382	0	668	0	49	67
Self-Supply Thermoelectric Power Production (Once-through cooling)	51	186	2	239	0	0	5
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	7,720	0	7,720	0	0	0
In-Stream Hydroelectric Water Use	0	9,304	0	9,304	0	0	0
Other Self Supply	0	26	0	26	0	0	0
<b>Total</b>	<b>435</b>	<b>17,624</b>	<b>21</b>	<b>18,079</b>	<b>0</b>	<b>49</b>	<b>84</b>

*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 land, are contained in the watersheds of Lake Erie, Lake Ontario and the St. Lawrence River, including the Lake Champlain and Lake George watersheds. More than four million New Yorkers depend on the fresh water of these watersheds for drinking water.<sup>11</sup>

Excluding in-stream hydroelectric water use (231,952 mgd or 878,034 mld), the total withdrawal amount from the basin for New York was 3,482 mgd (13,182 mld), a nearly 1 percent decrease from 2018 (3,509 mgd or 13,282 mld). Most withdrawals were from the Lake Ontario watershed, with 3,005 mgd (11,375 mld) withdrawn, 86 percent of New York's total withdrawal from the basin.

The thermoelectric power production sectors (both once-through and recirculated cooling) withdrew 1,759 mgd (6,658 mld), which represented 51 percent of the total withdrawal amount. Public water supply was the next largest water use sector, withdrawing 481 mgd (1,821 mld) and accounting for 14 percent of the total withdrawals from the basin. For the Lake Erie and Lake Ontario watersheds, Great Lakes surface water was the primary source of water, when in-stream hydroelectric is excluded. For the St. Lawrence River watershed, other surface water was the primary source of water, when in-stream hydroelectric is excluded.

The 2019 total (net) diversion amount for New York was 44 mgd (167 mld), of which 12 mgd (46 mld) was for public supply<sup>12</sup> and 32 mgd (121 mld) for other self-supply purposes<sup>13</sup>. The total consumptive use amount was 245 mgd (926 mld). The largest consumptive uses were attributed to the industrial sector at 68 mgd (258 mld) and public water supply at 59 mgd (224 mld).

The water use data was provided by the New York State Department of Environmental Conservation. The data collected was metered and reported by the user. Reporting compliance varied among the water use sectors from 75 percent for the self-supply irrigation sector to 100 percent for the hydroelectric power, self-supply thermoelectric power production (once-through cooling), and other self-supply sectors. New York does not estimate the water use for facilities that did not report their use. New York's five-year implementation of permits for water withdrawal was completed during 2017. The permits include an ongoing requirement to report water use, which should support continued improvement in compliance. Additionally, reporting facilities are required to complete a water conservation program and corresponding report section that includes conservation and efficiency measures. These measures include source metering, water auditing, leak detection and repair, recycling and reuse, and reductions during periods of drought.

Notable changes from 2018 water use by New York facilities include:

- A 22 percent (7 mgd or 25 mld) decrease in water withdrawals and consumptive use (6 mgd or 23 mld) for self-supply irrigation due to fewer facilities reporting, likely associated with compliance challenges brought on by the COVID-19 pandemic.
- A 10 percent (44 mgd or 165 mld) decrease in water withdrawals for the thermoelectric power production (recirculated cooling) sector, which is consistent with typical fluctuations.

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<sup>11</sup> Great Lakes Basin Advisory Council. 2013. Our Great Lakes Water Resources: Conserving and Protecting Our Water Today for Use Tomorrow Final Report. [http://www.dec.ny.gov/docs/regions\\_pdf/glbacfrpt.pdf](http://www.dec.ny.gov/docs/regions_pdf/glbacfrpt.pdf)

<sup>12</sup> 10 mgd for City of Rome, 2 mgd for City of Glens Falls

<sup>13</sup> 32 mgd for Erie Barge Canal

**Table 15a.** New York 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	300	165	16	481	0	12	59
Self-Supply Commercial and Institutional	0	46	1	47	0	0	9
Self-Supply Irrigation	0	20	4	24	0	0	22
Self-Supply Livestock	0	16	10	25	0	0	4
Self-Supply Industrial	126	174	6	306	0	0	68
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,291	82	0	1,373	0	0	27
Self-Supply Thermoelectric Power Production (Recirculated cooling)	386	0	0	386	0	0	19
Off-Stream Hydroelectric Power Production	0	62	0	62	0	0	0
In-Stream Hydroelectric Water Use	151,044	80,908	0	231,952	0	0	0
Other Self Supply	0	777	0	777	0	32	35
<b>Total</b>	<b>153,147</b>	<b>82,250</b>	<b>37</b>	<b>235,434</b>	<b>0</b>	<b>44</b>	<b>245</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,136	624	61	1,821	0	46	224
Self-Supply Commercial and Institutional	0	173	5	178	0	0	35
Self-Supply Irrigation	1	76	15	92	0	0	83
Self-Supply Livestock	0	60	37	96	0	0	15
Self-Supply Industrial	478	660	22	1,160	0	0	258
Self-Supply Thermoelectric Power Production (Once-through cooling)	4,887	311	0	5,198	0	0	104
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,460	0	0	1,460	0	0	73
Off-Stream Hydroelectric Power Production	0	235	0	235	0	0	0
In-Stream Hydroelectric Water Use	571,764	306,270	0	878,034	0	0	0
Other Self Supply	0	2,942	0	2,942	0	121	134
<b>Total</b>	<b>579,726</b>	<b>311,350</b>	<b>141</b>	<b>891,216</b>	<b>0</b>	<b>167</b>	<b>926</b>

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

## Ohio

Ohio's portion of the Lake Erie watershed drains 11,649 square miles and is home to 4.65 million people. Ohio's 312-mile shoreline includes the cities of Toledo, Sandusky, and Cleveland. Agricultural row crops account for 59 percent of the land use in the Ohio watersheds draining to Lake Erie, followed by urban residential and commercial land use at a combined 16 percent. Another 16 percent are forested lands and wetlands, and pastureland makes up another five percent of total land use.<sup>14</sup>

The 2019 total reported withdrawal amount from the basin for Ohio was 1,246 mgd (4,716 mld), a 15 percent decrease from the total withdrawal amount for 2018 (1,471 mgd or 5,570 mld). Primary water use sectors included public water supply withdrawing 506 mgd or 1,915 mld and thermoelectric power production (once-through and recirculated cooling) at 502 mgd (1,899 mld), each representing approximately 40 percent of total withdrawal amount. Self-supply industrial use (763 mgd or 202 mld) accounted for 16 percent of Ohio's water withdrawals. The source for 66 percent of the total withdrawal amount was Lake Erie. However, within the self-supply irrigation and industrial water use sectors, other surface water was the predominant source at 92 percent and 49 percent of the total withdrawal amount, respectively.

The total (net) diversion amount was 27 mgd (101 mld) into the Lake Erie watershed.<sup>15</sup> Diversions out of the Lake Erie watershed totaled 13 mgd (51 mld), all for public water supply purposes, and were offset by 40 mgd (152 mld) of incoming diversions, primarily associated with other self-supply, and diversion returns. Total consumptive use was 123 mgd (467 mld). 61 percent of the total consumptive use was attributed to the public water supply sector.

The water use data was provided by the Ohio Department of Natural Resources with a 100 percent reporting compliance from every water use sector.

There was a 36 percent (200 mgd or 757 mld) decrease in water withdrawals for thermoelectric power production (once-through cooling) due to a power plant going offline and the closure of a steel manufacturer with its own energy production. No further notable changes from 2018 water use by Ohio facilities were reported.

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<sup>14</sup> Ohio Environmental Protection Agency. 2010. Ohio Lake Erie Phosphorus Task Force Final Report. [http://www.epa.ohio.gov/portals/35/lakeerie/ptaskforce/Task\\_Force\\_Final\\_Report\\_April\\_2010.pdf](http://www.epa.ohio.gov/portals/35/lakeerie/ptaskforce/Task_Force_Final_Report_April_2010.pdf)

<sup>15</sup> Incoming diversions are reported as negative values in the database and on tables.

Table 16a. Ohio 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	387	92	27	506	0	1	76
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	24	2	26	0	0	23
Self-Supply Livestock	0	0	1	1	0	0	0
Self-Supply Industrial	59	98	45	202	0	0	4
Self-Supply Thermoelectric Power Production (Once-through cooling)	235	127	0	362	0	0	4
Self-Supply Thermoelectric Power Production (Recirculated cooling)	140	0	0	140	0	0	14
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	8	1	10	0	-28	2
<b>Total</b>	<b>822</b>	<b>349</b>	<b>75</b>	<b>1,246</b>	<b>0</b>	<b>-27</b>	<b>123</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,463	348	104	1,915	0	5	287
Self-Supply Commercial and Institutional	1	0	0	1	0	0	0
Self-Supply Irrigation	2	90	6	99	0	0	89
Self-Supply Livestock	0	0	2	2	0	-1	2
Self-Supply Industrial	224	370	169	763	0	0	14
Self-Supply Thermoelectric Power Production (Once-through cooling)	888	482	0	1,369	0	0	14
Self-Supply Thermoelectric Power Production (Recirculated cooling)	530	0	0	530	0	0	53
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	31	3	37	0	-106	9
<b>Total</b>	<b>3,111</b>	<b>1,322</b>	<b>284</b>	<b>4,716</b>	<b>0</b>	<b>-101</b>	<b>467</b>

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

## Ontario

More than 98 percent of Ontario residents live within the Great Lakes-St. Lawrence River Basin. Ontario's portion of the Great Lakes forms the longest freshwater coastline in the world stretching more than 6,200 miles (10,000 kilometers) across five major watersheds in the Great Lakes-St. Lawrence River system: Lake Superior, Lake Huron, Lake Erie, Lake Ontario and the St. Lawrence River watersheds.<sup>16</sup>

Excluding in-stream hydroelectric water use (reported amount of 253,425 mgd or 959,319 mld), a total of 15,667 mgd or 59,305 mld was withdrawn from the basin. The three largest water use categories were thermoelectric power (once-through cooling) at 13,525 mgd (51,196 mld) and representing 86 percent of the total withdrawal amount, public supply at 1,077 mgd (4,075 mld); and industrial at 994 mgd (3,763 mld). Great Lakes surface water was the primary source for withdrawals in the Lake Huron, Lake Erie, Lake Ontario, and St. Lawrence River watersheds, while other surface water was the primary source for withdrawals in the Lake Superior watersheds.

No diversions out of the Great Lakes-St. Lawrence River basin were reported for Ontario, while 3,473 mgd (13,147 mld) of water was diverted into the Lake Superior basin<sup>17</sup>, associated with the Long Lac and Ogoki diversions. The Welland Canal is entirely within Ontario and functions as two intrabasin transfers (one out of the Lake Erie Basin and one into the Lake Ontario Basin). These transfers effectively cancel each other out, resulting in a net zero intrabasin transfer. For more information about the volume of these transfers, see the Lake Erie Basin section above. Similarly, additional intrabasin diversions for public drinking water supply between Lakes Huron, Erie, and Ontario were reported but did not result in a net transfer.

The total consumptive use amount was approximately 324 mgd (1,226 mld). The three water use sectors representing the largest consumptive uses were public water supply at 129 mgd (489 mld), thermoelectric power at 122 mgd (461 mld), and industrial at 70 mgd (264 mld). Use associated with intrabasin diversions accounted for 6 mgd (21 mld) of the total consumptive use.

The data was provided by the Ontario Ministry of Natural Resources and Forestry and the Ontario Ministry of Environment, Conservation and Parks and was collected primarily through the provincial water taking and reporting system. Additional estimates were provided by water use managers to capture water use that was not reported. Reporting compliance varied among water use sectors from 76 percent for the self-supply livestock sector to 96 percent for public water supply.

Notable changes from 2018 water use by Ontario facilities include:

- A 66 percent (4 mgd or 16 mld) decrease in water withdrawals in the self-supply irrigation sector, due in large part to several users decreasing use and dropping below the reporting threshold.
- An 11 percent (354 mgd or 1,339 mld) increase in amount of water diverted into the Great Lakes basin, primarily due to relatively wet weather conditions in 2019, though changes in diversions are also associated with other water balance needs. The 2019 reported diversions are near the long-term average diversion amount.

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<sup>16</sup> Ontario's Great Lakes Strategy, 2016. <https://www.ontario.ca/page/ontarios-great-lakes-strategy>

<sup>17</sup> Incoming diversions are reported as negative values in the database and on tables.

Table 17a. Ontario 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	788	225	64	1,077	0	0	129
Self-Supply Commercial and Institutional	0	7	1	8	0	0	1
Self-Supply Irrigation	0	1	0	2	0	0	2
Self-Supply Livestock	0	30	24	54	0	0	0
Self-Supply Industrial	607	274	112	994	0	0	70
Self-Supply Thermoelectric Power Production (Once-through cooling)	13,209	316	0	13,525	0	0	122
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	116,450	0	253,425	0	-3,473	0
Other Self Supply	2	5	1	8	0	0	0
<b>Total</b>	<b>151,582</b>	<b>117,308</b>	<b>202</b>	<b>269,092</b>	<b>0</b>	<b>-3,473</b>	<b>324</b>

*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 Basin sections above.*

Table 17b. Ontario 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,982	853	241	4,075	0	0	489
Self-Supply Commercial and Institutional	2	26	3	30	0	0	4
Self-Supply Irrigation	2	5	1	8	0	0	7
Self-Supply Livestock	0	114	90	204	0	0	2
Self-Supply Industrial	2,299	1,038	425	3,763	0	0	264
Self-Supply Thermoelectric Power Production (Once-through cooling)	50,002	1,195	0	51,196	0	0	461
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	440,812	0	959,319	0	-13,147	0
Other Self Supply	6	18	4	29	0	0	0
<b>Total</b>	<b>573,800</b>	<b>444,059</b>	<b>765</b>	<b>1,018,624</b>	<b>0</b>	<b>-13,147</b>	<b>1,226</b>

*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 Basin sections above.*

## Pennsylvania

The Pennsylvania portion of the Lake Erie watershed spans 511 square miles and is home to more than 240,000 people concentrated along the 77 miles of Lake Erie coastline<sup>18</sup>. Pennsylvania also contains 99 square miles in the Lake Ontario basin, encompassing the headwaters of the Genesee River. Approximately 2,000 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.<sup>19</sup>

The total withdrawal amount from the basin for Pennsylvania was 38 mgd (143 mld), a 6 percent decrease from the 2018 reported withdrawal of 40 mgd (153 mld). 82 percent (31 mgd or 118 mld) of the total withdrawal amount was used for public water supply purposes.

No diversions were reported in 2019. The total consumptive use was 4 mgd (15 mld). The public water supply sector made up the majority (79 percent) of the total consumptive use.

The water use data was provided by the Pennsylvania Department of Environmental Protection (DEP). Reporting compliance varied among water use sectors from 88 percent for the irrigation sector to 100 percent for the self-supply commercial and institutional, self-supply industrial, and self-supply thermoelectric power production (once-through cooling) sectors. Depending upon sector, withdrawals were either metered, partially metered, or calculated. Water use was estimated for one facility due to its closure in December 2019 and subsequent non-compliance.

Although several sectors experienced substantially large relative changes in water withdrawal from 2018, these changes fell within typical fluctuations and the large relative differences could largely be attributed to the small total volume of water withdrawn.

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<sup>18</sup> Pennsylvania Department on Environmental Protection Coastal Resources Management Program, <https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/About-the-Program.aspx>

<sup>19</sup> Pennsylvania Department of Environmental Protection, Pennsylvania's Watershed Regions: Great Lakes, [http://files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/WaterAtlas/05-great\\_lakes\\_region.pdf](http://files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/WaterAtlas/05-great_lakes_region.pdf)



**Table 18a.** Pennsylvania 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	30	0	2	31	0	0	3
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	1	1	3	0	0	0
Self-Supply Industrial	4	0	0	4	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
<b>Total</b>	<b>33</b>	<b>2</b>	<b>3</b>	<b>38</b>	<b>0</b>	<b>0</b>	<b>4</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	112	0	6	118	0	0	12
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	1	0	1	0	0	1
Self-Supply Livestock	0	5	5	10	0	0	1
Self-Supply Industrial	13	0	0	14	0	0	1
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
<b>Total</b>	<b>125</b>	<b>7</b>	<b>11</b>	<b>143</b>	<b>0</b>	<b>0</b>	<b>15</b>

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

## Québec

Much of Québec's population lives in the Great-Lakes St. Lawrence River watershed. The portion of the St. Lawrence River included in the Great Lakes-St. Lawrence Basin 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.

The total withdrawal amount from the basin for Québec was 1,237 mgd (4,681 mld), a nominal (less than one percent) increase from the 2018 withdrawal total of 1,245 mgd (4,714 mld). 73 percent of the withdrawal was used for public water supply purposes at 900 mgd (3,408 mld). The industrial sector made up 25 percent of total withdrawals at 312 mgd (1,180 mld).

The total diversion amount was 3 mgd (11 mld) for public supply purposes from the St. Lawrence River. The total consumptive use amount was 175 mgd (663 mld) or 14 percent of the total withdrawal amount. The primary water use sectors contributing to the total consumptive use were public supply at 135 mgd (511 mld) and self-supply industrial at 30 mgd (113 mld).

Starting with 2012 data, the province of Québec began its data collection program which gathers estimated or metered water use data reported by water users. Québec began collecting water use reports from the irrigation (agricultural users), livestock, and aquaculture sectors in 2016. Due to new sectors reporting and a relatively new legal system for water withdrawals, Québec data quality and compliance rates are a continual focus for improvement, and figures in this year's report for 2018 and 2019 diversion returns reflect this work. Reporting compliance rates increased overall in 2019 as a result of these ongoing efforts, with rates varying among water use sectors from 16 percent in the livestock sector to 78 percent for public water supply.

There was a 31 percent (4 mgd or 34 mld) decrease in water withdrawals for other self-supply due to one less water user in the sector. No further notable changes from 2018 water use by Québec facilities were reported.

**Table 19a.** Québec 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	638	201	62	900	0	3	135
Self-Supply Commercial and Institutional	1	5	1	6	0	0	1
Self-Supply Irrigation	0	4	1	5	0	0	4
Self-Supply Livestock	0	4	0	4	0	0	0
Self-Supply Industrial	132	162	18	312	0	0	30
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	5	3	0	9	0	0	4
<b>Total</b>	<b>776</b>	<b>380</b>	<b>81</b>	<b>1,237</b>	<b>0</b>	<b>3</b>	<b>175</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,415	760	233	3,408	0	11	511
Self-Supply Commercial and Institutional	2	18	4	24	0	0	6
Self-Supply Irrigation	1	16	2	19	0	0	17
Self-Supply Livestock	0	17	0	17	0	0	0
Self-Supply Industrial	500	614	66	1,180	0	0	113
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	18	13	2	33	0	0	17
<b>Total</b>	<b>2,936</b>	<b>1,438</b>	<b>307</b>	<b>4,681</b>	<b>0</b>	<b>11</b>	<b>663</b>

*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 also lives. Over 1.6 million Wisconsin residents get their drinking water from Lake Michigan or Lake Superior.<sup>20</sup>

The total reported water withdrawal amount from the basin for Wisconsin was 3,802 mgd (14,394 mld), an eight percent decrease from the 2018 water withdrawal total of 4,154 mgd (15,725 mld). Ninety-nine percent of withdrawals came from the Lake Michigan watershed. The primary water use sectors were thermoelectric power production (once-through cooling), public water supply, and industrial.

The net reported diversion was 2 mgd (7 mld) from the Lake Michigan watershed. Diversions out of the Lake Michigan watershed totaled 6 mgd (24 mld), 98 percent of which was for public water supply purposes. Of the total diversion amount, 4 mgd (17 mld) were returned to the Lake Michigan basin. The total consumptive use was 107 mgd (407 mld). The primary consumptive uses came from public water supply, thermoelectric power production (once-through cooling), and irrigation.

The water use data was provided by the Wisconsin Department of Natural Resources. Reporting compliance varied among water use sectors from 95 percent for the livestock and commercial and institutional sectors to 100 percent for the thermoelectric power production and public water supply sectors. Data was not estimated for the facilities that did not report water use.

Notable changes from 2018 water use by Wisconsin facilities include:

- A 26 percent (10 mgd or 38 mld) decrease in irrigation water withdrawal due to weather conditions, with 2019 being the wettest year ever recorded in Wisconsin. Consumptive use associated with irrigation decreased by 27 percent, contributing to a 13 percent reduction in total consumptive use.
- A 63 percent (3 mgd or 12 mld) decrease in net diversion due to the Pleasant Prairie Power Plant being fully inoperative in 2019 after going offline in May 2018. For the same reason, the self-supply thermoelectric power production (recirculated cooling) water withdrawal decreased to zero.

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<sup>20</sup> Wisconsin Department of Natural Resources. 2019. <https://storymaps.arcgis.com/stories/746865c012064b6e8f0a89a4affe6499>

**Table 20a.** Wisconsin 2019 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	231	21	44	296	0	2	36
Self-Supply Commercial and Institutional	2	6	2	9	0	0	0
Self-Supply Irrigation	0	2	26	28	0	0	20
Self-Supply Livestock	0	13	15	28	0	0	5
Self-Supply Industrial	1	94	14	108	0	0	13
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,224	107	0	3,331	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
<b>Total</b>	<b>3,458</b>	<b>243</b>	<b>102</b>	<b>3,802</b>	<b>0</b>	<b>2</b>	<b>107</b>

*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 2019 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	876	79	166	1,121	0	7	135
Self-Supply Commercial and Institutional	6	23	7	35	0	0	2
Self-Supply Irrigation	0	7	99	106	0	0	74
Self-Supply Livestock	0	49	57	107	0	0	20
Self-Supply Industrial	4	354	52	410	0	0	51
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,203	406	0	12,609	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	6	0	0	0
<b>Total</b>	<b>13,089</b>	<b>919</b>	<b>385</b>	<b>14,394</b>	<b>0</b>	<b>7</b>	<b>407</b>

*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 consider Public Water Supplies. This category also includes water for mobile homes, hospitals, schools, air conditioning and other similar uses not covered under a public supply. In addition, this category includes amusement and recreational water uses such as snowmaking and water slides.

### Self-Supply Irrigation

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

### Self-Supply Livestock

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

### Self-Supply Industrial

Industrial water includes water used in the manufacture of metals, chemicals, paper, food and beverage, and other products, as well as mining water use. Mining water use includes water used in the extraction or washing of minerals, for example solids, such as coal and ores, and liquids such as crude petroleum and natural gas. Water used in quarrying and milling is also included in the industrial category. Brine extraction from oil and gas operations is not included. Withdrawals and consumptive uses for industrial and mining purposes (including dewatering operations) recorded under another category (e.g., public supply) will not be recorded here. Once initially reported, water used in a closed cycle (recirculation) will not be reported as a withdrawal. “Make-up water<sup>21</sup>” 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.

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<sup>21</sup> For industrial boiler systems, make-up water is the raw water, softened water or demineralized water required for steam generation. <http://www.pdhcenter.com/courses/m165/m165content.pdf>

### **Self-Supply Thermoelectric Power Production (Recirculated cooling)**

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

### **Off-Stream Hydroelectric Power Production**

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

### **In-Stream Hydroelectric Water Use**

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

### **Other Self Supply**

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