



# Annual Report of the Great Lakes Regional Water Use Database

Representing 2018 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 2018 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, the Great Lakes and St. Lawrence Governors and premiers (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. The 2018 annual water use report presents the seventh dataset that was assembled by the GLC using the updated data collection and reporting protocols.

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 2019 to improve data quality and describes the quality of data for the 2018 annual report.

## Overview

### Improving Data Quality

Together with the Great Lakes-St. Lawrence Governors and Premiers, the GLC is working with the states and provinces to improve data collection, reporting, quality, accuracy, and compatibility. To guide the preparation of 2018 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 2018 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.

During data processing, some inconsistencies in reporting methods for interbasin and intrabasin water diversions were identified. The GLC reviewed these inconsistencies with each jurisdiction that reported water diversions to ensure accurate net diversion<sup>1</sup> figures were reported in 2018. Moving forward, the GLC will work with the states and provinces to establish a more robust protocol for reporting outgoing diversions, returns to the Basin, and net diversions.

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

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<sup>1</sup> Net diversion is the net change of water to the Great Lakes-St. Lawrence River Basin caused by interbasin diversions, calculated by subtracting incoming diversions from outgoing diversions.

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.

Minnesota and Ohio report 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, Minnesota's compliance program successfully emphasizes permit holders' obligations to report their water withdrawals.

Québec is still developing its reporting program and working to improve compliance among users. Baseline data accuracy in Quebec is also being improved, which resulted in a decrease in compliance rates from 2017.

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

Sector	IL	IN	MI	MN	NY	OH	ONT	PA	QC	WI
Public Water Supply	100	100	99	100	95	100	100	98	74	100
Self-Supply Commercial & Institutional	100	92	85	100	86	100	96	100	54	96
Self-Supply Irrigation	30	94	70	100	91	100	97	83	37	97
Self-Supply Livestock	-	89	70	100	90	100	98	90	16	95
Self-Supply Industrial	100	96	85	100	92	100	94	100	66	97
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	100	95	100	100	100	100	100	-	100
Self-Supply Thermoelectric Power Production (Recirculated cooling)	-	100	95	100	92	100	-	-	-	100
Off-Stream Hydroelectric Power Production	-	-	-	100	100	100	-	-	-	-
In-Stream Hydroelectric Water Use	-	-	-	100	100	-	99	-	-	-
Other Self-Supply	100	88	85	100	100	100	98	-	57	100

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

## Great Lakes Regional Water Use for 2018

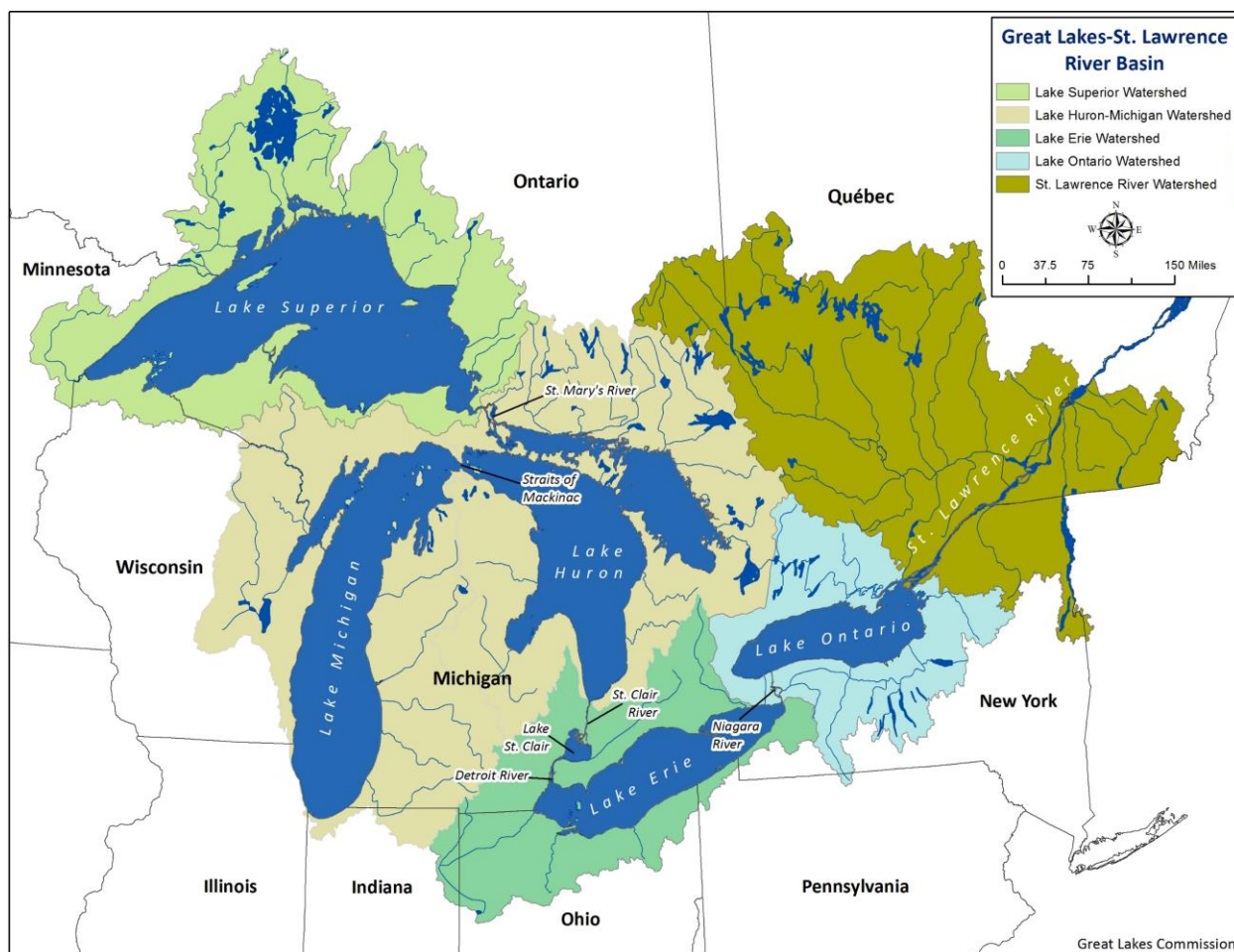


Figure 1. Great Lakes-St. Lawrence River Basin

The Great Lakes and the 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>2</sup>

In 2018, the total reported withdrawal amount for the Great Lakes-St. Lawrence River Basin, excluding in-stream hydroelectric water use<sup>3</sup>, was 40,363 million gallons per day (mgd) or 152,790 million liters per day (mld). This total represents a decrease of approximately 4 percent from the 2017 reported total withdrawal amount of 42,146 mgd (159,541 mld). 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. Nearly five percent of the total reported amount withdrawn (1,914 mgd or 7,245 mld) was consumed or otherwise lost to the Basin.

<sup>2</sup> An Olympic size swimming pool holds at least 2.5 million liters.

<sup>3</sup> In-stream hydroelectric water use is frequently excluded from withdrawal totals because jurisdictions are not required to report use for this sector. This category includes “run of the river” use, which is not considered a water withdrawal or consumptive use in the standard sense.

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 B. 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).

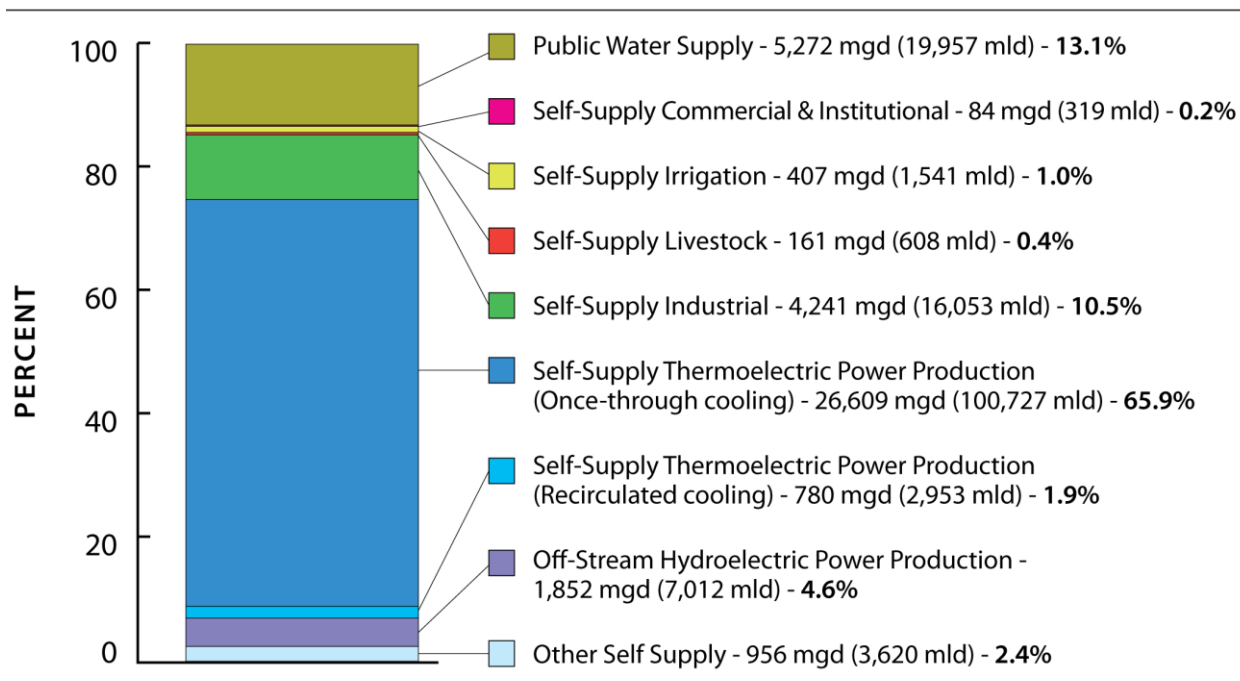


Figure 2. Water Withdrawals by Water Use Sector (excluding in-stream hydroelectric water use)

The Lake Michigan watershed had the greatest withdrawal, 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).

Figure 4 shows total withdrawals, excluding in-stream hydroelectric water use, by jurisdiction. In-stream hydroelectric water use is not included in withdrawal totals because jurisdictions are not required to report use for this sector. Ontario, which has the largest land area of the 10 jurisdictions (108,680 square miles or 281,377 square kilometers over five watersheds), was the largest withdrawer of Great Lakes water. Facilities in Ontario withdrew 15,905 mgd (60,207 mld) or 39 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 40 mgd (153 mld).

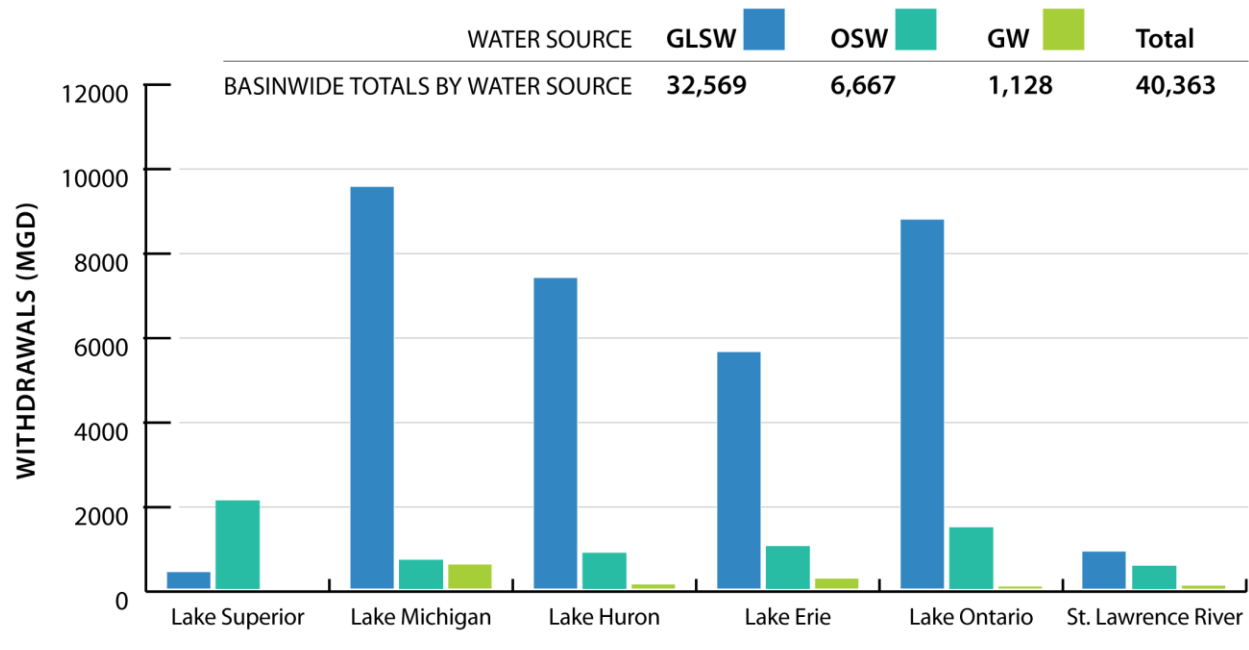


Figure 3. Water Withdrawals by Watershed in mgd (excludes in-stream hydroelectric water use)

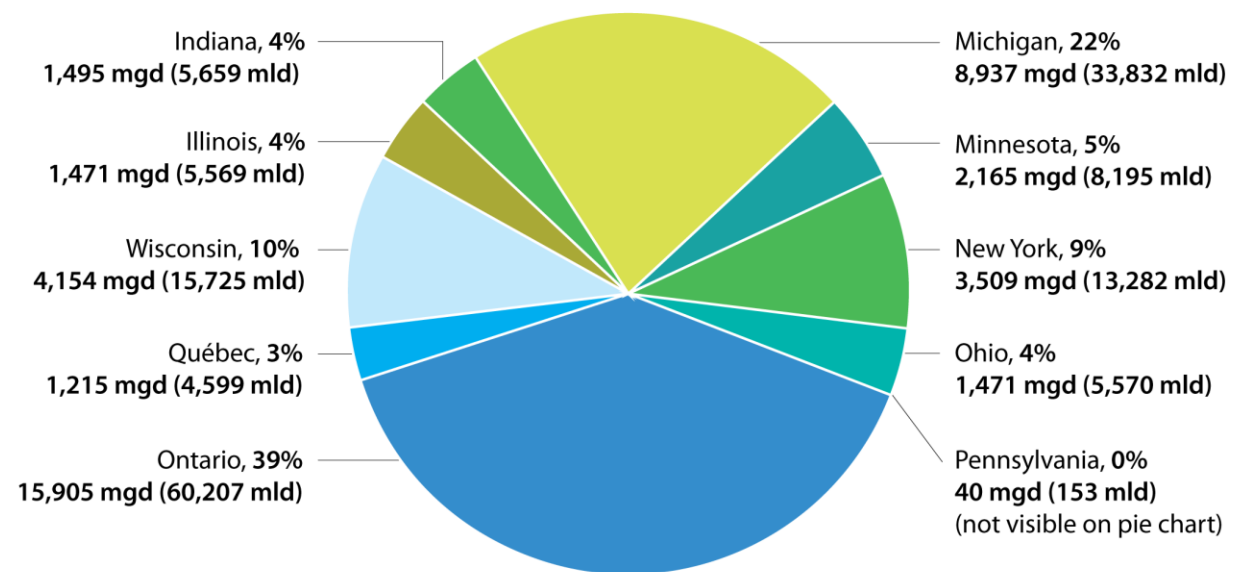


Figure 4. Water Withdrawals by Jurisdiction (excludes in-stream hydroelectric water use)



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 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 trends in consumptive use.

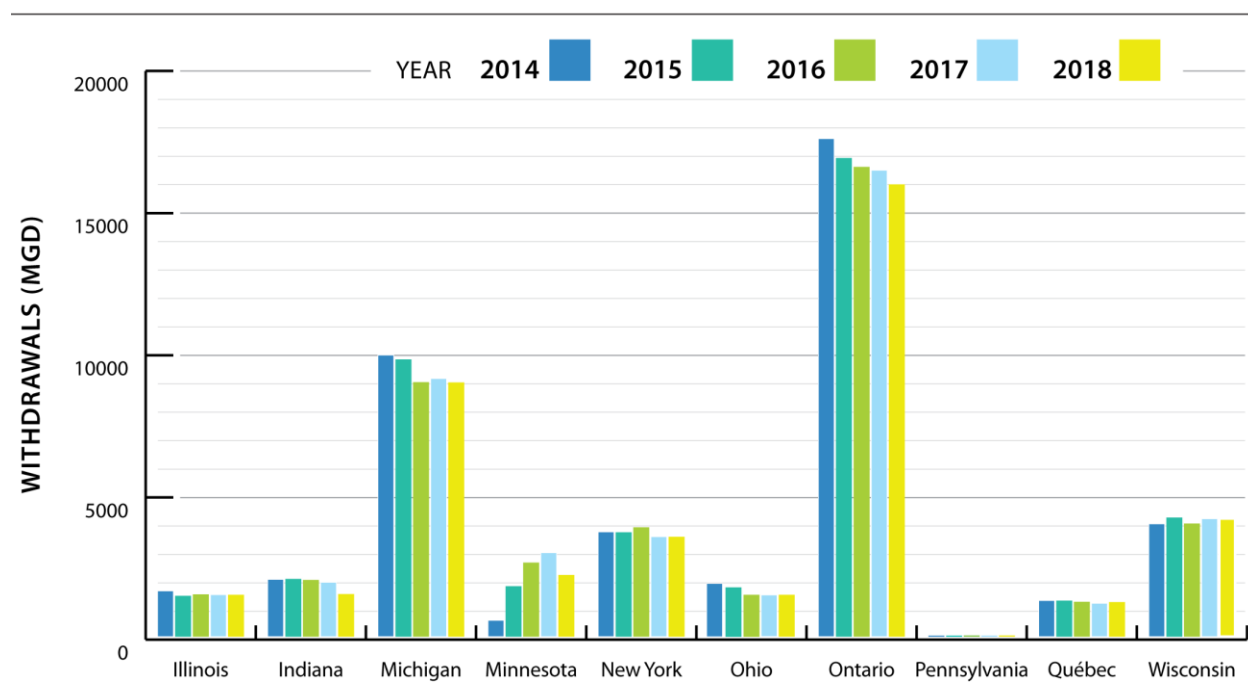
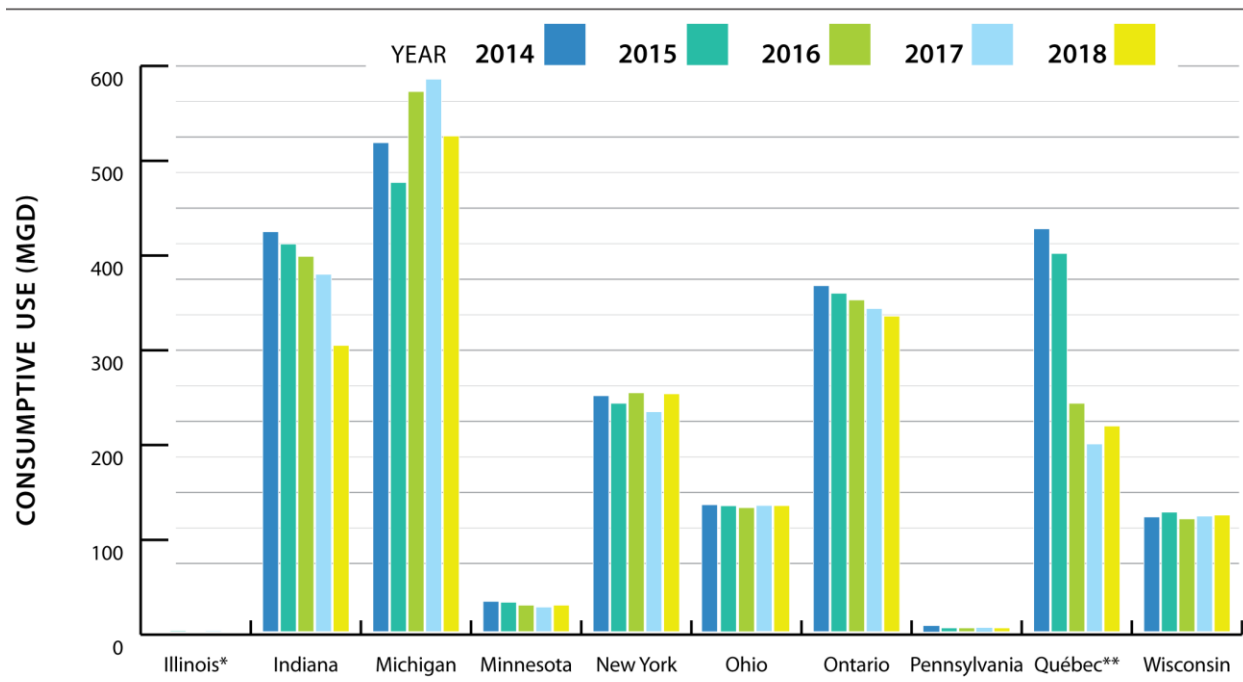


Figure 5. Water withdrawals by jurisdiction over the past five years.



**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.

## Self-supply Irrigation

For most jurisdictions, self-supply irrigation water use is variable from year-to-year. Varying precipitation patterns across the Basin explain the fluctuations in water use from this sector. For example, while self-supply irrigation water use decreased in Michigan in 2018, it increased in Wisconsin. This was largely the result of the timing of hot and dry weather in Wisconsin. Three jurisdictions (Illinois, Minnesota and Pennsylvania) reported negligible water use from the self-supply irrigation sector.

## Hydroelectric Power Generation

Water use for hydroelectric power generation (both in-stream and off-stream) is the largest single sector of water use, typically representing more than 95 percent of the region's total water use. In-stream hydroelectric power production continues to be a major 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>4</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

<sup>4</sup> U.S. Energy Information Administration. 2018. <http://www.eia.gov/state/?sid=NY>

this water use by all jurisdictions. In-stream hydroelectric power water use is not considered a withdrawal because the water remains in the water body and has negligible water consumption.

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 but are typically left out of the overall discussion in those sections. In 2018, a total withdrawal of 1,852 mgd (7,012 mld) was reported for the off-stream hydroelectric power production sector, a decrease from 2017 reported withdrawal of 2,665 mgd (10,088 mld).

## Diversions and Consumptive Uses

Diversions and consumptive uses of water are key components of the regional water use database. See Appendix A for the Compact's and Agreement's definitions of these terms. These reflect water not returned to the source watershed. These water use data are considered particularly informative for assessing the cumulative hydrologic effects of water use in the region.

The total reported 2018 diversion out of the Great Lakes-St. Lawrence River Basin was 1,126 mgd or 4,263 mld. More than 85 percent (963 mgd, 3,646 mld) of this amount was associated with the Illinois diversion, which takes water from Lake Michigan and discharges it into the Mississippi River watershed. The reported amount associated with the Illinois diversion decreased by 2 percent compared to the 2017 reported amount of 985 mgd (3,730 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 a number of diversions into the Basin, including the Long Lac and Ogoki diversions (incoming diversions from the Hudson Bay watershed into northern Lake Superior), which contributed 3,119 mgd (11,808 mld) to the Basin in 2018. This is a decrease from the 2017 reported amount of 4,040 mgd (15,293 mld). Despite this decrease, 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 incoming diversions minus outgoing diversions, is a gain of 2,037 mgd<sup>6</sup> (7,713 mld), meaning that more water is diverted into the Basin than is 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

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

<sup>6</sup> The Great Lakes Regional Water Use Database records net incoming diversions with a negative sign and net outgoing diversions with a positive sign.

consumptive use that was determined through measurement. The total reported consumptive use for the Basin for 2018 was 1,914 mgd (7,245 mld) – a 5 percent drop from the 2017 total consumptive use amount of 2,017 mgd (7,633 mld). The industrial and irrigation sectors were primary contributors to this reduction in the total consumptive use amount. At 694 mgd (2,629 mld), the Lake Michigan watershed had the largest consumptive use total among the five lake watersheds and the St. Lawrence River watershed.

Considering both consumptive use and diversions, the Basin gained a total of 124 mgd (468 mld) in 2018. By comparison, the Basin gained a total of 911 mgd (3,448 mld) in 2017. Tables 2a to 4b summarize water withdrawals, diversions, and consumptive uses by watershed, sector, and jurisdiction for 2018.

**Table 2a. Basin 2018 Water Use Data Summary by Watershed in mgd**

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	407	31,957	17	32,382	0	-3,108	45
Lake Michigan	9,528	689	586	10,803	0	1,040	694
Lake Huron	26,231	16,471	116	42,817	42	0	142
Lake Erie	55,383	1,655	253	57,291	3,749	-15	423
Lake Ontario	49,894	98,404	65	148,363	-3,791	42	363
St. Lawrence River	172,824	55,170	91	228,084	0	3	247
<b>Total</b>	<b>314,267</b>	<b>204,346</b>	<b>1,128</b>	<b>519,740</b>	<b>0</b>	<b>-2,037</b>	<b>1,914</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 2018 Water Use Data Summary by Watershed in mld**

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	1,542	120,970	65	122,577	-1	-11,763	169
Lake Michigan	36,067	2,609	2,217	40,892	1	3,938	2,629
Lake Huron	99,293	62,350	438	162,081	157	0	538
Lake Erie	209,647	6,264	960	216,871	14,192	-58	1,600
Lake Ontario	188,870	372,501	245	561,616	-14,350	158	1,374
St. Lawrence River	654,210	208,840	344	863,394	0	12	936
<b>Total</b>	<b>1,189,629</b>	<b>773,534</b>	<b>4,268</b>	<b>1,967,431</b>	<b>0</b>	<b>-7,713</b>	<b>7,245</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 2018 Water Use Data Summary by Sector in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,036	777	459	5,272	0	885	582
Self-Supply Commercial and Institutional	6	69	9	84	0	2	15
Self-Supply Irrigation	3	128	276	407	0	0	358
Self-Supply Livestock	0	99	61	161	0	0	16
Self-Supply Industrial	2,634	1,303	303	4,241	0	34	573
Self-Supply Thermoelectric Power Production (Once-through cooling)	24,988	1,619	2	26,609	0	0	248
Self-Supply Thermoelectric Power Production (Recirculated cooling)	738	39	3	780	0	3	80
Off-Stream Hydroelectric Power Production	0	1,852	0	1,852	0	0	0
In-Stream Hydroelectric Water Use	281,698	197,679	0	479,377	0	-3,119	0
Other Self Supply	162	779	15	956	0	159	41
<b>Total</b>	<b>314,267</b>	<b>204,346</b>	<b>1,128</b>	<b>519,740</b>	<b>0</b>	<b>-2,037</b>	<b>1,914</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 2018 Water Use Data Summary by Sector in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	15,278	2,942	1,738	19,957	0	3,349	2,204
Self-Supply Commercial and Institutional	24	262	33	319	0	7	56
Self-Supply Irrigation	11	485	1,045	1,541	0	0	1,356
Self-Supply Livestock	1	375	232	608	0	-1	61
Self-Supply Industrial	9,972	4,934	1,147	16,053	0	128	2,171
Self-Supply Thermoelectric Power Production (Once-through cooling)	94,590	6,130	6	100,727	0	0	938
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,795	147	12	2,953	0	10	304
Off-Stream Hydroelectric Power Production	0	7,012	0	7,012	0	0	0
In-Stream Hydroelectric Water Use	1,066,344	748,297	0	1,814,640	0	-11,808	0
Other Self Supply	614	2,950	56	3,620	0	602	154
<b>Total</b>	<b>1,189,629</b>	<b>773,534</b>	<b>4,268</b>	<b>1,967,431</b>	<b>0</b>	<b>-7,713</b>	<b>7,245</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 2018 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	1,471	0	0	1,471	0	963	0
Indiana	1,337	72	86	1,495	0	80	302
Michigan	7,331	1,064	542	8,937	0	0	523
Minnesota	161	4,437	6	4,603	0	12	28
New York	146,837	82,268	35	229,140	0	45	251
Ohio	976	419	77	1,471	0	-23	133
Ontario	151,676	115,335	202	267,213	0	-3,119	333
Pennsylvania	35	2	3	40	0	0	4
Québec	770	384	61	1,215	0	0	217
Wisconsin	3,673	366	115	4,154	0	5	123
<b>Total</b>	<b>314,267</b>	<b>204,346</b>	<b>1,128</b>	<b>519,740</b>	<b>0</b>	<b>-2,037</b>	<b>1,914</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 2018 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	5,568	0	0	5,569	0	3,646	1
Indiana	5,061	271	327	5,659	0	302	1,141
Michigan	27,752	4,029	2,050	33,832	0	0	1,980
Minnesota	608	16,795	23	17,426	0	45	105
New York	555,837	311,418	134	867,389	0	169	949
Ohio	3,695	1,585	290	5,570	0	-86	505
Ontario	574,156	436,589	765	1,011,510	0	-11,808	1,259
Pennsylvania	133	7	12	153	0	0	15
Québec	2,914	1,454	232	4,599	0	2	823
Wisconsin	13,905	1,385	435	15,725	0	19	466
<b>Total</b>	<b>1,189,629</b>	<b>773,534</b>	<b>4,268</b>	<b>1,967,431</b>	<b>0</b>	<b>-7,713</b>	<b>7,245</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

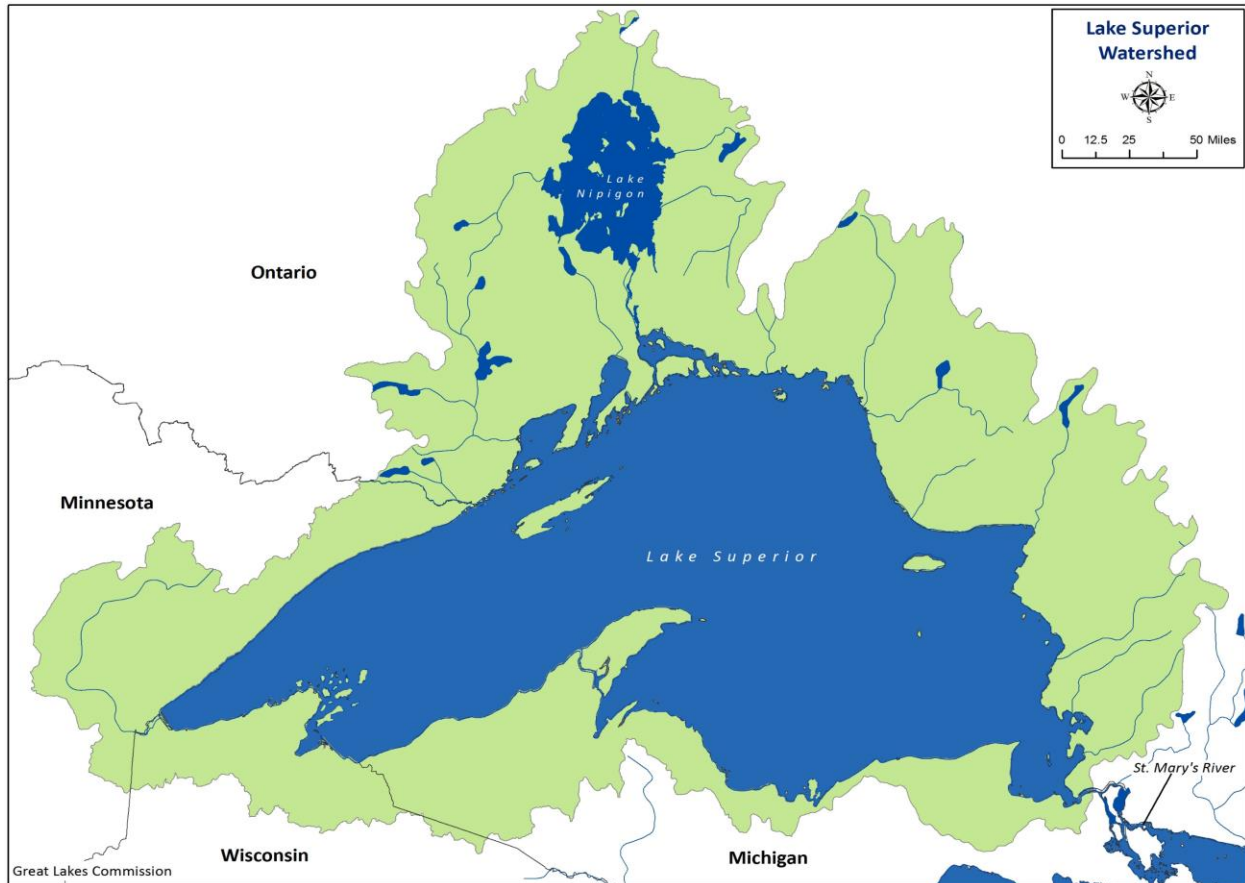


Figure 7. Lake Superior Watershed

### 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>7</sup> Its surface area is roughly the size of South Carolina, or approximately 31,700 square miles (82,103 square kilometers)

<sup>7</sup>Minnesota Sea Grant. 2017.  
<http://www.seagrant.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  
**Population in the Watershed:** United States 444,000; Canada 229,000. Total: 673,000

## Water Withdrawals

Four jurisdictions – Michigan, Minnesota, Ontario, and Wisconsin – share the Lake Superior watershed and collectively withdrew 2,519 mgd (9,536 mld) in 2018, excluding reported in-stream hydroelectric water use of 29,862 mgd (113,042 mld). This represents a 25 percent decrease from the 2017 total withdrawal amount of 3,382 mgd (12,803 mld). This overall decrease is mainly explained by a decrease in withdrawals in Minnesota’s off-stream hydroelectric power production sector, which declined from 2,605 mgd (9,861 mld) in 2017 to 1,792 mgd (6,785 mld) in 2018. The off-stream hydroelectric power production sector represents over 70 percent of all withdrawals from the watershed excluding in-stream hydroelectric power production. The self-supply industrial sector (316 mgd or 1,196 mld) and thermoelectric power production, once-through cooling (314 mgd or 1,188 mld) were the other significant water use sectors.

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, 83 percent (2,094 mgd or 7,929 mld) of the total reported withdrawal amount from the watershed came from other surface waters. The remaining withdrawals came directly from Lake Superior (16 percent or 407 mgd or 1,542 mld) and groundwater (1 percent or 17 mgd or 65 mld).

## Water Diversions and Consumptive Uses

The reported net water gain<sup>8</sup> (3,063 mgd or 11,596 mld) in the Lake Superior watershed was largely attributable to the Long Lac and Ogoki diversions in Northern Ontario, incoming interbasin diversions that totaled 3,119 mgd or 11,808 mld. On average, these diversions into the basin are about twice the volume of the Illinois diversion out of the Basin, though in 2018 they were over three times the Illinois diversion volume. Outgoing interbasin diversions totaling 12 mgd (45 mld) were reported in Minnesota, most of which was associated with the self-supply industrial sector. A small amount of the outgoing diversion (0.03 mgd or 0.1 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 45 mgd (169 mld). Self-supply industrial use (34 mgd or 130 mld) was the largest contributor to total consumptive use for the watershed, followed by public water supply (6 mgd or 25 mld). Total consumption in 2018 increased by 14 percent (5 mgd or 20 mld) from 2017, likely due to increases in industrial water uses.

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<sup>8</sup> Net incoming diversions are reflected as negative values on tables in this report.



**Table 5a.** Lake Superior Watershed 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	44	3	13	59	0	0	6
Self-Supply Commercial and Institutional	2	0	0	2	0	0	0
Self-Supply Irrigation	0	0	1	1	0	0	1
Self-Supply Livestock	0	24	2	27	0	0	0
Self-Supply Industrial	151	164	1	316	0	12	34
Self-Supply Thermoelectric Power Production (Once-through cooling)	210	103	0	314	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,792	0	1,792	0	0	0
In-Stream Hydroelectric Water Use	0	29,862	0	29,862	0	-3,119	0
Other Self Supply	0	7	0	7	0	0	0
<b>Total</b>	<b>407</b>	<b>31,957</b>	<b>17</b>	<b>32,382</b>	<b>0</b>	<b>-3,108</b>	<b>45</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	165	10	49	225	-1	0	25
Self-Supply Commercial and Institutional	8	1	0	9	0	0	1
Self-Supply Irrigation	0	1	2	3	0	0	3
Self-Supply Livestock	1	93	8	102	0	0	1
Self-Supply Industrial	571	620	4	1,196	0	45	130
Self-Supply Thermoelectric Power Production (Once-through cooling)	796	391	2	1,188	0	0	10
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	6,785	0	6,785	0	0	0
In-Stream Hydroelectric Water Use	0	113,042	0	113,042	0	-11,808	0
Other Self Supply	0	28	0	28	0	0	0
<b>Total</b>	<b>1,542</b>	<b>120,970</b>	<b>65</b>	<b>122,577</b>	<b>-1</b>	<b>-11,763</b>	<b>169</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

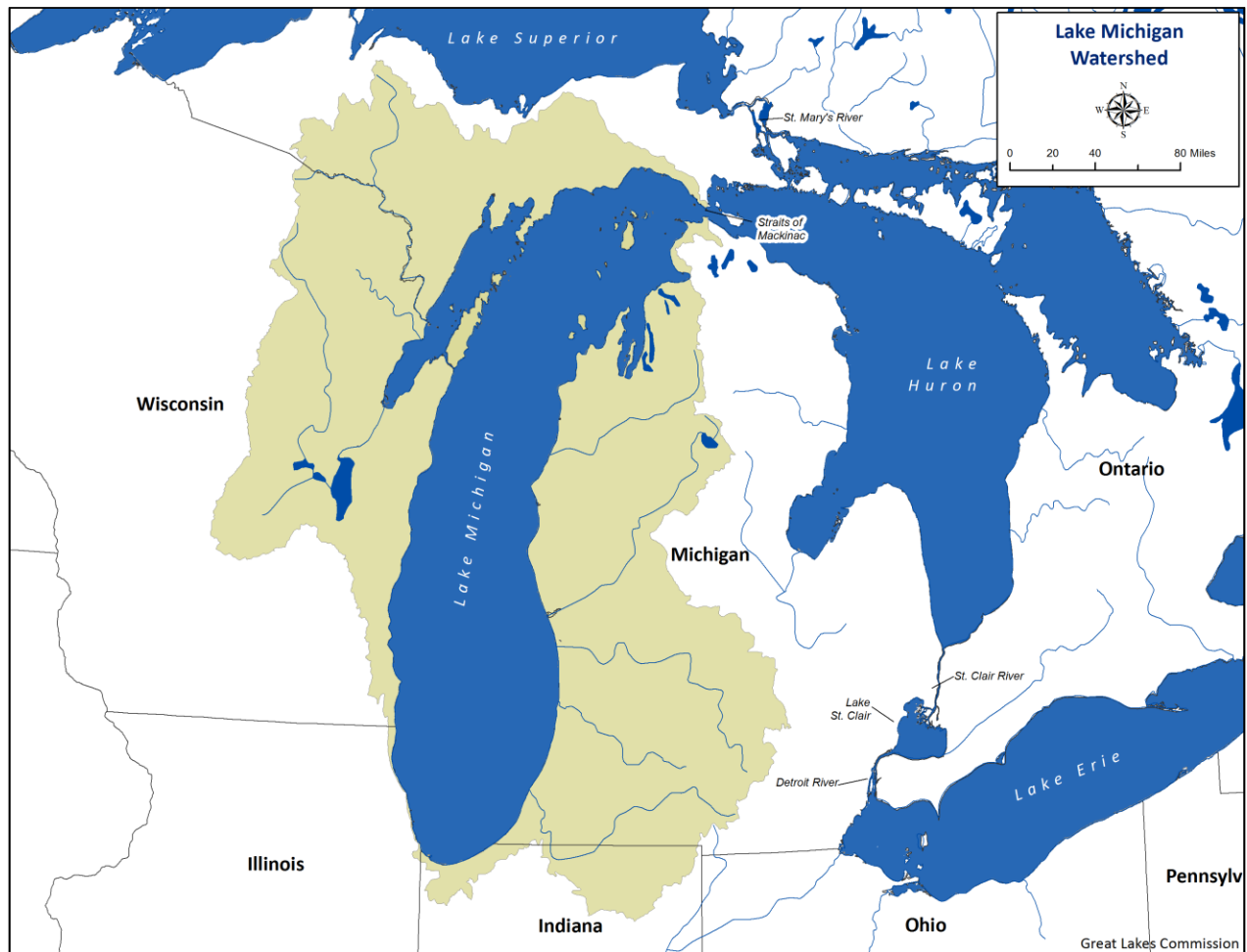


Figure 8. Lake Michigan Watershed

### 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 12 million people call the Lake Michigan watershed home; about a third of the entire population of the Great Lakes-St. Lawrence River Basin lives in the Lake Michigan watershed.

#### 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

**Population in the Watershed:** 12,052,743

## **Water Withdrawals**

Four jurisdictions share the Lake Michigan watershed – Illinois, Indiana, Michigan, and Wisconsin – and collectively withdrew 10,803 mgd (40,892 mld) in 2018. No in-stream hydroelectric use was reported. The primary water uses were thermoelectric power, once-through cooling (7,047 mgd or 26,675 mld); self-supply industrial use (1,562 mgd or 5,912 mld); and public water supply (1,518 mgd or 5,746 mld). Surface water from Lake Michigan was the primary source of water withdrawals in the watershed, accounting for 88 percent of total withdrawals (9,528 mgd or 36,067 mld).

## **Water Diversions and Consumptive Uses**

Reported net water loss from the Lake Michigan watershed totaled 1,735 mgd (6,566 mld). This represents 16 percent of total withdrawals. There was an 8 percent reduction in Lake Michigan water loss from 2017. Water loss primarily consisted of the Illinois diversion of 963 mgd or 3,646 mld and consumptive use, which totaled 694 mgd (2,629 mld) between the four Lake Michigan jurisdictions. The sectors that represent the majority of consumptive use in the watershed were self-supply industrial use (277 mgd or 1,049 mld), self-supply irrigation (252 mgd or 953 mld), and public water supply (86 mgd or 327 mld).

**Table 6a.** Lake Michigan Watershed 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,270	22	227	1,518	0	862	86
Self-Supply Commercial and Institutional	3	9	6	18	0	2	1
Self-Supply Irrigation	0	47	241	289	0	0	252
Self-Supply Livestock	0	24	21	44	0	0	8
Self-Supply Industrial	1,279	205	78	1,562	0	22	277
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,693	352	1	7,047	0	0	52
Self-Supply Thermoelectric Power Production (Recirculated cooling)	131	29	2	162	0	3	18
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	151	2	10	163	0	151	0
<b>Total</b>	<b>9,528</b>	<b>689</b>	<b>586</b>	<b>10,803</b>	<b>0</b>	<b>1,040</b>	<b>694</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,806	81	858	5,746	1	3,264	327
Self-Supply Commercial and Institutional	12	35	21	67	0	7	4
Self-Supply Irrigation	1	179	913	1,092	0	0	953
Self-Supply Livestock	0	89	78	167	0	0	29
Self-Supply Industrial	4,840	777	295	5,912	0	83	1,049
Self-Supply Thermoelectric Power Production (Once-through cooling)	25,337	1,334	4	26,675	0	0	196
Self-Supply Thermoelectric Power Production (Recirculated cooling)	497	108	9	614	0	10	69
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	573	6	39	619	0	573	0
<b>Total</b>	<b>36,067</b>	<b>2,609</b>	<b>2,217</b>	<b>40,892</b>	<b>1</b>	<b>3,938</b>	<b>2,629</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 fresh water 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  
**Population in the Watershed:** United States 1,483,872; Canada 1,476,487. Total: 2,960,359

## **Water Withdrawals**

Only two jurisdictions – Michigan and Ontario – share the watershed and collectively withdrew 8,342 mgd (31,577 mld) in 2018, excluding reported in-stream hydroelectric water use (34,476 mgd or 130,504 mld), in 2018. This is a 2 percent decrease from the 2017 water withdrawal amount of 8,506 mgd (32,198 mld).

The primary water uses were thermoelectric power, once-through cooling (7,915 mgd or 29,961 mld); public water supply (202 mgd or 764 mld); and self-supply industrial use (154 mgd or 585 mld). Excluding in-stream hydroelectric water use, Lake Huron surface water was the source of 88 percent of the total withdrawals in the watershed.

## **Water Diversions and Consumptive Uses**

Reported net water loss from the Lake Huron watershed was 184 mgd (695 mld), of which 142 mgd or 538 mld is associated with consumptive uses. Thermoelectric power production, once-through cooling (68 mgd or 258 mld) and public water supply (25 mgd or 93 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 change (all water diverted remained in the Basin). Over 90 percent of the diversion was into the Lake Erie watershed.

**Table 7a. Lake Huron Watershed 2018 Water Use Data Summary in mgd**

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	115	50	38	202	42	0	25
Self-Supply Commercial and Institutional	0	2	0	3	0	0	0
Self-Supply Irrigation	0	8	18	27	0	0	24
Self-Supply Livestock	0	17	12	29	0	0	0
Self-Supply Industrial	14	94	47	154	0	0	16
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,241	674	0	7,915	0	0	68
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	10	1	10	0	0	9
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	18,861	15,615	0	34,476	0	0	0
Other Self Supply	0	1	0	2	0	0	0
<b>Total</b>	<b>26,231</b>	<b>16,471</b>	<b>116</b>	<b>42,817</b>	<b>42</b>	<b>0</b>	<b>142</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 2018 Water Use Data Summary in mld**

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	434	188	142	764	157	0	93
Self-Supply Commercial and Institutional	0	9	2	11	0	0	1
Self-Supply Irrigation	0	32	70	102	0	0	92
Self-Supply Livestock	0	65	44	109	0	0	1
Self-Supply Industrial	51	356	178	585	0	0	59
Self-Supply Thermoelectric Power Production (Once-through cooling)	27,410	2,551	0	29,961	0	0	258
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	37	2	40	0	0	34
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	71,396	59,108	0	130,504	0	0	0
Other Self Supply	2	4	0	6	0	0	0
<b>Total</b>	<b>99,293</b>	<b>62,350</b>	<b>438</b>	<b>162,081</b>	<b>157</b>	<b>0</b>	<b>538</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

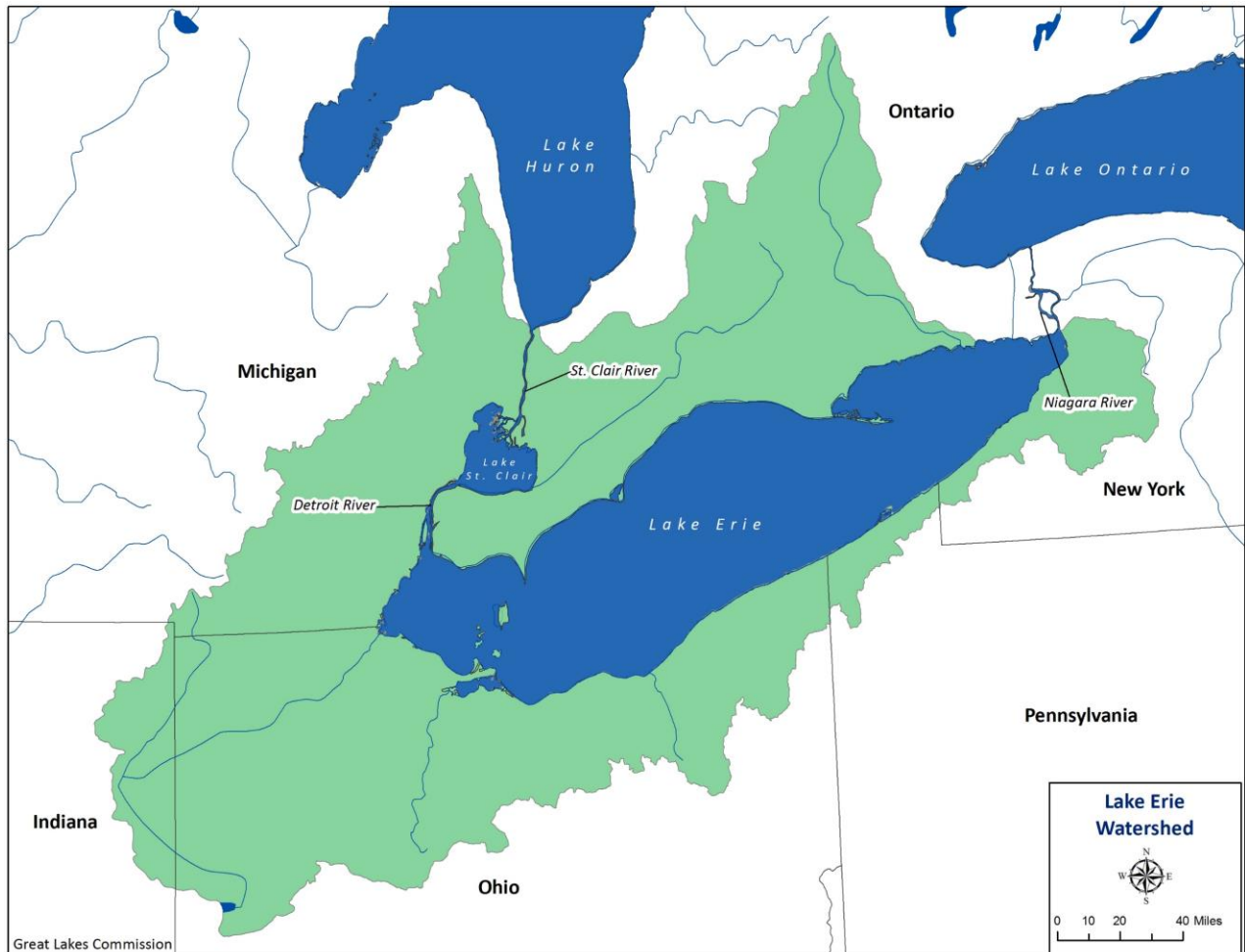


Figure 10. Lake Erie Watershed

### 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 12.5 million people, representing more than one-third of the entire population of the Great Lakes-St. Lawrence River Basin.

#### 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

**Population in the Watershed:** United States, est. 10,640,671; Canada est. 1,892,306. Total: est. 12,532,977



## Water Withdrawals

Six jurisdictions – Indiana, Michigan, New York, Ohio, Ontario and Pennsylvania – share the watershed and collectively withdrew 6,884 mgd (26,057 mld) in 2018, excluding reported in-stream hydroelectric water use, which accounted for an additional 50,408 mgd (190,813 mld). There was a 3 percent decrease in water withdrawals from the 2017 total withdrawal amount of 6,906 mgd (26,142 mld). Aside from water used for in-stream hydroelectric power generation purposes, the primary water uses were thermoelectric power generation, once-through cooling (totaling 3,883 mgd or 14,697 mld); public water supply (1,516 mgd or 5,740 mld), and self-supply industrial use (1,212 mgd or 4,587 mld).

Lake Erie surface water was the source of 80 percent of the total withdrawals in the watershed. However, other surface water and groundwater were the only sources of Indiana’s water use, primarily supporting the public water supply sector.

## Water Diversions and Consumptive Uses

Reported net water loss from the Lake Erie watershed totaled 4,157 mgd (15,734 mld). The largest loss from the Lake Erie watershed is due to the Welland Canal intrabasin diversion, which diverted 3,789 mgd (14,192 mld) to the Lake Ontario watershed for other self-supply and 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.

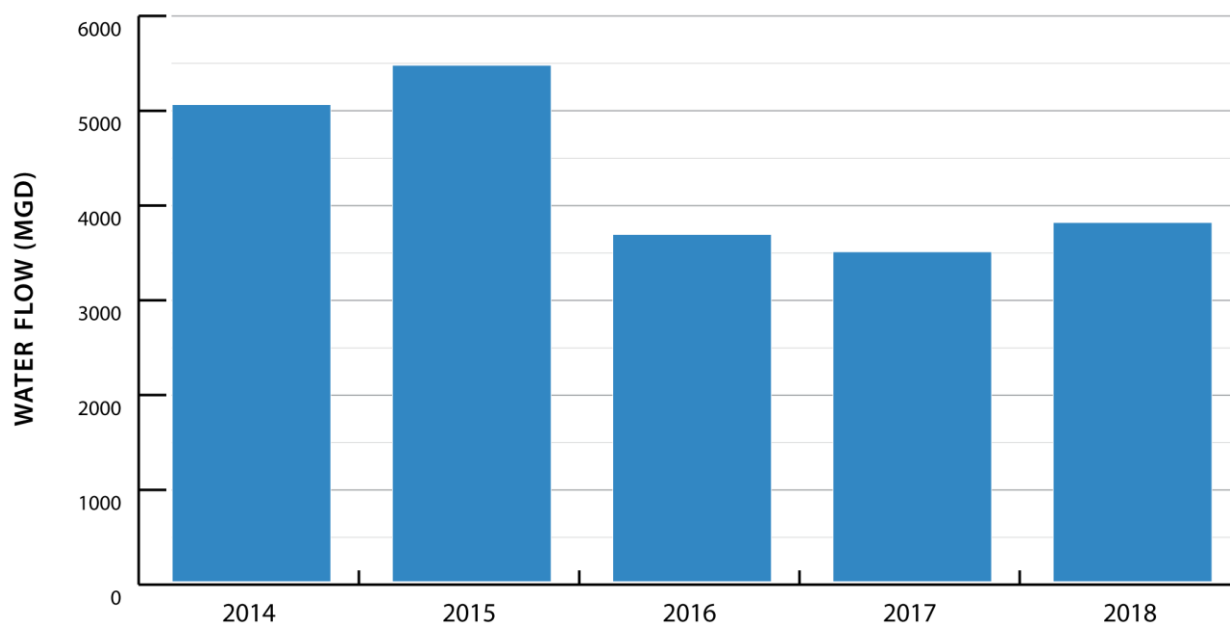


Figure 11. Flow through the Welland Canal over the past five years.

Additionally, incoming intrabasin diversions were reported in Ontario and Michigan for the public water sector, totaling 40 mgd (151 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 net gain (for the Lake Erie watershed and Great Lakes-St. Lawrence River Basin) of 15 mgd (58 mld).

Consumptive use in the Lake Erie watershed totaled 423 mgd (1,600 mld). The major consumptive uses were for public water supply (195 mgd or 740 mld) and the self-supply industrial sector (98 mgd or 371 mld).

Table 8a. Lake Erie Watershed 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,221	185	110	1,516	-40	9	195
Self-Supply Commercial and Institutional	1	3	1	4	0	0	0
Self-Supply Irrigation	1	41	14	56	0	0	50
Self-Supply Livestock	0	7	7	14	0	0	1
Self-Supply Industrial	708	387	117	1,212	0	0	98
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,507	376	0	3,883	0	0	43
Self-Supply Thermoelectric Power Production (Recirculated cooling)	178	0	0	178	0	0	32
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	49,767	641	0	50,408	0	0	0
Other Self Supply	1	16	4	21	3,789	-24	3
<b>Total</b>	<b>55,383</b>	<b>1,655</b>	<b>253</b>	<b>57,291</b>	<b>3,749</b>	<b>-15</b>	<b>423</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	4,623	699	418	5,740	-151	35	740
Self-Supply Commercial and Institutional	3	10	3	16	0	0	2
Self-Supply Irrigation	4	155	52	210	0	0	189
Self-Supply Livestock	0	26	28	54	0	-1	4
Self-Supply Industrial	2,678	1,465	443	4,587	0	0	371
Self-Supply Thermoelectric Power Production (Once-through cooling)	13,276	1,422	0	14,697	0	0	163
Self-Supply Thermoelectric Power Production (Recirculated cooling)	672	2	0	674	0	0	120
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	188,389	2,425	0	190,813	0	0	0
Other Self Supply	3	61	15	79	14,342	-92	12
<b>Total</b>	<b>209,647</b>	<b>6,264</b>	<b>960</b>	<b>216,871</b>	<b>14,192</b>	<b>-58</b>	<b>1,600</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

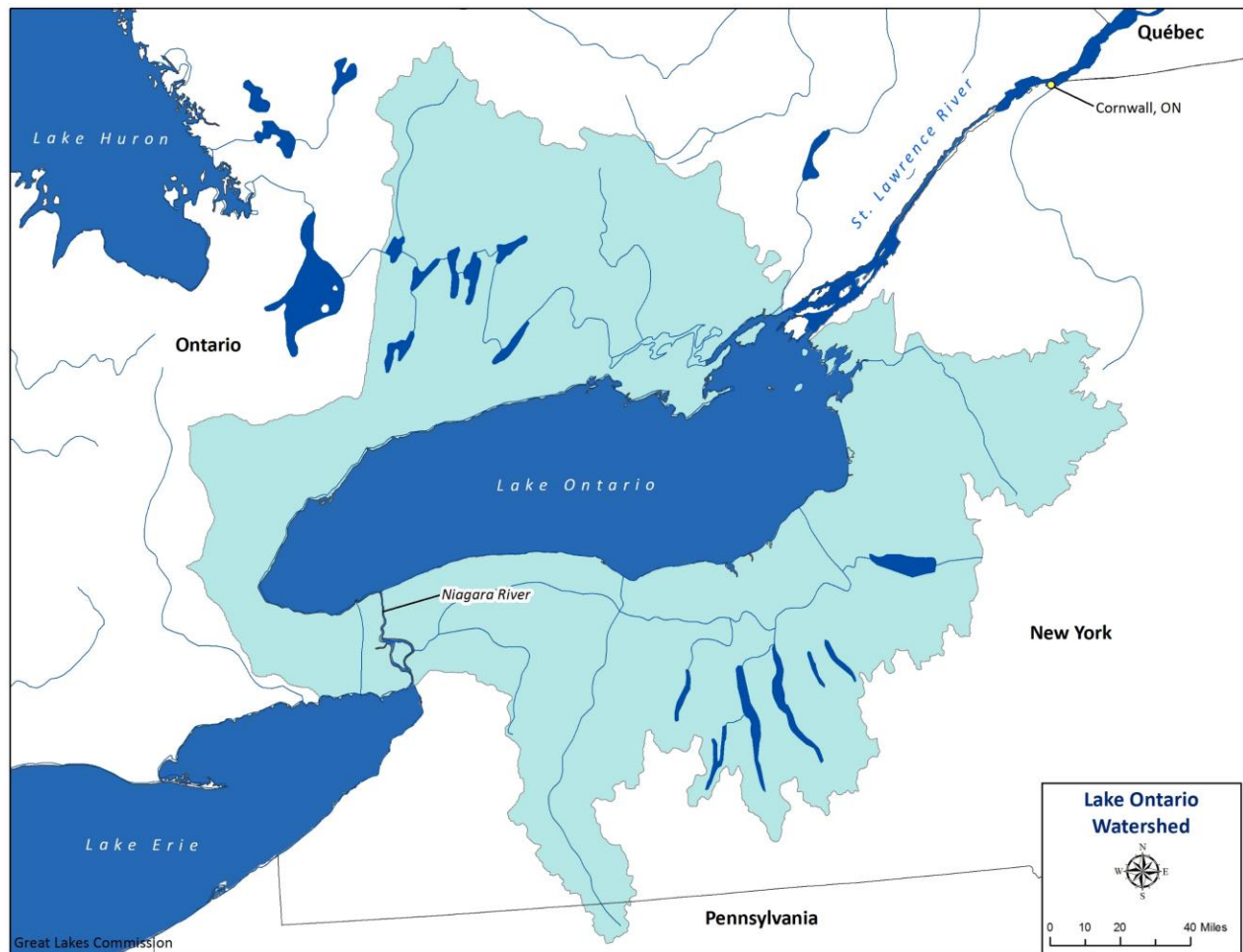


Figure 12. Lake Ontario Watershed

### 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 one-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

**Population in the Watershed:** United States, est. 2,856,360; Canada est. 2,835,818. Total: est. 5,692,178

## Water Withdrawals

Three jurisdictions – New York, Ontario and Pennsylvania – share the watershed and collectively withdrew 10,276 mgd (38,898 mld) of water in 2018, excluding reported in-stream hydroelectric water use. Reported in-stream hydroelectric water use accounted for an additional 138,087 mgd (522,718 mld). There was a 3 percent decrease in water withdrawn from the 2017 withdrawal amount of 10,560 mgd (39,975 mld). Aside from withdrawals for in-stream hydroelectric power generation purposes, the primary water uses were for thermoelectric power generation, once-through cooling (7,397 mgd or 27,999 mld); public water supply (938 mgd or 3,549 mld), and other self-supply uses (751 mgd or 2,842 mld).

Lake Ontario surface water was the source of 85 percent of the total withdrawals in the watershed, with 14 percent of withdrawals coming from other surface water and less than 1 percent from groundwater.

## Water Diversions and Consumptive Uses

The Lake Ontario watershed reported a net water gain of 3,386 mgd (12,818 mld)<sup>9</sup>. The net water gain in the Lake Ontario watershed is predominately attributable to the Welland Canal (3,789 mgd or 14,342 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 (148 mld) were reported in New York, associated with the Erie Barge Canal and public water supply for the City of Rome and the City of Glen Falls. Consumptive use in the Lake Ontario watershed totaled 363 mgd (1,374 mld), which is comprised primarily by consumptive use for public water supply (116 mgd or 441 mld); thermoelectric power production, once-through cooling (82 mgd or 309 mld); and self-supply industrial use (72 mgd or 274 mld).

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<sup>9</sup> Net incoming diversions are reflected as negative values on tables in this report.

**Table 9a.** Lake Ontario Watershed 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	723	200	14	938	-2	10	116
Self-Supply Commercial and Institutional	0	43	1	44	0	0	9
Self-Supply Irrigation	1	27	1	30	0	0	27
Self-Supply Livestock	0	16	14	30	0	0	3
Self-Supply Industrial	312	251	35	598	0	0	72
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,284	113	0	7,397	0	0	82
Self-Supply Thermoelectric Power Production (Recirculated cooling)	429	0	0	429	0	0	21
Off-Stream Hydroelectric Power Production	0	60	0	60	0	0	0
In-Stream Hydroelectric Water Use	41,143	96,944	0	138,087	0	0	0
Other Self Supply	1	750	0	751	-3,789	32	32
<b>Total</b>	<b>49,894</b>	<b>98,404</b>	<b>65</b>	<b>148,363</b>	<b>-3,791</b>	<b>42</b>	<b>363</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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,738	759	52	3,549	-7	37	441
Self-Supply Commercial and Institutional	0	162	3	165	0	0	35
Self-Supply Irrigation	4	103	5	113	0	0	101
Self-Supply Livestock	0	60	53	112	0	0	11
Self-Supply Industrial	1,180	952	133	2,265	0	0	274
Self-Supply Thermoelectric Power Production (Once-through cooling)	27,573	426	0	27,999	0	0	309
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,625	0	0	1,625	0	0	81
Off-Stream Hydroelectric Power Production	0	227	0	227	0	0	0
In-Stream Hydroelectric Water Use	155,745	366,973	0	522,718	0	0	0
Other Self Supply	3	2,839	0	2,842	-14,342	121	123
<b>Total</b>	<b>188,870</b>	<b>372,501</b>	<b>245</b>	<b>561,616</b>	<b>-14,350</b>	<b>158</b>	<b>1,374</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 watershed and collectively withdrew 1,540 mgd (5,830 mld) of the water in 2018, excluding in-stream hydroelectric water use, which accounted for an additional 226,084 mgd (857,563 mld). The 2018 withdrawals are a 3 percent increase from the 2017 withdrawal total of 1,496 mgd (5,665 mld). Aside from in-stream hydroelectric, the primary water uses were public water supply (1,039 mgd or 3,933 mld), and self-supply industrial use (399 mgd or 1,509 mld).

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 36 percent of the total, with remaining portion of the total withdrawal amount (6 percent) coming from groundwater sources.

## **Water Diversions and Consumptive Uses**

Net water loss in the St. Lawrence River watershed totaled 247 mgd (948 mld). This net loss includes a diversion amount of 3 mgd (12 mld) for public supply purposes in New York and Québec and a combined consumptive use amount of 247 mgd (936 mld). The largest consumptive uses were the for the public water supply sector at 153 mgd (589 mld) and self-supply industrial sector at 76 mgd (288 mld).



**Table 10a.** St. Lawrence River Watershed 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	663	318	58	1,039	0	3	153
Self-Supply Commercial and Institutional	0	12	1	13	0	0	3
Self-Supply Irrigation	0	4	1	5	0	0	5
Self-Supply Livestock	0	11	6	17	0	0	4
Self-Supply Industrial	172	202	25	399	0	0	76
Self-Supply Thermoelectric Power Production (Once-through cooling)	52	2	0	54	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	171,927	54,617	0	226,544	0	0	0
Other Self Supply	9	3	0	12	0	0	5
<b>Total</b>	<b>172,824</b>	<b>55,170</b>	<b>91</b>	<b>228,084</b>	<b>0</b>	<b>3</b>	<b>247</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,510	1,204	219	3,933	0	12	579
Self-Supply Commercial and Institutional	2	45	4	51	0	0	13
Self-Supply Irrigation	1	15	4	20	0	0	19
Self-Supply Livestock	0	42	22	64	0	0	15
Self-Supply Industrial	651	764	94	1,509	0	0	288
Self-Supply Thermoelectric Power Production (Once-through cooling)	198	7	0	206	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	650,814	206,749	0	857,563	0	0	0
Other Self Supply	33	12	2	47	0	0	19
<b>Total</b>	<b>654,210</b>	<b>208,840</b>	<b>344</b>	<b>863,394</b>	<b>0</b>	<b>12</b>	<b>936</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 2018 was 1,471 mgd (5,569 mld), a marginal decrease from 2017 (1,474 mgd or 5,580 mld). The largest uses of reported water were public water supply at 809 mgd or 3,064 mld (55 percent of the total withdrawal amount) and thermoelectric power production, once-through cooling at 478 mgd or 1,811 mld (32 percent of the total withdrawal amount). Both sectors experienced small increases in withdrawals from 2017. The primary source for all withdrawals was Lake Michigan.

The Illinois Diversion, which diverts water from Lake Michigan through the Chicago Area Water System (CAWS) into the Mississippi River watershed, is comprised of three elements: public water supply, stormwater runoff, and direct diversion. 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 amount of water diverted for public water supply, self-supply commercial and institutional, and self-supply industrial was 812 mgd (3,073 mld). The diversion amount supporting other uses (i.e., discretionary diversion) was 151 mgd (573 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, except for two self-supply irrigation users (both of which were below the 0.1 mgd reporting threshold).

Notable changes in 2018 water use by Illinois facilities include:

- A nominal (less than one percent) increase in water withdrawals by the City of Chicago for public water supply, the first year that withdrawals have not decreased since 1994; and
- A 16 percent decrease in diversions to operate and maintain the CAWS.

**Table 11a.** Illinois 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	809	0	0	809	0	809	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	30	0	0	30	0	1	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	478	0	0	478	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	151	0	0	151	0	151	0
<b>Total</b>	<b>1,471</b>	<b>0</b>	<b>0</b>	<b>1,471</b>	<b>0</b>	<b>963</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,064	0	0	3,064	0	3,064	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	113	0	0	113	0	2	1
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,811	0	0	1,811	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	573	0	0	573	0	573	0
<b>Total</b>	<b>5,568</b>	<b>0</b>	<b>0</b>	<b>5,569</b>	<b>0</b>	<b>3,646</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 2018, the total reported water withdrawal amount from the Basin for Indiana was 1,495 mgd (5,659 mld). The largest uses were self-supply industrial (1,219 mgd or 4,615 mld) and public water supply (169 mgd or 638 mld). The industrial sector reported a substantial decrease in withdrawal amount from 2017, while the public water supply withdrawal was consistent with the 2017 withdrawal amount.

The total reported diversion amount for Indiana was 80 mgd (302 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 (50 mgd or 189 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 21 mgd (81 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 in the Upper Wabash watershed. The water distributed through that portion of the system (about eight mgd or 29 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 302 mgd (1,141 mld), with the industrial sector in the Lake Michigan watershed (245 mgd or 926 mld or 81 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 88 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 in 2018 water use by Indiana facilities include:

- An 84 percent (189 mgd or 716 mld) decrease in water withdrawal for self-supply thermoelectric power production (once-through cooling), largely due to a power plant retirement in May 2018.
- A 20 percent (7 mgd or 27 mld) decrease in self-supply irrigation water withdrawal amount, which is likely attributable to wet conditions during August and September 2018.
- A 15 percent (224 mgd or 849 mld) decrease in self-supply industrial water withdrawal amount. Approximately half of this is due to a facility evaluating calculation methods and identifying that

water use had previously been over-estimated, and the other half is due to two facilities shutting down portions of their sites.

- A 15 percent (6 mgd or 22 mld) increase in water withdrawal for self-supply thermoelectric power production (recirculated cooling) from 2017, though withdrawal amount is consistent with typical use in this sector. 2017 recirculating cooling use was anomalously low due to a being system taken offline for several months.

**Table 12a.** Indiana 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	88	34	46	169	0	58	20
Self-Supply Commercial and Institutional	0	0	1	1	0	0	0
Self-Supply Irrigation	0	4	24	28	0	0	25
Self-Supply Livestock	0	0	3	3	0	0	1
Self-Supply Industrial	1,202	7	10	1,219	0	21	245
Self-Supply Thermoelectric Power Production (Once-through cooling)	36	0	0	36	0	0	1
Self-Supply Thermoelectric Power Production (Recirculated cooling)	11	27	2	39	0	0	10
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>1,337</b>	<b>72</b>	<b>86</b>	<b>1,495</b>	<b>0</b>	<b>80</b>	<b>302</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	334	130	174	638	0	221	77
Self-Supply Commercial and Institutional	0	0	5	5	0	0	1
Self-Supply Irrigation	0	14	92	105	0	0	94
Self-Supply Livestock	0	0	10	10	0	0	3
Self-Supply Industrial	4,550	27	38	4,615	0	81	926
Self-Supply Thermoelectric Power Production (Once-through cooling)	136	0	0	136	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	41	101	7	149	0	0	38
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>5,061</b>	<b>271</b>	<b>327</b>	<b>5,659</b>	<b>0</b>	<b>302</b>	<b>1,141</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>10</sup>

In 2018, the total reported water withdrawal amount from the Basin for Michigan was 8,937 mgd (33,832 mld), a decrease of less than 2 percent from the 2017 total water withdrawal amount of 9,079 mgd (34,368 mld). The largest use was thermoelectric power production, once-through cooling, with 6,713 mgd (25,410 mld) withdrawn, or 75 percent of Michigan’s total withdrawal. 49 percent of Michigan’s total withdrawal amount (4,383 mgd or 16,591 mld) came from the Lake Erie watershed, mainly used for thermoelectric power production. 42 percent of total withdrawal amount (3,769 mgd or 14,265 mld) came from the Lake Michigan watershed, followed by the Lake Huron watershed at 581 mgd or 2,200 mld (7 percent) and the Lake Superior watershed at 205 mgd or 775 mld (2 percent).

The total amount of consumptive use in Michigan was 523 mgd or 1,980 mld (approximately six percent of the total withdrawal amount), with self-supply irrigation being the largest contributor to consumptive use at 241 mgd (914 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 in Michigan.

Notable changes in 2018 water use by Michigan facilities include:

- A 13 percent (136 mgd or 515 mld) decrease in public water supply, primarily attributable to stabilized reporting and processes following the transition period of Great Lakes Water Authority assuming operations for Detroit’s water supply.
- A 16 percent (51 mgd or 194 mld) decrease in self-supply irrigation withdrawals, in part due to a small number of large users delinquent in reporting 2018 data.
- An 11 percent (98 mgd or 370 mld) decrease in self-supply industrial sector primarily due to reduced dewatering at a limestone quarry.
- An 18 percent (9 mgd or 34 mld) decrease in livestock due to four aquaculture facilities not reporting and decreased use at a hatchery.

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<sup>10</sup> Michigan Office of the Great Lakes. [https://www.michigan.gov/documents/deq/deq-og1-waterstrategy\\_538161\\_7.pdf](https://www.michigan.gov/documents/deq/deq-og1-waterstrategy_538161_7.pdf)

Table 13a. Michigan 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	676	15	198	890	0	0	111
Self-Supply Commercial and Institutional	0	1	3	5	0	0	1
Self-Supply Irrigation	0	57	211	268	0	0	241
Self-Supply Livestock	0	36	5	42	0	0	1
Self-Supply Industrial	344	379	111	834	0	0	83
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,151	560	1	6,713	0	0	52
Self-Supply Thermoelectric Power Production (Recirculated cooling)	158	12	1	171	0	0	33
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	4	11	15	0	0	0
<b>Total</b>	<b>7,331</b>	<b>1,064</b>	<b>542</b>	<b>8,937</b>	<b>0</b>	<b>0</b>	<b>523</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,561	56	751	3,368	0	0	421
Self-Supply Commercial and Institutional	1	6	12	19	0	0	2
Self-Supply Irrigation	2	216	797	1,015	0	0	914
Self-Supply Livestock	0	138	20	158	0	0	6
Self-Supply Industrial	1,304	1,433	420	3,156	0	0	316
Self-Supply Thermoelectric Power Production (Once-through cooling)	23,286	2,120	4	25,410	0	0	198
Self-Supply Thermoelectric Power Production (Recirculated cooling)	597	46	4	647	0	0	124
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	15	42	58	0	0	0
<b>Total</b>	<b>27,752</b>	<b>4,029</b>	<b>2,050</b>	<b>33,832</b>	<b>0</b>	<b>0</b>	<b>1,980</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. 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.<sup>11</sup>

Excluding in-stream hydroelectric water use (2,439 mgd or 9,231 mld), the total withdrawal amount from the Basin for Minnesota was 2,165 mgd (8,195 mld), a decrease of 27 percent from the total withdrawn amount for 2017 (2,952 mgd or 11,175 mld). The majority of the decrease in water withdrawal is attributable to substantial reduction in withdrawal for off-stream hydroelectric power production, which remains the sector with the largest use. The second largest use sector is self-supply industrial at 218 mgd (825 mld). In 2017, 92 percent of total withdrawals came from other surface water within the Lake Superior watershed (1,998 mgd or 7,564 mld), while only 7 percent, or 161 mgd (608 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 12 mgd (45 mld) was for self-supply industrial purposes. Total consumptive use was 28 mgd (105 mld). 2018 is the first year that consumptive use increased in Minnesota since 2012. The majority of consumptive use was for industrial purposes (22 mgd or 83 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 in 2018 water use by Minnesota facilities include:

- A 31 percent (813 mgd or 3,076 mld) decrease in water use for off-stream hydroelectric power production, which is considered typical fluctuation despite representing the largest year-to-year change in volume across all use sectors.
- A 10 percent (10 mgd or 36 mld) increase in withdrawal for self-supply thermoelectric power production (once-through cooling), due to increased demand for mine processing.
- An 8 percent (16 mgd or 60 mld) increase in self-supply industrial sector water withdrawals, which can be attributed to a plant returning to using its long-term average amount of water after two years of reduced operations.

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<sup>11</sup> Minnesota Pollution Control Agency. 2013. <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/basins/lake-superior-basin/index.html>

**Table 14a.** Minnesota 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	27	1	6	34	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	124	94	0	218	0	12	22
Self-Supply Thermoelectric Power Production (Once-through cooling)	7	103	0	111	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	1,792	0	1,792	0	0	0
In-Stream Hydroelectric Water Use	0	2,439	0	2,439	0	0	0
Other Self Supply	0	7	0	7	0	0	0
<b>Total</b>	<b>161</b>	<b>4,437</b>	<b>6</b>	<b>4,603</b>	<b>0</b>	<b>12</b>	<b>28</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	101	5	21	127	0	0	13
Self-Supply Commercial and Institutional	8	1	0	9	0	0	1
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	1	0	0	1	0	0	1
Self-Supply Industrial	470	355	0	825	0	45	83
Self-Supply Thermoelectric Power Production (Once-through cooling)	28	391	2	420	0	0	8
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	6,785	0	6,785	0	0	0
In-Stream Hydroelectric Water Use	0	9,231	0	9,231	0	0	0
Other Self Supply	0	28	0	28	0	0	0
<b>Total</b>	<b>608</b>	<b>16,795</b>	<b>23</b>	<b>17,426</b>	<b>0</b>	<b>45</b>	<b>105</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>12</sup>

Excluding in-stream hydroelectric water use (225,631 mgd or 854,106 mld), the total withdrawal amount from for New York was 3,509 mgd (13,282 mld), a nominal (less than 0.03 percent) decrease from 2017 (3,518 mgd or 13,318 mld). Most withdrawals were from the Lake Ontario watershed, with 3,048 mgd (11,538 mld) withdrawn, 87 percent of New York's total withdrawal amount.

The thermoelectric power production sectors (both once-through and recirculated cooling) withdrew 1,793 mgd (6,788 mld), which represented 51 percent of the total withdrawal amount. Public water supply was the next largest water use sector, withdrawing 490 mgd (1,854 mld) and accounting for 14 percent of the total withdrawals. 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 2018 total (net) diversion amount for New York was 45 mgd (169 mld), of which 13 mgd (48 mld) was for public supply<sup>13</sup> and 32 mgd (121 mld) for other self-supply purposes<sup>14</sup>. The total consumptive use amount was 251 mgd (949 mld). The largest consumptive uses were attributed to industrial purposes at 67 mgd (254 mld) and public water supply at 60 mgd (229 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 86 percent for the self-supply commercial and institutional sector to 100 percent for the hydroelectric power, self-supply thermoelectric power production (once-through cooling), and other self-supply sectors. New York state 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 a requirement to report use, which should support continued improvement in compliance. Additionally, reporting facilities were required to complete a water conservation program and corresponding report section that included conservation and efficiency measures. These measures included source metering, water auditing, leak detection and repair, recycling and reuse, and reductions during periods of drought.

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

- A 165 percent (19 mgd or 73 mld) increase in water withdrawals for self-supply irrigation, due to the increased number of reporters in this sector.
- An 11 percent (38 mgd or 144 mld) decrease in water withdrawals for the self-supply industrial sector, attributable to decreased use typical with fluctuations in operations.

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<sup>12</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>13</sup> 10 mgd for City of Rome, 3 mgd for City of Glens Falls

<sup>14</sup> 32 mgd for Erie Barge Canal

Table 15a. New York 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	306	166	18	490	0	13	60
Self-Supply Commercial and Institutional	0	49	1	51	0	0	10
Self-Supply Irrigation	0	29	2	31	0	0	28
Self-Supply Livestock	0	16	9	25	0	0	4
Self-Supply Industrial	127	174	5	306	0	0	67
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,251	113	0	1,364	0	0	27
Self-Supply Thermoelectric Power Production (Recirculated cooling)	429	0	0	429	0	0	21
Off-Stream Hydroelectric Power Production	0	60	0	60	0	0	0
In-Stream Hydroelectric Water Use	144,723	80,908	0	225,631	0	0	0
Other Self Supply	0	753	0	753	0	32	33
<b>Total</b>	<b>146,837</b>	<b>82,268</b>	<b>35</b>	<b>229,140</b>	<b>0</b>	<b>45</b>	<b>251</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,158	629	68	1,854	0	48	229
Self-Supply Commercial and Institutional	0	186	5	192	0	0	37
Self-Supply Irrigation	1	110	6	117	0	0	106
Self-Supply Livestock	0	59	35	94	0	0	13
Self-Supply Industrial	479	660	20	1,160	0	0	254
Self-Supply Thermoelectric Power Production (Once-through cooling)	4,737	426	0	5,163	0	0	103
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,625	0	0	1,625	0	0	81
Off-Stream Hydroelectric Power Production	0	227	0	227	0	0	0
In-Stream Hydroelectric Water Use	547,836	306,270	0	854,106	0	0	0
Other Self Supply	0	2,850	0	2,850	0	121	125
<b>Total</b>	<b>555,837</b>	<b>311,418</b>	<b>134</b>	<b>867,389</b>	<b>0</b>	<b>169</b>	<b>949</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 pasture land makes up another five percent of total land use.<sup>15</sup>

The 2018 total reported withdrawal amount from the Basin for Ohio was 1,471 mgd (5,570 mld), a less than one percent decrease from the total withdrawal amount for 2017 (1,458 mgd or 5,518 mld). Primary water use sectors included thermoelectric power production (once-through and recirculated cooling) at 699 mgd (2,645 mld), representing 47 percent of total withdrawal amount; public water supply (520 mgd or 1,970 mld), representing 35 percent; and self-supply industrial (210 mgd or 795 mld), representing 14 percent. 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 48 percent of the total withdrawal amount, respectively.

The total (net) diversion amount was 23 mgd (86 mld) into the Lake Erie watershed.<sup>16</sup> Diversions out of the Lake Erie watershed totaled 14 mgd (52 mld), all for public water supply purposes, and were offset by 37 mgd (139 mld) of incoming diversions, primarily associated with other self-supply. Total consumptive use was 133 mgd (505 mld). 59 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.

No notable changes in 2018 water use by Ohio facilities were reported.

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<sup>15</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>16</sup> Incoming diversions are reflected as negative values on tables in this report.

**Table 16a.** Ohio 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	390	104	27	520	0	2	78
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	29	2	32	0	0	28
Self-Supply Livestock	0	0	1	1	0	0	1
Self-Supply Industrial	63	101	46	210	0	0	4
Self-Supply Thermoelectric Power Production (Once-through cooling)	385	176	0	562	0	0	6
Self-Supply Thermoelectric Power Production (Recirculated cooling)	137	0	0	137	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	9	0	-24	3
<b>Total</b>	<b>976</b>	<b>419</b>	<b>77</b>	<b>1,471</b>	<b>0</b>	<b>-23</b>	<b>133</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	1,475	393	101	1,970	0	6	295
Self-Supply Commercial and Institutional	1	0	0	1	0	0	0
Self-Supply Irrigation	2	110	8	120	0	0	108
Self-Supply Livestock	0	0	3	3	0	-1	2
Self-Supply Industrial	237	384	174	795	0	0	16
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,459	667	0	2,126	0	0	21
Self-Supply Thermoelectric Power Production (Recirculated cooling)	519	0	0	519	0	0	52
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	30	2	35	0	-92	10
<b>Total</b>	<b>3,695</b>	<b>1,585</b>	<b>290</b>	<b>5,570</b>	<b>0</b>	<b>-86</b>	<b>505</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>17</sup>

Excluding in-stream hydroelectric water use (reported amount of 251,308 mgd or 951,303 mld), a total of 15,905 mgd or 60,207 mld was withdrawn from the Basin. The three largest water use categories were thermoelectric power (once-through cooling) at 13,697 mgd (51,847 mld) or 86 percent of the total withdrawal amount; public supply at 1,143 mgd (4,327 mld); and industrial at 993 mgd (3,760 mld). Great Lakes surface water was the primary source for withdrawals in the Lake Huron, Lake Ontario, and St. Lawrence River watersheds, while other surface water was the primary source for withdrawals in the Lake Superior and Lake Erie watersheds.

No diversions out of the Great Lakes-St. Lawrence River Basin were reported for Ontario, while 3,119 mgd (11,808 mld) of water was diverted into the Lake Superior Basin, 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 333 mgd (1,259 mld). The three water use sectors representing the largest consumptive uses were thermoelectric power at 123 mgd (467 mld), public water supply at 137 mgd (519 mld) and industrial at 66 mgd (249 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 94 percent for the self-supply industrial sector to 100 percent for public water supply and thermoelectric power production (once-through cooling).

Notable changes in 2018 water use by Ontario facilities include:

- A 39 percent (4 mgd or 15 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.
- A 35 percent (3.4 mgd or 13 mld) decrease in water withdrawals for self-supply commercial and institutional uses, due in large part to several users decreasing use and dropping below the reporting threshold.
- A 23 percent (921 mgd or 3,485 mld) decrease in amount of water diverted into the Great Lakes basin, primarily due to drier weather conditions, though changes in diversions are also associated with other water balance needs.

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<sup>17</sup> Ontario's Great Lakes Strategy, 2016. <https://www.ontario.ca/page/ontarios-great-lakes-strategy>

Table 17a. Ontario 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	839	237	67	1,143	0	0	137
Self-Supply Commercial and Institutional	0	6	0	6	0	0	1
Self-Supply Irrigation	1	4	1	6	0	0	5
Self-Supply Livestock	0	28	26	54	0	0	0
Self-Supply Industrial	605	282	106	993	0	0	66
Self-Supply Thermoelectric Power Production (Once-through cooling)	13,255	442	0	13,697	0	0	123
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	114,332	0	251,308	0	-3,119	0
Other Self Supply	1	3	1	5	0	0	0
<b>Total</b>	<b>151,676</b>	<b>115,335</b>	<b>202</b>	<b>267,213</b>	<b>0</b>	<b>-3,119</b>	<b>333</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,175	899	253	4,327	0	0	519
Self-Supply Commercial and Institutional	0	22	2	24	0	0	3
Self-Supply Irrigation	4	15	3	23	0	0	20
Self-Supply Livestock	0	105	100	205	0	0	2
Self-Supply Industrial	2,291	1,066	402	3,760	0	0	249
Self-Supply Thermoelectric Power Production (Once-through cooling)	50,174	1,673	0	51,847	0	0	467
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	432,795	0	951,303	0	-11,808	0
Other Self Supply	3	13	4	20	0	0	0
<b>Total</b>	<b>574,156</b>	<b>436,589</b>	<b>765</b>	<b>1,011,510</b>	<b>0</b>	<b>-11,808</b>	<b>1,259</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 40 mgd (153 mld). 80 percent (32 mgd or 110 mld) of the total withdrawal amount was used for public water supply purposes.

No diversions were reported in 2018. 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 83 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.

Although several sectors experienced substantially large relative changes in water withdrawal from 2017, these changes fell within typical fluctuations and the large relative differences could largely be attributed to the small total volume of water withdrawn. Two facilities reported water withdrawals in 2018 that were previously below the reporting threshold.

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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 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	30	0	2	32	0	0	3
Self-Supply Commercial and Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	2	2	3	0	0	0
Self-Supply Industrial	5	0	0	5	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>35</b>	<b>2</b>	<b>3</b>	<b>40</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	115	0	6	122	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	6	6	12	0	0	1
Self-Supply Industrial	18	0	0	18	0	0	2
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>133</b>	<b>7</b>	<b>12</b>	<b>153</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 1,215 mgd (4,599 mld) a 3 percent increase from the 2017 withdrawal total of 1,171 mgd (4,431 mld). The majority (72 percent) of this amount was used for public water supply purposes at 873 mgd (3,305 mld). The industrial sector made up 26 percent of total withdrawals at 316 mgd (1,196 mld).

The total (net) diversion amount was 0.4 mgd (2 mld) for public supply purposes from the St. Lawrence River. The net diversion includes 3 mgd (11 mld) diverted and 2 mgd (9 mld) returned. The total consumptive use amount was 217 mgd (823 mld) or 18 percent of the total withdrawal amount. The primary water use sectors contributing to the total consumptive use were public supply at 131 mgd (496 mld) and self-supply industrial at 72 mgd (273 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. As a result of improved baseline data accuracy, compliance rates decreased overall in 2018, for example in the commercial and institutional (54 percent) and livestock (16 percent) sectors.

Notable changes in 2018 water use by Québec facilities include:

- A 16 percent (45 mgd or 169 mld) increase in self-supply industrial sector water withdrawal, as two new water users were added to the database. The reporters also contributed to the 10 percent (20 mgd or 75 mld) increase in consumptive use.
- A 6 percent (4 mgd or 23 mld) decrease in self-supply livestock water withdrawals, attributed to two water users not reporting 2018 withdrawals.

**Table 19a.** Québec 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	627	197	49	873	0	0	131
Self-Supply Commercial and Institutional	0	5	1	6	0	0	3
Self-Supply Irrigation	0	3	1	4	0	0	3
Self-Supply Livestock	0	4	0	4	0	0	3
Self-Supply Industrial	133	172	11	316	0	0	72
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	9	3	0	12	0	0	5
<b>Total</b>	<b>770</b>	<b>384</b>	<b>61</b>	<b>1,215</b>	<b>0</b>	<b>0</b>	<b>217</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 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	2,373	747	184	3,305	0	2	496
Self-Supply Commercial and Institutional	2	18	2	22	0	0	10
Self-Supply Irrigation	1	10	3	14	0	0	13
Self-Supply Livestock	0	16	0	16	0	0	12
Self-Supply Industrial	504	650	41	1,196	0	0	273
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	33	12	2	47	0	0	19
<b>Total</b>	<b>2,914</b>	<b>1,454</b>	<b>232</b>	<b>4,599</b>	<b>0</b>	<b>2</b>	<b>823</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 20 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 4,154 mgd (15,725 mld), an immaterial increase from the 2017 water withdrawal total of 4,146 mgd (15,696 mld). Ninety-nine percent of withdrawals came from the Lake Michigan watershed. The primary water use sectors were thermoelectric power production (once-through cooling) at 3,649 mgd (13,813 mld), public water supply at 312 mgd (1,182 mld), and industrial at 110 mgd (415 mld).

The total (net) reported diversion was 5 mgd (19 mld) from the Lake Michigan watershed for thermoelectric power production (recirculated cooling) and public water supply purposes. The total consumptive use was 123 mgd (466 mld). The primary consumptive uses came from public water supply (37 mgd or 142 mld), thermoelectric power production (recirculated cooling) (36 mgd or 138 mld), and irrigation (27 mgd or 101 mld).

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 self-supply livestock sector to 100 percent for the thermoelectric and public water supply sectors. Data was not estimated for the facilities that did not report water use.

Notable changes in 2018 water use by Wisconsin facilities include:

- A 56 percent (6 mgd or 24 mld) decrease in net diversion, largely due to the Pleasant Prairie Power Plant going offline in May 2018. For the same reason, the self-supply thermoelectric power production (recirculated cooling) water withdrawal decreased by 71 percent (8 mgd or 31 mld).
- A 31 percent (9 mgd or 34 mld) increase in irrigation water withdrawal, attributed to hot and dry periods in the growing season.

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<sup>20</sup> Wisconsin Department of Natural Resources. 2019. <http://dnr.wi.gov/topic/greatlakes/learn.html>

**Table 20a.** Wisconsin 2018 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	244	22	47	312	0	2	37
Self-Supply Commercial and Institutional	1	8	2	11	0	0	1
Self-Supply Irrigation	0	2	36	38	0	0	27
Self-Supply Livestock	0	14	15	29	0	0	6
Self-Supply Industrial	1	95	13	110	0	0	14
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,424	225	0	3,649	0	0	36
Self-Supply Thermoelectric Power Production (Recirculated cooling)	3	0	0	3	0	3	3
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	1	2	0	0	0
<b>Total</b>	<b>3,673</b>	<b>366</b>	<b>115</b>	<b>4,154</b>	<b>0</b>	<b>5</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 20b.** Wisconsin 2018 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	923	81	178	1,182	0	9	142
Self-Supply Commercial and Institutional	5	30	7	42	0	0	2
Self-Supply Irrigation	0	9	135	144	0	0	101
Self-Supply Livestock	0	51	58	109	0	0	21
Self-Supply Industrial	5	359	51	415	0	0	52
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,960	853	0	13,813	0	0	138
Self-Supply Thermoelectric Power Production (Recirculated cooling)	13	0	0	13	0	10	10
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	2	5	7	0	0	0
<b>Total</b>	<b>13,905</b>	<b>1,385</b>	<b>435</b>	<b>15,725</b>	<b>0</b>	<b>19</b>	<b>466</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. 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.

## Appendix B. 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. 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. 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)

Withdrawals and consumptive uses already recorded under another category (e.g., public supply) will not be reported here.

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

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.

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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>



### **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 categories 1-9. 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.