Annual Report of the Great Lakes Regional Water Use Database

Representing 2017 Water Use Data

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

Great Lakes Commission
des Grands Lacs

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Acknowledgments

The Great Lakes Commission thanks the states and provinces for their commitment in collecting and reporting the water use data included in this report. Appreciation is extended to Jim Casey (Illinois), Allison Mann (Indiana), Andrew LeBaron (Michigan), Sean Hunt (Minnesota), Rich Kruzansky (New York), Brad Lodge and Michael Hallfrisch (Ohio), Jonathan Staples (Ontario), Michael Hill (Pennsylvania), Jean-François Ricard (Québec), and Shaili Pfeiffer and Jennifer Filbert (Wisconsin) for their time and effort in preparing and reviewing the 2017 water use data included in this report. Special thanks go to the staff of the Great Lakes and St. Lawrence Governors and Premiers for their guidance throughout the process and their input in the review of this report.

Preface

This is the Annual Report of the Great Lakes-St. Lawrence River Regional Water Use Database, representing 2017 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 2017 annual water use report presents the sixth 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 2018 to improve data quality and describes the quality of data for the 2017 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 2017 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, reporting compliance rates by water use sector, documenting the year for which the data is collected, significant changes in the data between the current year and previous years, and describing 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 have submitted metadata along with associated 2017 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.

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

In compiling this report, the report authors noted specific steps taken by each jurisdiction to improve reporting compliance and data quality.

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

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 water use permit holders. 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. As a result, 2017 data show improvements in reporting compliance across the commercial and institutional sector and the self-supply irrigation, livestock, and industrial sectors.

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

Sector	IL	IN	MI	MN	NY	OH	ONT	PA	QC	WI
Public Water Supply	100	98	99	100	92	100	100	94	88	100
Self-Supply Commercial & Institutional	100	91	85	100	92	100	97	100	67	96
Self-Supply Irrigation	100	93	75	100	80	100	96	89	45	97
Self-Supply Livestock	-	89	75	100	80	100	95	90	23	95
Self-Supply Industrial	100	95	85	100	92	100	93	100	92	97
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	100	95	100	75	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	-	98	-	-	-
Other Self-Supply	100	93	85	100	100	100	97	-	86	97

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

***N/A indicates that reporting compliance percentage could not be calculated.*

Great Lakes Regional Water Use for 2017

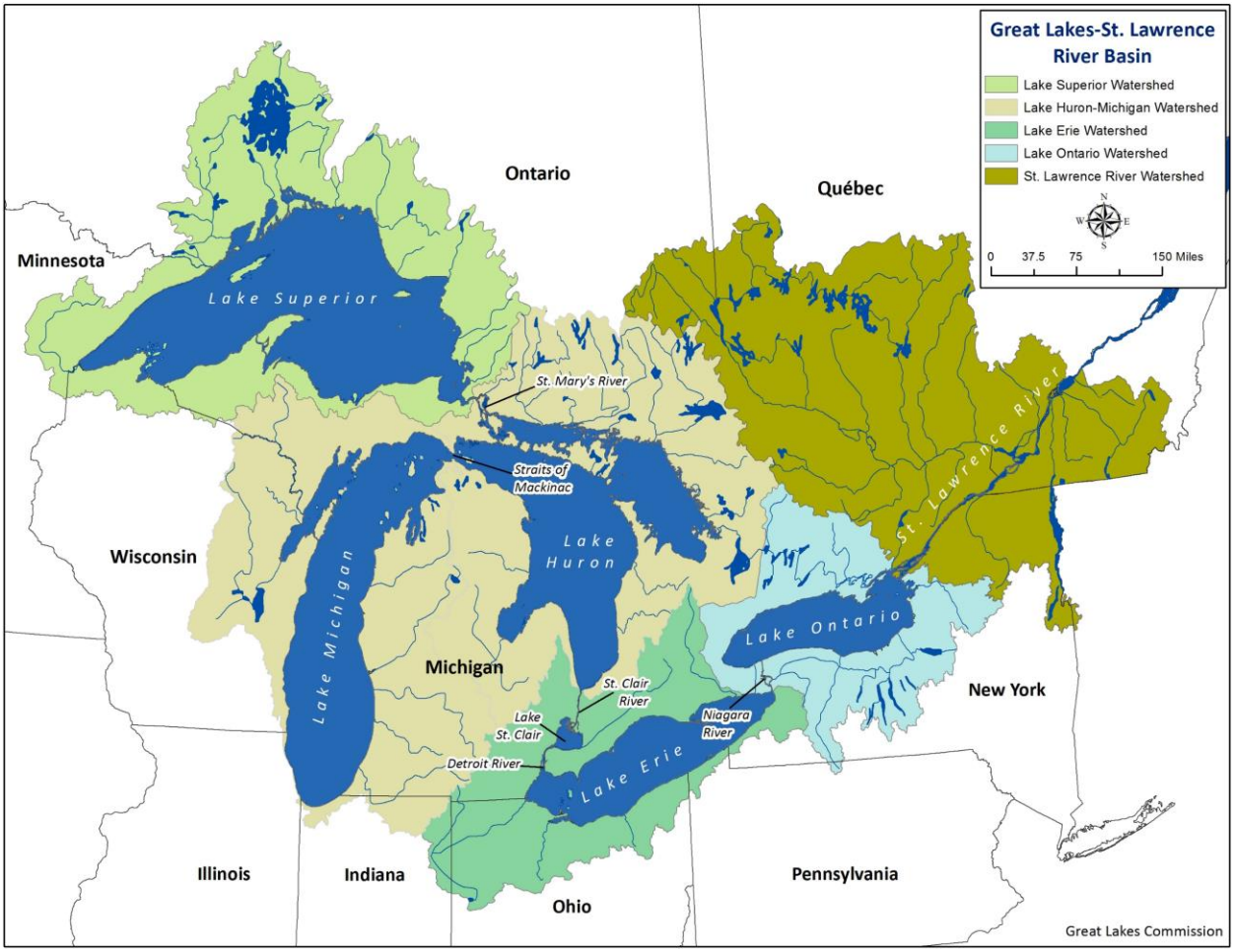

Figure 1. Great Lakes-St. Lawrence River Basin

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.[1]

In 2017, the total reported withdrawal amount for the Great Lakes-St. Lawrence River Basin, excluding in-stream hydroelectric water use, was 42,080 million gallons per day (mgd) or 159,290 million liters per day (mld). This total represents a decrease of less than one percent from the 2016 reported total withdrawal amount of 42,246 mgd (159,916 mld). Nearly five percent of the total reported amount withdrawn (2,015 mgd or 7,628 mld) was consumed or otherwise lost to the Basin.

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

[1] An Olympic size swimming pool holds at least 2.5 million liters.

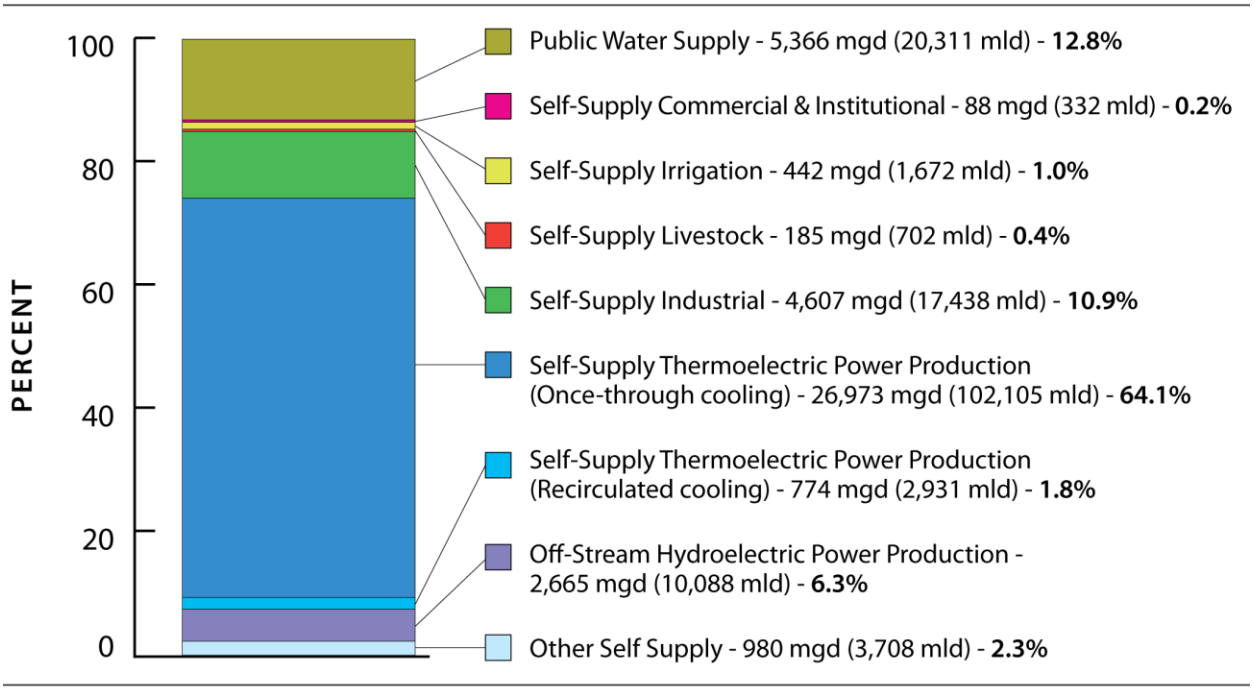

Figure 2. Water Withdrawals by Water Use Sector (excluding in-stream hydroelectric water use)

The Lake Michigan watershed has the greatest withdrawal, followed by Lakes Ontario and Huron, respectively. Figure 3, below, shows withdrawals by watershed broken down by water source: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW).

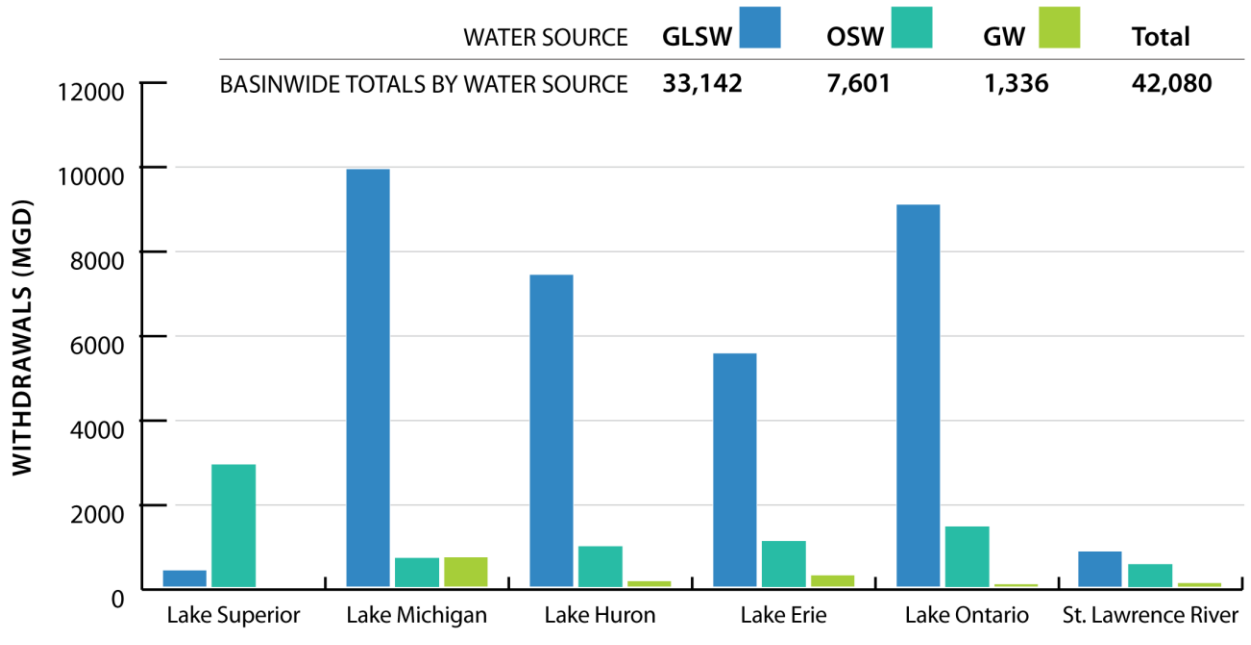

Figure 3. Water Withdrawals by Watershed in mgd (excludes in-stream hydroelectric water use)

Figure 4 shows total withdrawals excluding in-stream hydroelectric water use by jurisdiction. In-stream hydroelectric water use is not included in withdrawal totals because jurisdictions are not required to report use for this sector. 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. 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 16,402 mgd (62,088 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 37 mgd (139 mld).

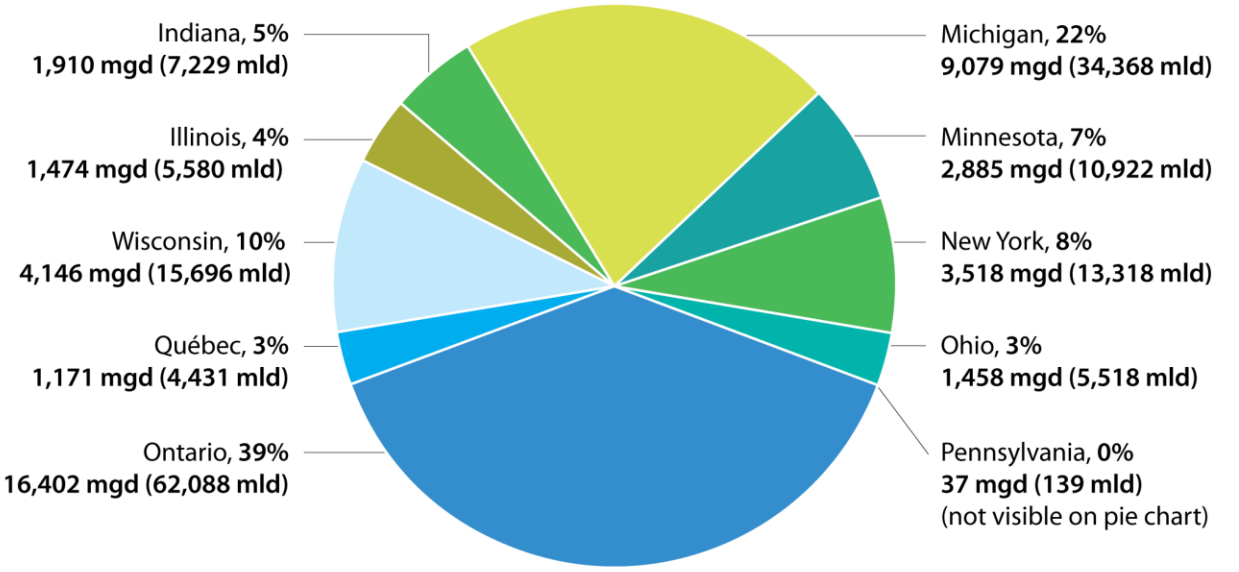

Figure 4. Water Withdrawals by Jurisdiction (excludes in-stream hydroelectric water use)

Figure 5 shows total water withdrawals by jurisdiction over the past five years (excluding in-stream hydroelectric water use). Water use in each jurisdiction has generally decreased or stayed steady 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. Minnesota's withdrawals have increased over the past three years due to an increase in withdrawals from Lake Superior for off-stream hydroelectric power production. 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 decreasing trend in consumptive use reflects more accurate reporting due to improved compliance rates in the province. 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.

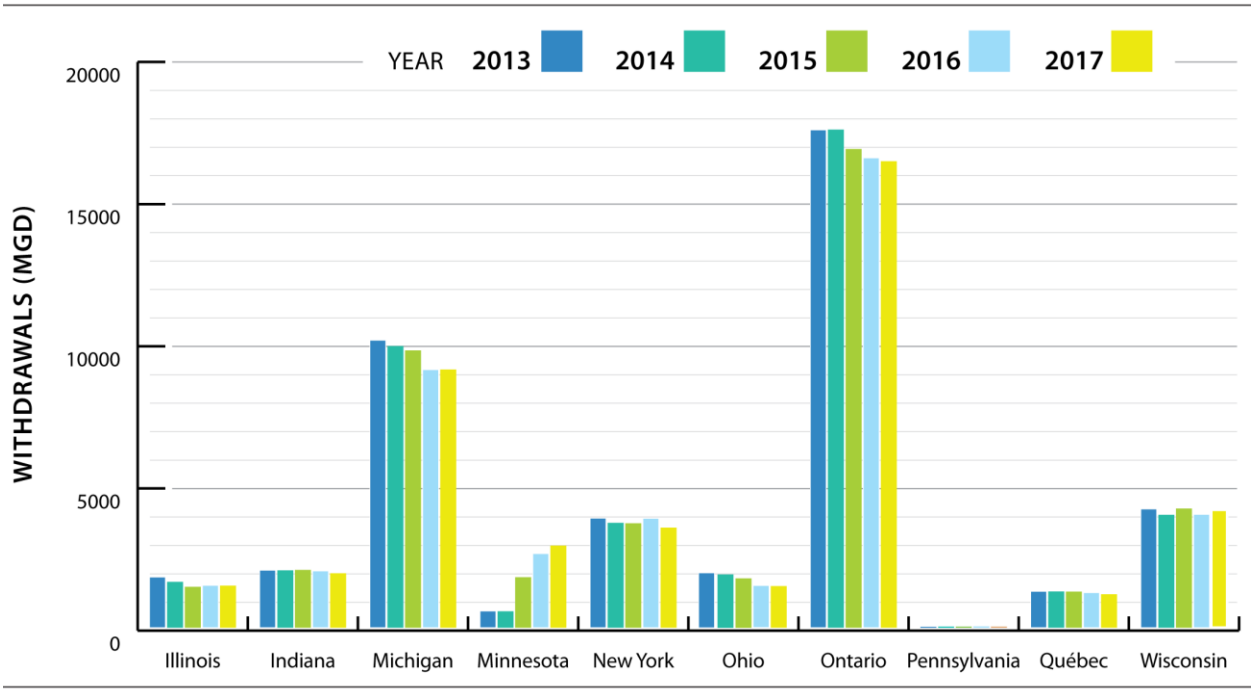

Figure 5. Water withdrawals by jurisdiction over the past five years.

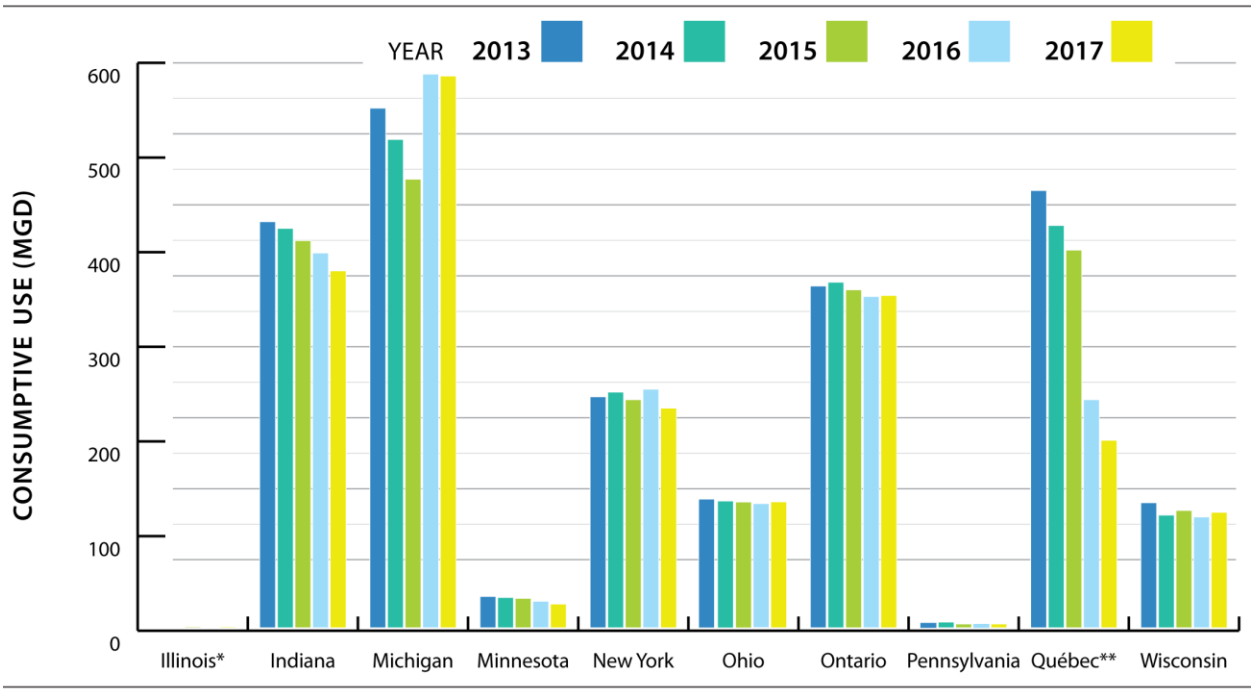

Figure 6. Consumptive use by jurisdiction over the past five years.
** Illinois' consumptive use is negligible. Water loss associated with the Illinois diversion is reported in table 2a.*
*** Québec's overall consumptive use decrease from 2016 to 2017 is the result of a change to the jurisdiction's consumptive 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. Figure 7 shows self-supply irrigation water use for each jurisdiction over the past five years. Varying precipitation patterns across the Basin explain the fluctuations in water use from this sector. For example, while self-supply irrigation water use may have decreased in Wisconsin in 2017, it increased in Michigan. This was the result of Michigan experiencing less precipitation compared to previous years. Three jurisdictions (Illinois, Minnesota and Pennsylvania) reported negligible water use from the self-supply irrigation sector.

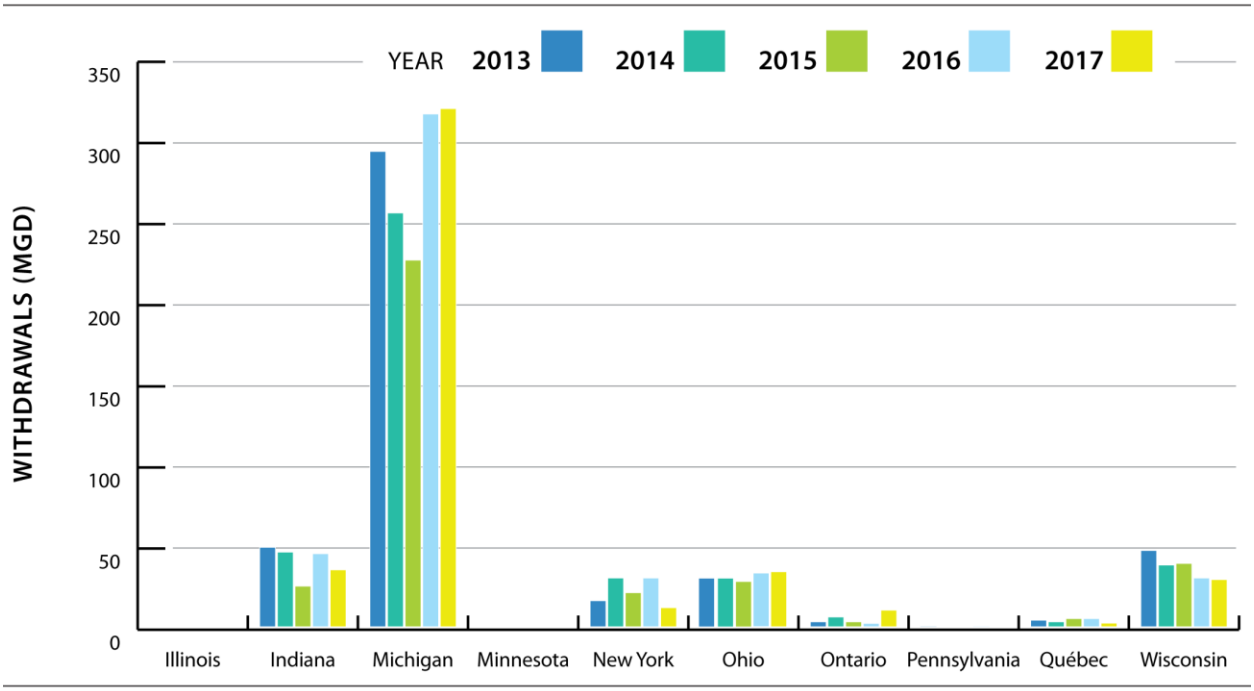

Figure 7. Self-supply irrigation water use for each jurisdiction over the past five years.

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 2011[2]). Under the 2009 water use data collection and reporting protocols, the reporting of in-stream hydroelectric power production data became optional, so the database and report do not represent this water use by all jurisdictions. In-stream hydroelectric power water use is not considered a withdrawal because the water remains in the water body and has negligible water consumption.

[2] U.S. Energy Information Administration. 2012. http://www.eia.gov/state/?sid=NY

Off-stream hydroelectric power generation is considered a withdrawal since the water is removed to a retention area or a reservoir that serves as a storage system. This storage substantially increases the surface area of the water body, and in so doing, increases the evaporation resulting in a consumptive use of water. After being used for power generation, the water is returned to the original water source. Both off-stream and in-stream totals are mentioned in the watershed and jurisdiction summaries in this report but are typically left out of the overall discussion in those sections. In 2017, a total withdrawal of 2,665 mgd (10,088 mld) was reported for the off-stream hydroelectric power production sector, contrasting with 2016 reported data of 2,202 mgd (8,336 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 2017 diversion out of the Great Lakes-St. Lawrence River Basin was 1,122 mgd or 4,247 mld. More than 87 percent (985 mgd, 3,729 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 one percent compared to the 2016 reported amount of 993 mgd (3,758 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 4,029 mgd (15,251 mld) to the entire Basin in 2017. This is an increase from the 2016 reported amount of 3,504 mgd (13,264 mld). Despite this increase, the inflow from the Long Lac and Ogoki diversions is well within the range of flow variability observed from 1944-2015. The flow from these diversions has ranged from 1,643 mgd (6,219 mld) to 5,181 mgd (19,612 mld).[3] 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 2,905 mgd[4] (11,010 mld), meaning that more water is diverted into the Basin than is diverted out of the Basin.

Consumptive use is 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. Consumptive use is most often calculated by applying a consumptive use coefficient to the reported withdrawal amount. The database documents the consumptive use coefficient used for each water withdrawal and the consumptive use that was determined through measurement. The total reported consumptive use for the Basin for 2017 was 2,015 mgd (7,628 mld) – a four percent drop from the 2016 total consumptive use amount of 2,106 mgd (7,972 mld). The industrial use at 630 mgd (2,385 mld) and public water supply use at 594 mgd (2,249 mld) were primary contributors to this reduction in the total

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

consumptive use amount. At 811 mgd (3,070 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 in 2017, the Basin gained a total of 890 mgd (3,369 mld). In comparison, in 2016 the Basin gained a total of 251 mgd (950 mld). Tables 2a to 4b summarize water withdrawals, diversions and consumptive uses by watershed, sector, and jurisdiction for 2017.

Table 2a. Basin 2017 Water Use Data Summary by Watershed in mgd [5]

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Lake Superior	401	33,425	16	33,842	0	-4,029	38
Lake Michigan	9,898	686	712	11,296	0	1,075	811
Lake Huron	29,325	16,659	147	46,131	42	0	145
Lake Erie	58,536	1,708	285	60,530	3,441	-2	446
Lake Ontario	50,200	99,959	73	150,233	-3,479	42	347
St. Lawrence River	171,889	51,523	103	223,515	0	5	228
Total	320,250	203,960	1,336	525,546	4	-2,909	2,015

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; note a negative sign indicated water entering the basin rather than leaving the basin

Table 2b. Basin 2017 Water Use Data Summary by Watershed in mld

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Lake Superior	1,519	126,526	62	128,106	0	-15,251	143
Lake Michigan	37,467	2,598	2,694	42,760	1	4,070	3,069
Lake Huron	111,008	63,062	555	174,625	157	0	550
Lake Erie	221,583	6,467	1,080	229,130	13,026	-7	1,690
Lake Ontario	190,029	378,385	278	568,692	-13,170	158	1,312
St. Lawrence River	650,671	195,036	388	846,095	0	20	865
Total	1,212,277	772,074	5,058	1,989,408	15	-11,010	7,629

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; note a negative sign indicated water entering the basin rather than leaving the basin

[5] Note: For readability, withdrawals, consumptive use and diversions out of the Basin are shown as positive values. Negative diversion values indicate water flows into the respective watershed.

Table 3a. Basin 2017 Water Use Data Summary by Sector in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	4,138	778	450	5,366	4	897	594
Self-Supply Commercial & Institutional	6	69	13	88	0	2	15
Self-Supply Irrigation	2	130	311	442	0	0	391
Self-Supply Livestock	1	102	82	185	0	0	20
Self-Supply Industrial	2,854	1,295	458	4,607	0	34	630
Self-Supply Thermoelectric Power Production (Once-through cooling)	25,204	1,768	1	26,973	0	0	250
Self-Supply Thermoelectric Power Production (Recirculated cooling)	744	27	3	774	0	12	75
Off-Stream Hydroelectric Power Production	0	2,665	0	2,665	0	0	0
In-Stream Hydroelectric Water Use	287,107	196,359	0	483,467	0	-4,040	0
Other Self Supply	194	766	19	980	0	187	40
Total	320,250	203,960	1,336	525,546	4	-2,909	2,015

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 2017 Water Use Data Summary by Sector in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	15,665	2,945	1,701	20,311	15	3,395	2,250
Self-Supply Commercial & Institutional	23	261	48	332	0	7	55
Self-Supply Irrigation	6	490	1,176	1,672	0	0	1,480
Self-Supply Livestock	3	388	311	702	0	-1	77
Self-Supply Industrial	10,804	4,901	1,733	17,438	0	129	2,384
Self-Supply Thermoelectric Power Production (Once-through cooling)	95,408	6,693	5	102,105	0	0	948
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,816	103	13	2,931	0	44	282
Off-Stream Hydroelectric Power Production	0	10,088	0	10,088	0	0	0
In-Stream Hydroelectric Water Use	1,086,819	743,301	0	1,830,120	0	-15,293	0
Other Self Supply	734	2,903	71	37,08	0	708	153
Total	1,212,277	772,074	5,058	1,989,408	15	-11,010	7,629

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 2017 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Illinois	1,474	0	0	1,474	0	985	1
Indiana	1,743	74	93	1,910	0	79	377
Michigan	7,259	1,135	686	9,079	0	0	583
Minnesota	136	5,347	5	5,488	0	11	25
New York	149,162	82,284	46	231,491	0	44	232
Ohio	947	439	72	1,458	0	-10	133
Ontario	155,095	113,935	262	269,292	4	-4,040	341
Pennsylvania	31	2	3	37	0	0	4
Québec	731	374	66	1,171	0	3	198
Wisconsin	3,671	371	105	4,146	0	19	122
Total	320,250	203,960	1,336	525,546	4	-2,909	2,015

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 2017 Water Use Data Summary by Jurisdiction (includes in-stream hydro) in mld

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Illinois	5,579	0	0	5,580	0	3,730	3
Indiana	6,598	280	350	7,229	0	300	1,428
Michigan	27,478	4,295	2,595	34,368	1	0	2,208
Minnesota	515	20,242	19	20,777	0	42	95
New York	564,639	311,477	172	876,289	0	167	877
Ohio	3,586	1,660	271	5,518	0	-37	504
Ontario	587,098	431,292	992	1,019,382	14	-15,293	1,289
Pennsylvania	119	9	12	139	0	0	14
Québec	2,768	1,415	249	4,431	0	10	748
Wisconsin	13,896	1,404	397	15,696	0	70	462
Total	1,212,277	772,074	5,058	1,989,408	15	-11,010	7,629

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

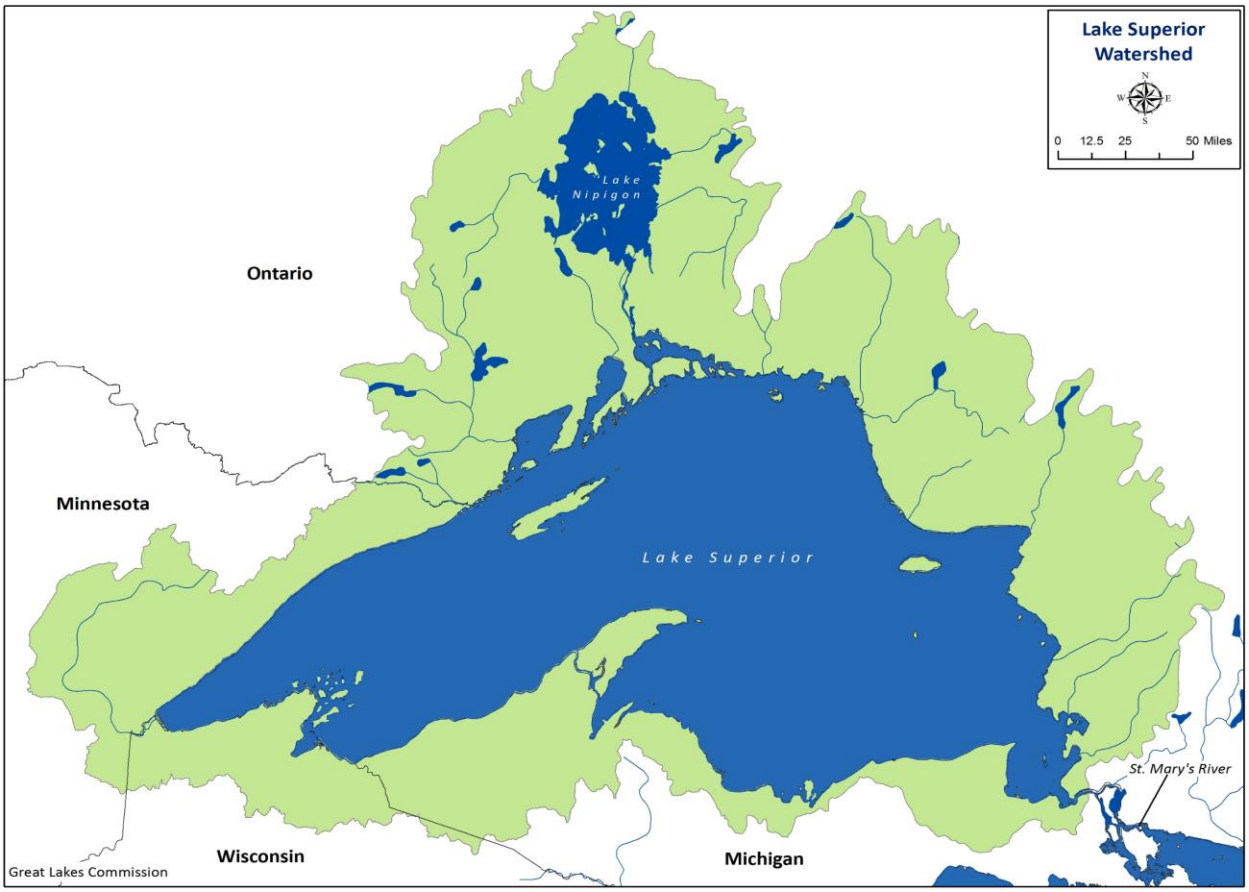

Figure 8. Lake Superior Watershed

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.[6] Its surface area is roughly the size of South Carolina, or approximately 31,700 square miles (82,103 square kilometers)

Basic Stats of Lake Superior

Length: 350 mi / 563 km

Breadth: 160 mi / 257 km

Elevation: 600 ft / 183 m

Depth: 483 ft / 147 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

[6]Retention time is the calculated quantity expressing the mean time water spends in a particular lake. Minnesota Sea Grant. 2012. http://www.seagrant.umn.edu/superior/facts

Water Withdrawals

Four jurisdictions – Michigan, Minnesota, Ontario, and Wisconsin – share the Lake Superior watershed and collectively withdrew 3,315 mgd (12,549 mld), excluding in-stream hydroelectric water use of 30,527 mgd (115,557 mld), in 2017. This amount is an eight percent increase from the 2016 total withdrawal amount of 3,060 mgd (11,583 mld). This overall increase is mainly explained by an increase in withdrawals in Minnesota's off-stream hydroelectric power production sector, which grew from 2,160 mgd (8,176 mld) in 2016 to 2,605 mgd (9,861) in 2017. The off-stream hydroelectric power production sector now represents 79 percent of all withdrawals from the watershed excluding in-stream hydroelectric power production. Thermoelectric power production, once-through and recirculated cooling (323 mgd or 1,223 mld) and industrial (298 mgd or 1,128 mld) were the other significant water use sectors despite both sectors reporting minor decreases.

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, 87 percent (2,898 mgd or 10,970 mld) of the total reported withdrawal amount from the watershed came directly from other surface waters. The remaining withdrawals came directly from Lake Superior (12 percent or 401 mgd or 1,518 mld) and groundwater (0.5 percent or 16 mgd or 61 mld).

Water Diversions and Consumptive Uses

The total watershed consumptive use for all four jurisdictions was 38 mgd (144 mld). Industrial use (28 mgd or 106 mld), public water supply (6 mgd or 23 mld), and thermoelectric power, recirculated cooling (two mgd or eight mld) sectors were the largest contributors, respectively, to the total consumptive use for the watershed. Total consumption in 2017 decreased by 23 percent (9 mgd or 34 mld) from 2016.

Reported net water gain (3,991 mgd or 15,108 mld) in the Lake Superior watershed came from the Long Lac and Ogoki diversions in Northern Ontario. On average, these diversions into the basin together are about twice the volume of the Illinois diversion out of the Basin.

Table 5a. Lake Superior Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	43	3	12	58	0	0	6
Self-Supply Commercial & Institutional	1	0	0	2	0	0	0
Self-Supply Irrigation	0	0	1	1	0	0	1
Self-Supply Livestock	1	26	2	29	0	0	1
Self-Supply Industrial	129	168	1	298	0	11	28
Self-Supply Thermoelectric Power Production (Once-through cooling)	227	96	0	323	0	0	2
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	2,605	0	2,605	0	0	0
In-Stream Hydroelectric Water Use	0	30,527	0	30,527	0	-4,040	0
Other Self Supply	0	0	0	0	0	0	0
Total	401	33,425	16	33,842	0	-4,029	38

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	164	10	46	220	0	0	24
Self-Supply Commercial & Institutional	5	1	0	7	0	0	1
Self-Supply Irrigation	0	1	2	3	0	0	3
Self-Supply Livestock	3	97	9	109	0	0	3
Self-Supply Industrial	488	635	4	1,126	0	42	106
Self-Supply Thermoelectric Power Production (Once-through cooling)	859	363	2	1,224	0	0	7
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	9,861	0	9,861	0	0	0
In-Stream Hydroelectric Water Use	0	115,557	0	115,557	0	-15,293	0
Other Self Supply	0	0	0	0	0	0	0
Total	1,519	126,526	62	128,106	0	-15,251	143

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

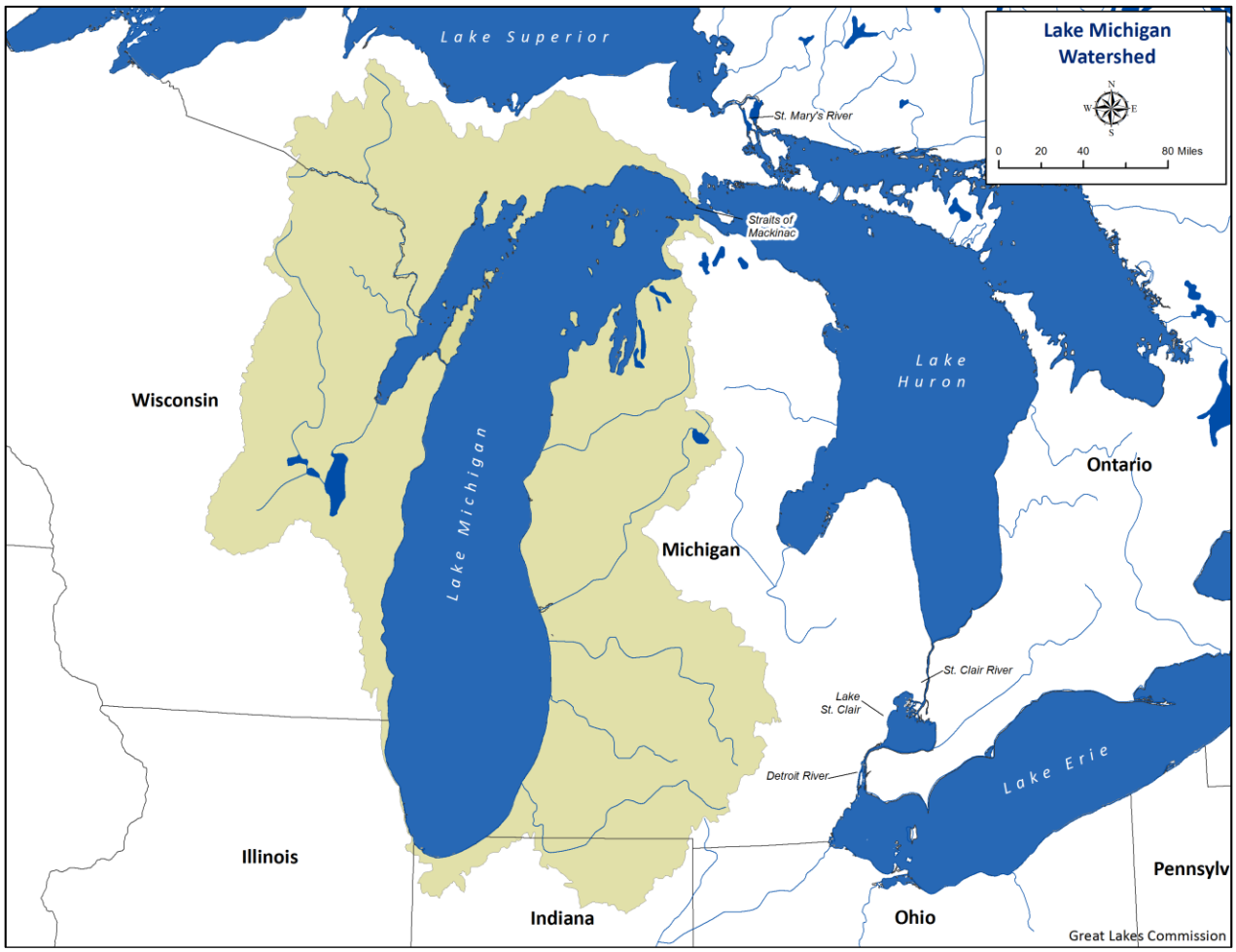

Figure 9. Lake Michigan Watershed

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 11,296 mgd (42,760 mld) in 2017 excluding in-stream hydroelectric use. The primary water uses were thermoelectric power, both once-through and recirculated cooling (7,341 mgd or 27,789 mld), industrial use (1,870 mgd or 7,079 mld) and public water supply (1,502 mgd or 5,686 mld). Lake Michigan was the primary source of water withdrawals in the Great Lakes watershed, accounting for 88 percent of total withdrawals (9,898 mgd or 37,468 mld).

Water Diversions and Consumptive Uses

Reported net water loss in the Lake Michigan watershed totaled 1,886 mgd (7,139 mld). This represents nearly 17 percent of total withdrawals. There was a one percent reduction in Lake Michigan water loss from 2016. Total water loss primarily consisted of the Illinois diversion of 985 mgd or 3,729 mld for public water supply and other self-supply purposes and total consumptive use of the four Lake Michigan jurisdictions was 811 mgd (3,070 mld). The sectors that represent the majority of consumptive use in the watershed were self-supply industrial use (354 mgd or 1,340 mld), irrigation (287 mgd or 1,085 mld), public water supply (85 mgd or 322 mld), and thermoelectric power production (76 mgd or 288 mld).

Table 6a. Lake Michigan Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,258	21	223	1,502	0	859	85
Self-Supply Commercial & Institutional	3	9	8	20	0	2	2
Self-Supply Irrigation	0	59	266	326	0	0	287
Self-Supply Livestock	0	15	30	46	0	0	7
Self-Supply Industrial	1,499	200	171	1,870	0	23	354
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,804	355	1	7,160	0	0	53
Self-Supply Thermoelectric Power Production (Recirculated cooling)	153	26	3	182	0	12	22
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	180	1	10	191	0	180	0
Total	9,898	686	712	11,296	0	1,075	811

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	4,763	79	845	5,686	1	3,251	323
Self-Supply Commercial & Institutional	13	34	29	75	0	7	6
Self-Supply Irrigation	1	225	1,007	1,233	0	0	1,086
Self-Supply Livestock	0	58	115	173	0	0	27
Self-Supply Industrial	5,673	757	649	7,079	0	87	1,339
Self-Supply Thermoelectric Power Production (Once-through cooling)	25,757	1,342	3	27,102	0	0	202
Self-Supply Thermoelectric Power Production (Recirculated cooling)	580	99	10	689	0	44	85
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	680	5	37	722	0	680	0
Total	37,467	2,598	2,694	42,760	1	4,070	3,069

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

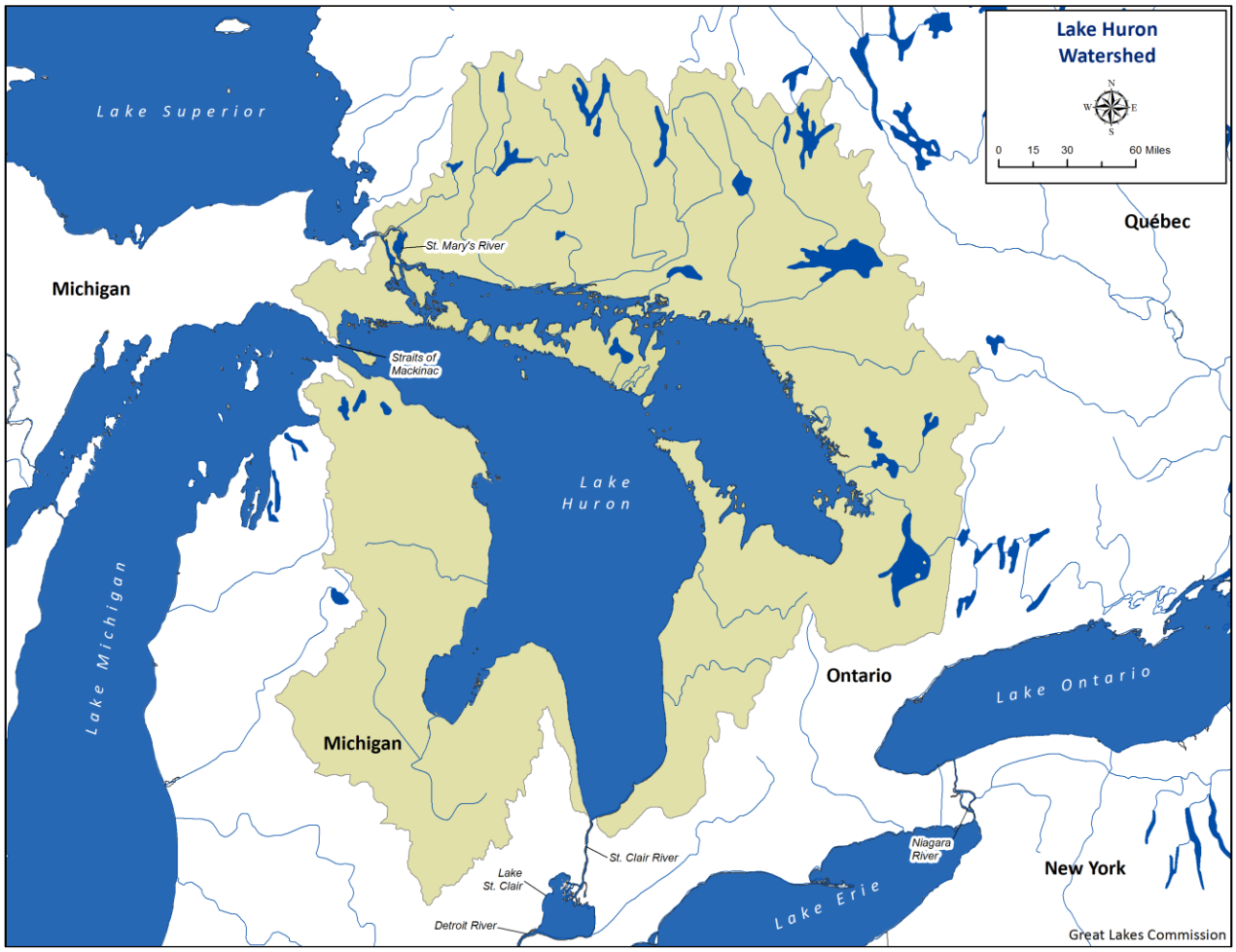

Figure 10. Lake Huron Watershed

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 8,506 mgd (32,199 mld) in 2017, excluding in-stream hydroelectric water use (37,625 mgd or 123,499 mld), in 2017. This is a four percent decrease from the 2016 water withdrawal amount of 8,483 mgd (32,112 mld).

The primary water uses were thermoelectric power once-through cooling (8,038 mgd or 30,427 mld), public water supply (204 mgd or 772 mld), and industrial use (178 mgd or 674 mld). Excluding in-stream hydroelectric water use, Lake Huron surface water was the source of 86 percent of the total withdrawals in the watershed.

Water Diversions and Consumptive Uses

Reported net water loss to the Lake Huron watershed was 187 mgd (708 mld), which consisted entirely of an intrabasin transfer for public water supply in Ontario. While hydrologically this intrabasin transfer remained in the Great Lakes-St. Lawrence River Basin, it represented a loss to the Lake Huron watershed and a net gain to the Lake Erie watershed. Public water supply (25 mgd or 95 mld), irrigation (34 mgd or 129 mld), and thermoelectric power production (69 mgd or 261 mld) made up 88 percent of consumptive use in the watershed.

Table 7a. Lake Huron Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	116	52	37	205	42	0	25
Self-Supply Commercial & Institutional	1	4	1	5	0	0	1
Self-Supply Irrigation	0	18	19	38	0	0	34
Self-Supply Livestock	0	21	18	38	0	0	0
Self-Supply Industrial	15	92	72	178	0	0	16
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,265	773	0	8,039	0	0	69
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	1	1	0	0	1
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	21,928	15,697	0	37,625	0	0	0
Other Self Supply	0	2	0	3	0	0	0
Total	29,325	16,659	147	46,131	42	0	145

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	438	197	139	774	157	0	94
Self-Supply Commercial & Institutional	3	14	3	20	0	0	3
Self-Supply Irrigation	0	70	72	142	0	0	128
Self-Supply Livestock	0	78	66	145	0	0	2
Self-Supply Industrial	56	347	271	674	0	0	60
Self-Supply Thermoelectric Power Production (Once-through cooling)	27,502	2,927	0	30,429	0	0	261
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	1	3	4	0	0	2
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	83,007	59,420	0	142,427	0	0	0
Other Self Supply	2	9	0	10	0	0	0
Total	111,008	63,063	555	174,625	157	0	550

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

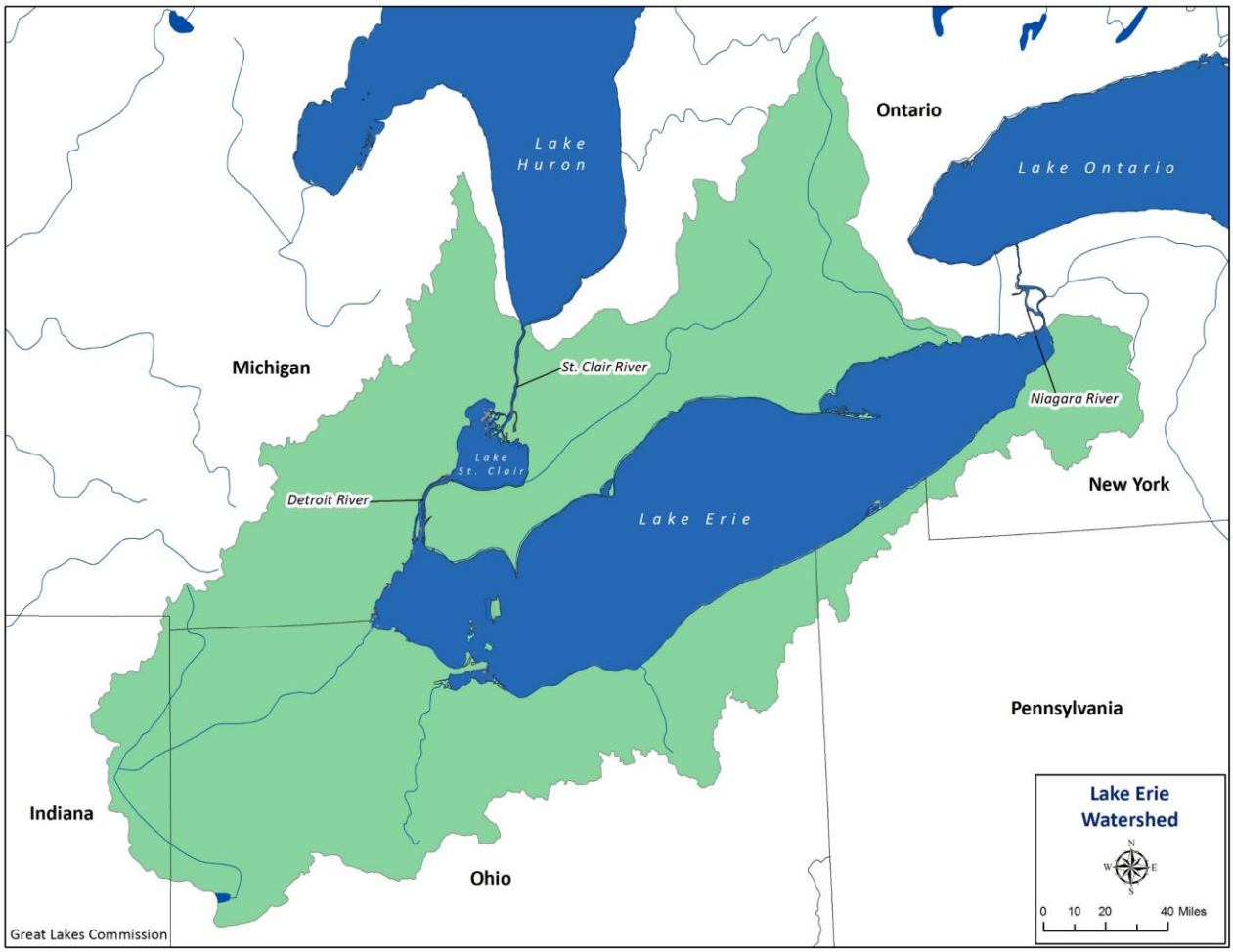

Figure 11. Lake Erie Watershed

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 6,906 mgd (26,142 mld) in 2017, excluding in-stream hydroelectric water use, which accounted for 53,624 mgd (202,989 mld), in 2017. This amount is a six percent decrease from the 2016 total withdrawal amount of 7,362 mgd (27,869 mld). Aside from water used for hydroelectric power generation purposes, the primary water uses were thermoelectric power generation, both once-through and recirculated cooling (3,892 mgd or 14,733 mld), public water supply (1,630 mgd or 6,170 mld), and industrial use (1,282 mgd or 4,853 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 in the Lake Erie watershed totaled 3,885 mgd (14,706 mld). This amount includes a diversion into the Lake Erie watershed of 66 mgd (250 mld) and a diversion out of the watershed of 3,504 mgd (13,264 mld). The largest intrabasin diversion out of the watershed is the Welland Canal at 3,481 mgd (13,177 mld) for other self-supply and navigation purposes, a five percent drop from 2016 (3,663 mgd or 13,867 mld). The Welland Canal was constructed in 1830 as a ship canal connecting Lake Erie to Lake Ontario. Figure 12 shows the flow through the Welland Canal over the past five years. Consumptive use in the Lake Erie watershed totaled 451 mgd (1,707 mld). The major consumptive uses were for public water supply (210 mgd or 795 mld) and industrial uses (102 mgd or 387 mld).

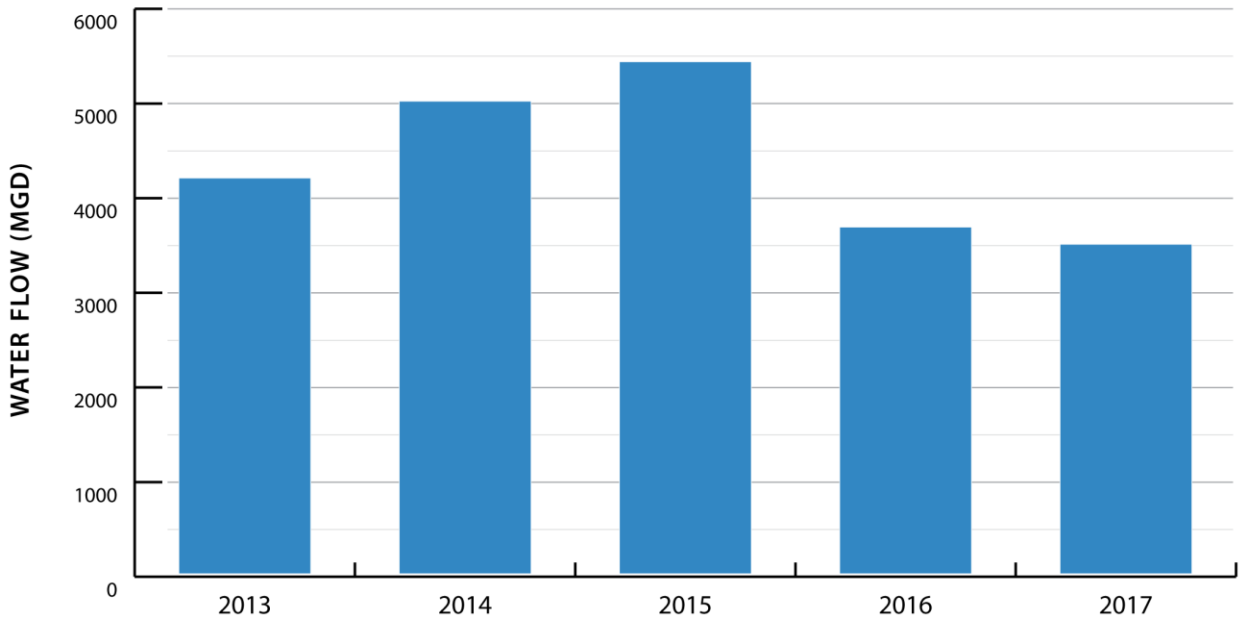

Figure 12. Flow through the Welland Canal over the past five years.

Table 8a. Lake Erie Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,329	192	110	1,630	-40	23	210
Self-Supply Commercial & Institutional	0	3	2	5	0	0	1
Self-Supply Irrigation	1	43	18	63	0	0	56
Self-Supply Livestock	0	7	7	14	0	0	1
Self-Supply Industrial	710	432	140	1,282	0	0	104
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,312	397	0	3,710	0	0	41
Self-Supply Thermoelectric Power Production (Recirculated cooling)	182	0	0	182	0	0	31
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	53,000	624	0	53,624	0	0	0
Other Self Supply	2	10	9	21	3481	-25	2
Total	58,536	1,708	285	60,530	3,441	-2	446

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	5,031	725	415	6,172	-150	87	794
Self-Supply Commercial & Institutional	1	10	8	19	0	0	2
Self-Supply Irrigation	4	164	70	238	0	0	213
Self-Supply Livestock	0	27	25	52	0	-1	4
Self-Supply Industrial	2,688	1,634	530	4,851	0	0	394
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,538	1,504	0	14,042	0	0	156
Self-Supply Thermoelectric Power Production (Recirculated cooling)	687	2	0	689	0	0	117
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	200,627	2,361	0	202,988	0	0	0
Other Self Supply	6	39	33	79	13,176	-93	9
Total	221,583	6,467	1,080	229,130	13,026	-7	1,690

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

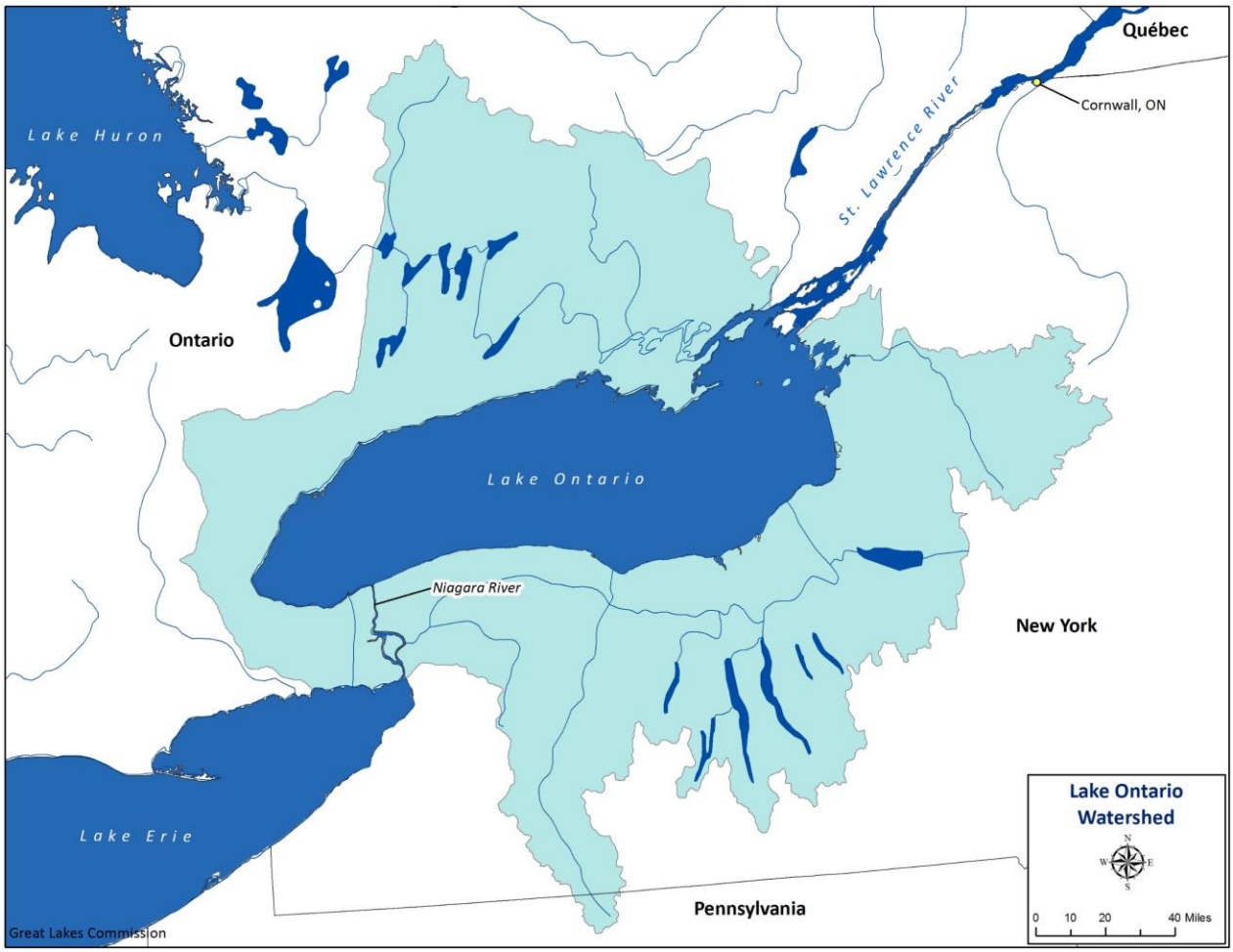

Figure 13. Lake Ontario Watershed

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 10,560 mgd (39,974 mld) of water, excluding in-stream hydroelectric water use, in 2017. In-stream hydroelectric water use was 139,672 mgd (521,630 mld), in 2017. The total withdrawal amount is nearly the same as the 2016 withdrawal amount of 10,591 mgd (40,091 mld). Aside from withdrawals for hydroelectric power generation purposes, the primary water uses were for thermoelectric power generation, both once-through and recirculated cooling (8,097 mgd or 30,650 mld), public water supply (946 mgd or 3,581 mld), and other self-supply uses (750 mgd or 2,838 mld).

Lake Ontario surface water was the source of 86 percent of the total withdrawals in the watershed, including most of the water used for public water supply and thermoelectric power generation and industrial purposes.

Water Diversions and Consumptive Uses

Reported water loss in the Lake Ontario watershed totaled 390 mgd (1,476 mld). This amount includes interbasin diversions totaling 42 mgd (159 mld), an intrabasin diversion of two mgd (six mld) and a combined consumptive use amount of 347 mgd (1,314 mld). The major consumptive uses were from public water supply (117 mgd or 444 mld), thermoelectric power production (105 mgd or 397 mld) and industrial uses (72 mgd or 273 mld).

The net water gain in the Lake Ontario watershed came from the Welland Canal (3,090 mgd or 11,697 mld), which diverts water from the Lake Erie watershed for navigation purposes.

Table 9a. Lake Ontario Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	732	201	13	946	2	10	117
Self-Supply Commercial & Institutional	0	42	1	43	0	0	8
Self-Supply Irrigation	0	7	2	9	0	0	8
Self-Supply Livestock	0	17	18	35	0	0	4
Self-Supply Industrial	373	208	39	620	0	0	72
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,542	145	0	7,687	0	0	84
Self-Supply Thermoelectric Power Production (Recirculated cooling)	409	0	0	409	0	0	21
Off-Stream Hydroelectric Power Production	0	60	0	60	0	0	0
In-Stream Hydroelectric Water Use	41,143	98,529	0	139,672	0	0	0
Other Self Supply	1	750	0	750	-3,481	32	32
Total	50,200	99,959	73	150,233	-3,479	42	347

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	2,771	761	50	3,582	6	37	445
Self-Supply Commercial & Institutional	0	158	3	161	0	0	32
Self-Supply Irrigation	0	25	8	33	0	0	30
Self-Supply Livestock	0	64	69	133	0	0	13
Self-Supply Industrial	1,412	788	148	2,348	0	0	272
Self-Supply Thermoelectric Power Production (Once-through cooling)	28,550	550	0	29,100	0	0	320
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,549	1	0	1,550	0	0	78
Off-Stream Hydroelectric Power Production	0	227	0	227	0	0	0
In-Stream Hydroelectric Water Use	155,745	372,973	0	528,718	0	0	0
Other Self Supply	3	2,838	0	2,841	-13,176	121	123
Total	190,029	378,385	278	568,692	-13,170	158	1,312

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

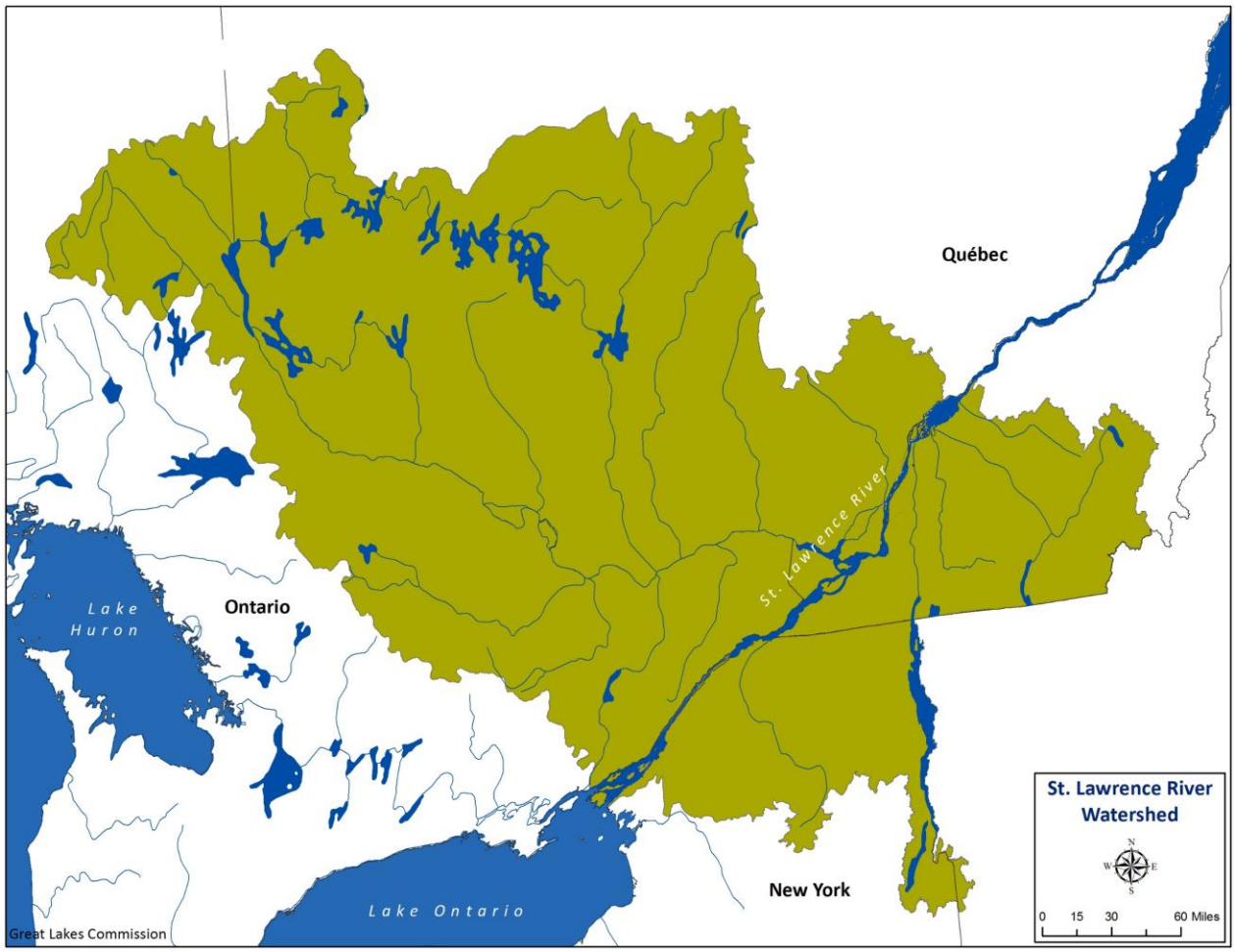

Figure 14. St. Lawrence River Watershed

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.

Water Withdrawals

Three jurisdictions – New York, Ontario and Québec – share the watershed and collectively withdrew 1,465 mgd (5,546 mld) of the water, excluding in-stream hydroelectric water use, which accounted for 222,018 mgd (840,430 mld), in 2017. This amount is a 14 percent decrease from the 2016 withdrawal total of 1,708 mgd (6,465 mld). Aside from

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

hydroelectric, the primary water uses were public water supply (1,024 mgd or 3,876 mld), and industrial use (359 mgd or 1,359 mld).

St. Lawrence River surface water was the source for 59 percent of the watershed's total withdrawal amount. Other surface water within the St. Lawrence River watershed accounted for 37 percent of the total. The remaining portion of the total withdrawal amount (four percent) came from groundwater sources.

Water Diversions and Consumptive Uses

Net water loss in the St. Lawrence River watershed totaled 234 mgd (886 mld). This total includes a diversion amount of five mgd (19 mld) for public supply purposes in New York and Québec and a combined consumptive use amount of 228 mgd (863 mld). The largest consumptive users were the public water supply sector at 151 mgd (152 mld) and industrial sector at 88 mgd (335 mld).

Table 10a. St. Lawrence River Watershed 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	660	310	54	1,024	0	5	151
Self-Supply Commercial & Institutional	0	12	1	13	0	0	3
Self-Supply Irrigation	0	1	5	6	0	0	5
Self-Supply Livestock	0	17	7	24	0	0	7
Self-Supply Industrial	129	195	35	359	0	0	56
Self-Supply Thermoelectric Power Production (Once-through cooling)	53	2	0	55	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	171,036	50,982	0	222,018	0	0	0
Other Self Supply	11	3	0	15	0	0	5
Total	171,889	51,523	103	223,515	0	5	228

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	2,497	1,174	206	3,877	0	20	570
Self-Supply Commercial & Institutional	1	44	5	49	0	0	12
Self-Supply Irrigation	1	5	17	24	0	0	21
Self-Supply Livestock	0	64	27	91	0	0	28
Self-Supply Industrial	488	740	132	1,360	0	0	212
Self-Supply Thermoelectric Power Production (Once-through cooling)	201	7	0	207	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	647,441	192,990	0	840,430	0	0	0
Other Self Supply	43	12	2	57	0	0	20
Total	650,671	195,036	388	846,095	0	20	865

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 2017 was 1,474 mgd (5,580 mld), a minor decrease from 2016 (1,485 mgd or 5,620 mld). The largest uses of reported water were public water supply at 803 mgd or 3,040 mld (54 percent of the total withdrawal amount) and thermoelectric power production, once-through cooling at 461 mgd or 1,745 mld (31 percent of the total withdrawal amount). Both sectors experienced small decreases in withdrawals in 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 and self-supply commercial and institutional was 803 mgd (3,039 mld). The diversion amount supporting other uses (i.e., discretionary diversion) was 180 mgd (681 mld).

Data collected for this report came from multiple sources including Illinois Department of Natural Resources and the Illinois State Water Survey. 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 0.1 mgd).

Notable changes in 2017 water use by Illinois facilities include:

- A two percent reduction in water withdrawals by the City of Chicago for public water supply, a downward trend that has continued since 1994; and
- A seven percent increase in diversions for effluent dilution by the Chicago Metropolitan Water Reclamation District.

Table 11a. Illinois 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	803	0	0	803	0	803	0
Self-Supply Commercial & 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	29	0	0	29	0	1	1
Self-Supply Thermoelectric Power Production (Once-through cooling)	461	0	0	461	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	180	0	0	180	0	180	0
Total	1,474	0	0	1,474	0	985	1

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	3,040	0	0	3,040	0	3,040	0
Self-Supply Commercial & 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	108	0	0	108	0	2	3
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,744	0	0	1,744	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	680	0	0	680	0	680	0
Total	5,579	0	0	5,580	0	3,730	3

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. The largest withdrawals, for public supply and industrial purposes, come from the surface waters of the St. Joseph (a major tributary within the Maumee watershed) and Maumee Rivers. Groundwater withdrawals in the Maumee River watershed are used primarily for public water supply and industrial dewatering.[7]

In 2017, the total reported water withdrawal amount from the Basin for Indiana was 1,910 mgd (7,230 mld). The largest uses were industrial (1,443 mgd or 5,462 mld), thermoelectric power (225 mgd or 852 mld) and public water supply (168 mgd or 636 mld). Each of these sectors reported small decreases in withdrawals.

The total reported diversion amount for Indiana was 79 mgd (299 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 (49 mgd or 182 mld) were distributed for public supply purposes from Lake Michigan surface water and discharged to the "Illinois Diversion" area, with less than one mgd (three mld) reported as a diversion from groundwater for public supply. The industrial sector was responsible for about 23 mgd (87 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 amount of water (about eight mgd or 29 mld, primarily from other surface water with a small portion from groundwater) distributed through that portion of the system was reported as a diversion from the Lake Erie watershed. Consumptive use in Indiana totaled 378 mgd (1,431 mld), with the industrial sector in the Lake Michigan watershed (310 mgd or 1,173 mld or 82 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 89 to 100 percent depending on the water use sector. Withdrawals and consumptive uses are not estimated for facilities that did not report.

Notable changes in 2017 water use by Indiana facilities include:

[7] Indiana Dept. of Natural Resources. 1996. http://www.in.gov/dnr/water/files/lakemich_basinsums.pdf
http://www.in.gov/dnr/water/files/maumee_basinsums.pdf

- A substantial decrease (17.5 mgd or seven percent) in water withdrawals for self-supply thermoelectric power production (once-through) was the result of one facility utilizing less of their registered baseline capacity than in previous years.
- An estimated three percent decrease in withdrawals from Lake Michigan surface water for industrial self-supply, primarily attributed to one user and reduced demand from the steel sector because of conservation efforts and reduced production.

Table 12a. Indiana 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	87	36	45	168	0	57	20
Self-Supply Commercial & Institutional	0	0	1	1	0	0	0
Self-Supply Irrigation	0	5	30	35	0	0	31
Self-Supply Livestock	0	0	2	2	0	0	1
Self-Supply Industrial	1,424	9	11	1,443	0	22	312
Self-Supply Thermoelectric Power Production (Once-through cooling)	225	0	0	225	0	0	5
Self-Supply Thermoelectric Power Production (Recirculated cooling)	8	24	2	34	0	0	8
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	1	1	0	0	0
Total	1,743	74	93	1,910	0	79	377

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	329	135	171	636	0	215	77
Self-Supply Commercial & Institutional	0	0	6	6	0	0	1
Self-Supply Irrigation	0	19	113	133	0	0	118
Self-Supply Livestock	0	0	9	9	0	0	3
Self-Supply Industrial	5,389	35	41	5,464	0	85	1,183
Self-Supply Thermoelectric Power Production (Once-through cooling)	852	0	0	852	0	0	17
Self-Supply Thermoelectric Power Production (Recirculated cooling)	29	91	8	127	0	0	29
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
Total	6,598	280	350	7,229	0	300	1,428

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 9.8 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. Michigan encompasses 38,575 square miles of Great Lakes water area and 3,126 miles of Great Lakes shoreline – more fresh water coastline than any other state.[8]

In 2017, the total reported water withdrawal amount from the Basin for Michigan was 9,079 mgd (34,368 mld), a decrease of four percent from the 2016 total water withdrawal amount of 9,071 mgd (34,337 mld). The largest use was thermoelectric power production, once-through and recirculated cooling, totaling 6,725 mgd (25,457 mld) or 74 percent of Michigan's total withdrawal. 48 percent of Michigan's total withdrawal amount (4,386 mgd, 16,603 mld) came from the Lake Erie watershed, mainly used for thermoelectric power production. Forty-three percent of total withdrawal amount (3,860 mgd or 14,612 mld) came from the Lake Michigan watershed, followed by the Lake Huron watershed at 614 mgd or 2,324 mld (seven percent) and the Lake Superior watershed at 219 mgd or 829 mld (two percent).

The total amount of consumptive use was 583 mgd or 2,207 mld (six percent of the total withdrawal amount), with self-supply irrigation being the largest contributor to consumptive use at 287 mgd (1,086 mld).

Data collected for this report came from multiple sources: the Michigan Department of Environmental Quality and Michigan Department of Agriculture and Rural Development. These data were generated with estimated reporting compliance rates ranging from 75 to 99 percent of total water use reporters, depending on the water use sector.

Notable changes in 2017 water use by Michigan facilities include:

- A significant decrease in self-supply thermoelectric power production once-through cooling, down roughly 17 mgd from 2016, was mostly the result of one plant closure;
- 2017 irrigation withdrawals reflect similar overall growing season conditions to 2016. Figure 15 shows the five-year trend in irrigation water use; and
- A large increase (131 mgd or 496 mld) in industrial use of groundwater for mining/quarry operations and a 22 mgd (83 mld) increase in withdrawals from the River Rouge (other surface water) reported by one user.

[8] Michigan Dept. of Transportation. http://www.michigan.gov/mdot/0,4616,7-151-9622_11033_11151-67959--,00.html

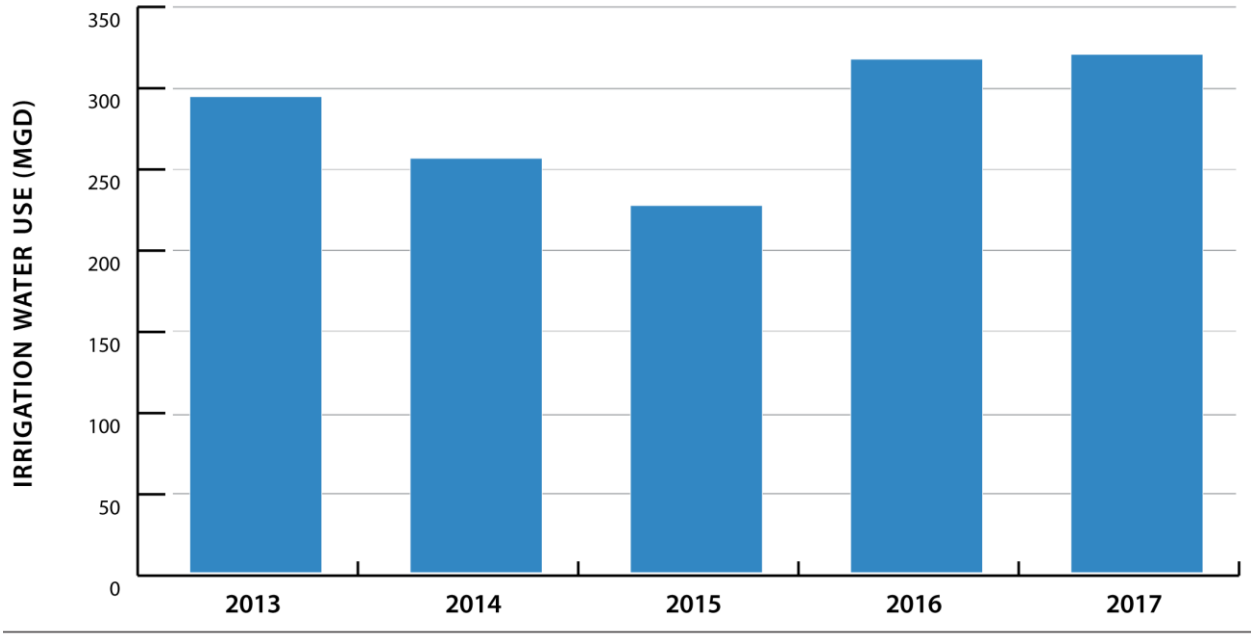

Figure 15. Michigan's self-supply irrigation water use over the past five years.

Table 13a. Michigan 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	813	15	198	1,026	0	0	128
Self-Supply Commercial & Institutional	0	3	5	8	0	0	1
Self-Supply Irrigation	0	79	240	319	0	0	287
Self-Supply Livestock	0	30	20	51	0	0	1
Self-Supply Industrial	314	412	206	931	0	0	93
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,951	589	1	6,541	0	0	48
Self-Supply Thermoelectric Power Production (Recirculated cooling)	180	3	1	184	0	0	24
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	15	19	0	0	0
Total	7,259	1,135	686	9,079	0	0	583

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	3,079	56	748	3,883	0	0	485
Self-Supply Commercial & Institutional	0	12	18	30	0	0	4
Self-Supply Irrigation	2	298	909	1,209	0	0	1,088
Self-Supply Livestock	0	115	77	192	0	0	5
Self-Supply Industrial	1,189	1,559	778	3,526	0	0	353
Self-Supply Thermoelectric Power Production (Once-through cooling)	22,527	2,230	3	24,759	0	0	183
Self-Supply Thermoelectric Power Production (Recirculated cooling)	680	11	5	696	0	0	90
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	56	72	0	0	0
Total	27,478	4,295	2,595	34,368	0	0	2,208

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.[9]

Excluding in-stream hydroelectric water use (2,603 mgd or 9,853 mld), the total withdrawal amount from the Basin for Minnesota was 2,885 mgd (10,921 mld), an increase of 11 percent from the total withdrawal amount for 2016 (2,605 mgd or 9,861 mld). This is explained by the continued increase in the off-stream hydroelectric power production sector, withdrawing a total amount of 2,605 mgd (9,861 mld) compared to 2,160 mgd (8,176 mld) in 2016, which is a 21 percent increase from the previous year. The second largest use sector is self-supply industrial at 222 mgd (840 mld). In 2017, 95 percent of total withdrawals (2,744 mgd or 10,387 mld) came from other surface water within the Lake Superior watershed, while only five percent, or 136 mgd (515 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 11 mgd (42 mld) was for self-supply industrial purposes. Total consumptive use was 25 mgd (95 mld), which has decreased by at least one mgd (four mld) every year since 2013. The majority of consumptive use was for industrial purposes (20 mgd or 76 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 2017 water use by Minnesota facilities include:

- An 80 percent reduction in water use for thermoelectric power production (once-through cooling) was primarily the result of one facility sitting idle and another user converting to natural gas;
- Despite the upward trend in use for in-stream hydroelectric from previous years as increased flow in the St. Louis River was maintained, 2017 showed a significant decrease (313 mgd reduction) in water use for this sector; and
- The 21 percent (445 mgd) increase in water use for off-stream hydroelectric power production is considered typical fluctuation despite representing the largest year-to-year change in volume across all use sectors.

[9] 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 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	27	2	5	34	0	0	3
Self-Supply Commercial & Institutional	1	0	0	2	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	1	0	0	1	0	0	1
Self-Supply Industrial	102	100	0	202	0	11	20
Self-Supply Thermoelectric Power Production (Once-through cooling)	5	37	0	42	0	0	1
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	2,605	0	2,605	0	0	0
In-Stream Hydroelectric Water Use	0	2,603	0	2,603	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	136	5,347	5	5,489	0	11	25

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	104	6	18	127	0	0	13
Self-Supply Commercial & Institutional	5	1	0	6	0	0	1
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	3	0	0	3	0	0	2
Self-Supply Industrial	385	380	0	765	0	42	77
Self-Supply Thermoelectric Power Production (Once-through cooling)	19	139	2	160	0	0	3
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	9,861	0	9,861	0	0	0
In-Stream Hydroelectric Water Use	0	9,855	0	9,855	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	515	20,242	19	20,777	0	42	95

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 lands are contained in the drainage 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, and hundreds of miles of waterways and border waters for navigation.[10]

Excluding in-stream hydroelectric water use (227,973 mgd or 862,972 mld), the total withdrawal amount from the Basin for New York was 3,518 mgd (13,317 mld), a nine percent decrease from 2016 (3,846 mgd or 14,559 mld). The Lake Ontario watershed was the source of the majority of New York's water withdrawals at 3,034 mgd (11,485 mld) or 86 percent of New York's total withdrawal amount. Thermoelectric power production (both once-through and recirculated cooling) at 1,793 mgd (6,787 mld) represented 51 percent of the total withdrawal amount; public water supply (479 mgd or 1,813 mld) represented nearly 14 percent of the total; and industrial (344 mgd or 1,302 mld) represented 10 percent of the total. 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 2017 total diversion amount for New York was 44 mgd (167 mld) of which 12 mgd (45 mld) was for public supply and 32 mgd (121 mld) for other self-supply purposes. The total consumptive use amount was 232 mgd (878 mld). The largest consumptive uses were attributed to industrial purposes at 68 mgd (257 mld) and public water supply at 60 mgd (227 mld).

The water use data was provided by the New York State Department of Environmental Conservation. The data collected was metered and estimated water use. Reporting compliance varies among the water use sectors from 80 percent for the livestock sector to 100 percent for the hydroelectric power sector. Low reporting compliance for the livestock sector might be the result of users failing to report when their use was below the reporting threshold. 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. These permits include a requirement to report use, which should support continuing 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 2017 water use by New York facilities include:

- A 19 percent decrease in water use for self-supply thermoelectric power production once-through cooling was the result of two facilities decreasing their water use.

[10] 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

Table 15a. New York 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	291	171	17	479	0	12	59
Self-Supply Commercial & Institutional	0	48	1	49	0	0	9
Self-Supply Irrigation	0	9	2	12	0	0	11
Self-Supply Livestock	0	17	16	33	0	0	4
Self-Supply Industrial	159	178	8	344	0	0	68
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,238	145	0	1,384	0	0	28
Self-Supply Thermoelectric Power Production (Recirculated cooling)	409	0	0	409	0	0	21
Off-Stream Hydroelectric Power Production	0	60	0	60	0	0	0
In-Stream Hydroelectric Water Use	147,065	80,908	0	227,973	0	0	0
Other Self Supply	0	748	1	748	0	32	33
Total	149,162	82,284	46	231,491	0	44	232

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,101	647	64	1,812	0	46	223
Self-Supply Commercial & Institutional	0	182	5	187	0	0	34
Self-Supply Irrigation	1	34	9	44	0	0	40
Self-Supply Livestock	0	64	60	124	0	0	16
Self-Supply Industrial	601	673	31	1,304	0	0	259
Self-Supply Thermoelectric Power Production (Once-through cooling)	4,687	550	0	5,237	0	0	105
Self-Supply Thermoelectric Power Production (Recirculated cooling)	1,549	1	0	1,550	0	0	78
Off-Stream Hydroelectric Power Production	0	227	0	227	0	0	0
In-Stream Hydroelectric Water Use	556,701	306,270	0	862,971	0	0	0
Other Self Supply	0	2830	3	2,833	0	121	123
Total	564,639	311,477	172	876,289	0	167	877

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.[11]

The 2017 total reported withdrawal amount from the Basin for Ohio was 1,458 mgd (5,519 mld), a one percent decrease from the total withdrawal amount for 2016 (1,477 mgd or 5,593 mld). Primary water use sectors included thermoelectric power production (once-through and recirculated cooling) at 694 mgd (2,627 mld), representing 48 percent of total withdrawal amount; public water supply (510 mgd or 1,931 mld), representing 35 percent; and industrial (210 mgd or 795 mld), representing 14 percent. The source for 65 percent of the total withdrawal amount was Lake Erie. However, within the irrigation and industrial water use sectors, other surface water was the primary source at 89 percent and 53 percent of the total withdrawal amount, respectively.

Diversions out of the Lake Erie watershed totaled 15 mgd (57 mld), all for public water supply purposes. Outgoing diversions were offset by incoming diversions totaling 25 mgd (95 mld), primarily for other self-supply purposes, resulting in a net diversion of 10 mgd (40 mld) into the Lake Erie watershed. Total consumptive use was 133 mgd (497 mld). Fifty-eight 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' Division of Water Resources with a 100 percent reporting compliance from every water use sector.

Notable changes in 2017 water use by Ohio facilities include:

- Withdrawals for self-supply thermoelectric power production (once-through cooling) decreased by 39 mgd (147 mld) due to a continued trend of coal-fired plant closures and reduced production throughout Northeast Ohio; and
- Withdrawals for public water supply increased by 10 mgd (38 mld) due to one city doubling its withdrawal.

[11] 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

Table 16a. Ohio 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	374	111	26	510	0	15	77
Self-Supply Commercial & Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	30	3	34	0	0	31
Self-Supply Livestock	0	0	1	1	0	0	1
Self-Supply Industrial	58	111	41	210	0	0	4
Self-Supply Thermoelectric Power Production (Once-through cooling)	378	180	0	558	0	0	6
Self-Supply Thermoelectric Power Production (Recirculated cooling)	136	0	0	136	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	7	1	9	0	-25	2
Total	947	438	72	1,458	0	-10	133

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 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,414	419	98	1,931	0	57	290
Self-Supply Commercial & Institutional	1	0	0	1	0	0	0
Self-Supply Irrigation	2	115	12	128	0	0	115
Self-Supply Livestock	0	0	3	3	0	-1	2
Self-Supply Industrial	220	419	156	795	0	0	15
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,432	679	0	2,112	0	0	21
Self-Supply Thermoelectric Power Production (Recirculated cooling)	514	0	0	514	0	0	51
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	3	27	3	34	0	-93	9
Total	3,586	1,660	271	5,518	0	-37	504

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 (more than 12 million people) live within the Great Lakes-St. Lawrence River Basin. Most live along the coast in eight of Canada's 20 largest cities, which include Toronto, Hamilton, Windsor, and Sarnia.[12] Ontario's portion of the Great Lakes forms the longest freshwater coastline in the world stretching more than 6,800 miles (11,000 kilometers)[13] 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.

Excluding in-stream hydroelectric water use (reported amount of 252,890 mgd or 957,293 mld), the total water withdrawal amount from the Basin was approximately 16,402 mgd (62,088 mld). The three largest water use categories were thermoelectric power (once-through cooling) at 14,111 mgd (53,416 mld) or 86 percent of the total withdrawal amount; public supply at 1,144 mgd (4,331 mld); and industrial at 1,064 mgd (4,028 mld). Except for the Lake Superior watershed, where other surface water was the primary source for withdrawals, the primary source for withdrawals came from Great Lakes surface water.

No diversions out of the Great Lakes-St. Lawrence River Basin were reported for Ontario, while diversions into the basin were approximately 4,040 mgd (15,293 mld). The Welland Canal is entirely within Ontario and functions as two intrabasin transfers (one out of the Lake Erie Basin and one into the Lake Ontario Basin). These transfers effectively cancel each other out, resulting in a net zero intrabasin transfer. For more information about the volume of these transfers, see the Lake Erie Basin section above. The total consumptive use amount was approximately 341 mgd (1,291 mld). The three water use sectors representing the largest consumptive uses included thermoelectric power at 127 mgd (480 mld), public water supply at 137 mgd (519 mld) and industrial at 66 mgd (272 mld). Ontario reported intrabasin diversions totaling four mgd (14 mld).

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 data varied among water use sectors from 93 percent for the industrial sector to 100 percent for public water supply and thermoelectric power production (once-through cooling).

Notable changes in 2017 water use by Ontario facilities include:

- A 26 mgd (95 mld) decrease in withdrawals for public water supply is primarily due to an internal counting change to align with regional reporting standards; and
- A 91 percent (110 mgd or 416 mld) decrease in withdrawals for commercial and institutional use is primarily due to one user being reclassified as an in-stream hydropower production user.

[12] Ontario Ministry of Natural Resources. 2012. http://www.mnr.gov.on.ca/en/Business/GreatLakes/2ColumnSubPage/STEL02_173888.html
[13] Ontario Ministry of the Environment. 2012, http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_096933.pdf

Table 17a. Ontario 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	849	230	66	1,144	4	0	137
Self-Supply Commercial & Institutional	1	7	2	10	0	0	1
Self-Supply Irrigation	0	3	8	10	0	0	9
Self-Supply Livestock	0	31	25	56	0	0	0
Self-Supply Industrial	672	231	161	1,064	0	0	66
Self-Supply Thermoelectric Power Production (Once-through cooling)	13,529	582	0	14,111	0	0	127
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	140,042	112,848	0	252,890	0	-4,040	0
Other Self Supply	2	4	0	6	0	0	0
Total	155,095	113,935	262	269,292	4	-4,040	341

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 transfers associated with the Welland Canal 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.*

Table 17b. Ontario 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	3,214	869	249	4,332	14	0	520
Self-Supply Commercial & Institutional	3	26	8	37	0	0	5
Self-Supply Irrigation	0	10	29	39	0	0	33
Self-Supply Livestock	0	119	94	213	0	0	2
Self-Supply Industrial	2,543	874	611	4,028	0	0	249
Self-Supply Thermoelectric Power Production (Once-through cooling)	51,214	2,203	0	53,418	0	0	481
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	530,118	427,176	0	957,294	0	-15,293	0
Other Self Supply	6	16	2	23	0	0	0
Total	587,098	431,292	992	1,019,382	14	-15,293	1,289

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 transfers associated with the Welland Canal 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.*

Pennsylvania

The Pennsylvania portion of the Lake Erie watershed spans 508 square miles. The largest land uses in Pennsylvania's portion of the Basin are agriculture and forest.[14] While it is the smallest watershed in the state, it is home to more than 240,000 people concentrated along the 76.6 miles of Lake Erie coastline.

The total withdrawal amount from the Basin for Pennsylvania was 37 mgd (140 mld). The majority (29 mgd or 110 mld), or 79 percent of the total withdrawal amount, was used for public water supply purposes.

No diversions were reported in 2016. The total consumptive use was four mgd (15 mld). The public water supply sector made up the majority (78 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 89 percent for the irrigation sector to 100 percent for the self-supply commercial and institutional and self-supply industrial sectors. Pennsylvania DEP did not include estimated water use for the facilities that failed to report their water use to the state.

It is important to note that multiple users in the self-supply irrigation and industrial sectors did not meet threshold facility use levels in 2017 and therefore are not represented in this year's report.

[14] Email communications with David Skellie, Pennsylvania Sea Grant. 2013.

Table 19a. Pennsylvania 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	28	0	2	29	0	0	3
Self-Supply Commercial & Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	0	0	0	0	0	0
Self-Supply Livestock	0	2	2	4	0	0	0
Self-Supply Industrial	4	0	0	4	0	0	0
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	31	2	3	37	0	0	4

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. Pennsylvania 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	105	0	6	111	0	0	11
Self-Supply Commercial & Institutional	0	0	0	0	0	0	0
Self-Supply Irrigation	0	1	0	1	0	0	1
Self-Supply Livestock	0	7	6	13	0	0	1
Self-Supply Industrial	14	0	0	14	0	0	1
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	0	0	0	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	0	0	0	0	0	0
Total	119	9	12	139	0	0	14

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 1,171 mgd (4,431 mld) – a small decrease from the 2016 withdrawal total of 1,228 mgd (4,648 mld). The majority (74 percent) of this amount was used for public water supply purposes at 866 mgd (3,279 mld). The industrial sector made up 23 percent of total withdrawals at 271 mgd (1,027 mld).

The total diversion amount was three mgd (10 mld) for public supply purposes. The total consumptive use amount was 198 mgd (748 mld) or 17 percent of the total withdrawal amount, which represents an 18 percent drop from 2016 (241 mgd, 911 mld). The primary water use sectors contributing to the total consumptive use were public supply at 130 mgd (492 mld) and industrial at 51 mgd (194 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 industry in 2016. Because of the new sectors reporting and the relatively new system overall, Québec data quality is improving each year, with notable improvements to compliance rates among the commercial and institutional (67 percent), livestock (45 percent), and industrial (23 percent) use sectors.

Notable changes in 2017 water use by Québec facilities include:

- Differences in consumptive use between 2017 and 2016 are primarily the result of fine tuning the methodology of calculating consumptive use for public water supply; and
- Differences in withdrawals between 2017 and 2016 are primarily the result of improved reporting compliance rates among users.

Table 20a. Québec 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	626	194	46	866	0	3	130
Self-Supply Commercial & Institutional	0	5	1	6	0	0	2
Self-Supply Irrigation	0	1	1	2	0	0	2
Self-Supply Livestock	0	9	2	10	0	0	7
Self-Supply Industrial	93	162	16	271	0	0	51
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	11	3	0	15	0	0	5
Total	731	374	66	1,171	0	3	198

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. Québec 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	2,371	734	173	3,279	0	10	492
Self-Supply Commercial & Institutional	1	17	2	21	0	0	9
Self-Supply Irrigation	1	4	3	8	0	0	8
Self-Supply Livestock	0	33	6	39	0	0	25
Self-Supply Industrial	351	613	62	1,027	0	0	194
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	43	12	2	57	0	0	20
Total	2,768	1,415	249	4,431	0	10	748

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

About 10,000 square miles of Lakes Michigan and Superior lie within Wisconsin's borders.[15] The state has more than 1,000 miles of Great Lakes shoreline and more than 20 percent of the state's land area lies within the Basin, where half the population of the state also lives. More than 1.6 million Wisconsin citizens get their drinking water from Lake Michigan or Lake Superior.[16]

The total reported water withdrawal amount from the Basin for Wisconsin was 4,146 mgd (15,694 mld), a four percent increase from the 2016 water withdrawal total of 3,983 mgd (15,077 mld). Ninety-nine percent of withdrawals came from the Lake Michigan watershed. The primary water use sectors were thermoelectric power production (once-through and recirculated cooling) at 3,632 mgd (13,749 mld), public water supply at 307 mgd (1,162 mld), and industrial at 108 mgd (409 mld).

The total reported diversion was 19 mgd (72 mld) from the Lake Michigan watershed, mainly for thermoelectric power production (recirculated cooling) purposes. The total consumptive use was 122 mgd (462 mld). The primary consumptive uses came from thermoelectric power (45 mgd or 170 mld), public water supply (37 mgd or 140 mld), and irrigation (20 mgd or 76 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 2017 water use by Wisconsin facilities include:

- A 23 mgd (87 mld) increase in withdrawals for public water supply is the result of one city using more water. Withdrawals reported in this sector also include water used by a local power plant; and
- The increase (161 mgd or 609 mld) in withdrawals for thermoelectric power production (once-through cooling) is within the range of normal fluctuation caused by climate variability.

[15] Wisconsin Sea Grant. 2013. http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=796
[16] Wisconsin Department of Natural Resources. 2013. http://dnr.wi.gov/topic/greatlakes/learn.html

Table 21a. Wisconsin 2017 Water Use Data Summary in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	240	21	46	307	0	7	37
Self-Supply Commercial & Institutional	2	6	2	10	0	0	1
Self-Supply Irrigation	0	3	27	29	0	0	20
Self-Supply Livestock	0	13	15	28	0	0	6
Self-Supply Industrial	1	92	14	108	0	0	13
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,423	236	0	3,659	0	0	37
Self-Supply Thermoelectric Power Production (Recirculated cooling)	12	0	0	12	0	12	9
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
Total	3,678	371	105	4,155	0	19	122

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 21b. Wisconsin 2017 Water Use Data Summary in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	TOTAL	Intrabasin	Interbasin	
Public Water Supply	909	79	174	1,161	0	26	139
Self-Supply Commercial & Institutional	6	23	8	37	0	0	2
Self-Supply Irrigation	0	10	100	110	0	0	77
Self-Supply Livestock	0	50	56	106	0	0	21
Self-Supply Industrial	4	348	54	407	0	0	51
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,933	892	0	13,824	0	0	138
Self-Supply Thermoelectric Power Production (Recirculated cooling)	44	0	0	44	0	44	34
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	0	3	4	7	0	0	0
Total	13,896	1,404	397	15,696	0	70	462

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[17]" 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.

[17] 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.