



Annual Report of the Great Lakes Regional Water Use Database

Representing 2012 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



Table of Contents

Acknowledgments.....	3
Preface	3
Overview.....	5
The Importance of Water in the Great Lakes and St. Lawrence River Region.....	5
Great Lakes Regional Water Use for 2012	7
Lake Watershed Summaries.....	12
Lake Superior.....	12
Lake Michigan	14
Lake Huron	16
Lake Erie.....	18
Lake Ontario	20
St. Lawrence River.....	22
Jurisdiction Reports	23
Illinois	23
Indiana	25
Michigan	27
Minnesota.....	28
New York.....	29
Ohio	30
Ontario	32
Pennsylvania	34
Québec	35
Wisconsin.....	36
Appendices.....	37

Acknowledgments

The Great Lakes Commission thanks the states and provinces for their commitment in collecting and reporting water use data. Jim Casey and Dan Injerd (Illinois), Allison Mann (Indiana), Andrew LeBaron (Michigan), Sean Hunt (Minnesota), Rich Kruzansky (New York), Lenn Black (Ohio), Jonathan Staples and Wendy Fallis (Ontario), Dave Jostenski (Pennsylvania) and Marc-Olivier Bedard (Québec) contribute much time and effort in preparing and reviewing water use data for this report. We are also appreciative of the Council of Great Lakes Governors for their financial support of this effort and careful review of this report.

Preface

This is the Annual Report of the Great Lakes-St. Lawrence River Regional Water Use Database, representing 2012 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, as required under the Great Lakes-St. Lawrence River Basin Water Resources Compact (the Compact) and the Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement (the Agreement).

The 2012 annual water use report is the first year of water use data using the new water use data collection and reporting protocols, which were adopted by the states and provinces in 2009. As such, it represents an important milestone in the life of annual water use data collection and reporting, and is an important step for the region toward providing better water use data and information to aid the Great Lakes-St. Lawrence River states and provinces in the implementation of the Compact and the Agreement. The report also serves as an example of the renewed commitment of the Great Lakes-St. Lawrence governors and premiers to execute improvements in water use data collection and reporting in order to improve accuracy, compatibility and reliability of the data over time.

The Great Lakes-St. Lawrence River Regional Water Use Database has been operational since 1988. It was established by the states and provinces in response to a provision of the 1985 Great Lakes Charter, which 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 Basin. The Charter (a precursor to the Compact and Agreement) was a non-binding, “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 binational Great Lakes-St. Lawrence River Basin. The Charter envisioned a centralized database as an important tool to support a regional water resources management program to guide the future development, management and conservation of the water resources of the basin. In 1988, the GLC was selected to serve as the repository for the regional water use database. The maintenance and operation of the database has been provided by the GLC since that time, in partial fulfillment of the Charter obligations.

After two decades of collecting water use data and issuing the annual water use reports under the Charter, the database has been revised and upgraded to meet the requirements set forth by the Compact and Agreement. In 2008, to help implement the needed improvements in jurisdictional water use data collection and reporting programs, 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

the new protocols in 2009. The protocols offer guidance to ensure that state and provincial water use data provided to the database repository is accurate, of the highest quality, and reported in a common and consistent manner.

While the common data protocols are an important step, it is recognized that much additional work needs to be done and that improvements in data collection, reporting, quality, accuracy and compatibility must continue to occur.

Additional information describing the improvements to the data collected under the new regional water use data collection and reporting protocols is provided in Appendix A. Data summarized in this report are available to download from the GLC website at projects.glc.org/waterusedata.

While this report contains the best available information as of its publishing date (January 15, 2014), the states and provinces may continue to update their 2012 data housed in the online database. Therefore, discrepancies between the data online and those summarized in this report may appear.

Overview

The Importance of Water in the Great Lakes and St. Lawrence River Region

The Great Lakes contain an estimated 6.5 quadrillion gallons (24.6 quadrillion liters) of water or 5,500 cubic miles (22,700 cubic kilometers)—representing 20 percent of all the liquid surface fresh water on Earth. It is enough to submerge the continental United States in nearly 10 feet of water. More than 36 million people – about 23 million in the United States and 13 million in Canada – rely on the Great Lakes for drinking water, jobs and to support their way of life. This represents roughly 8 percent of the U.S. population and 32 percent of Canada's.¹

Along with the St. Lawrence River, the Great Lakes exert a profound influence on the regional and national economies of the United States and Canada. The unique geographical, ecological and climatological characteristics of the Great Lakes and the land area making up the drainage basin have shaped the socio-economic heritage of the region, making it an economic powerhouse. If the eight-state, two-province region stood alone as a country it would be the second largest economy in the world, behind only the United States, and larger than Japan, Germany and England, China and India. In 2008, the region generated more than \$4.6 trillion in economic output (gross domestic product).²

Quick Facts on the U.S. Economy, Jobs and the Great Lakes

- 1.5 million jobs are tied to the Great Lakes
- The international shipping trade annually transports 50 million tons of cargo through the Great Lakes
- The Great Lakes fishing industry (both commercial and recreational) is valued at \$7 billion annually
- The eight Great Lakes states account for 30 percent of nationwide agricultural sales, a \$45 billion industry

With so much economic activity occurring and so much fresh surface water available in this region, there is often a misconception that water is immune to the threats associated with poor water quality and water scarcity that affect other areas of the globe. However, as vast as the Great Lakes and St. Lawrence River seem, they are still a fragile and finite resource that can be impacted adversely unless properly managed, protected and conserved.

As population, economic growth and land use changes have occurred in the Great Lakes-St. Lawrence River region over the past 50 years, the Great Lakes governors and premiers saw the need to collectively

¹ Wisconsin Sea Grant. 2013. <http://www.seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=796>

² Brookings Institute. 2008. The Vital Connection: Reclaiming Great Lakes Economic Leadership in the Bi-National US-Canadian Region. http://deepblue.lib.umich.edu/bitstream/handle/2027.42/88349/2009_Brookings_The_Vital_Connection.pdf?sequence=1

come together to better manage the region's water resources. They recognized that the region must use water wisely to ensure that it remains sustainable and to maintain the region's economic competitiveness.

Under the 2005 Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement) and the 2008 companion Great Lakes – St. Lawrence River Basin Water Resources Compact (Compact)³, the governors and premiers formalized a regional management regime. These agreements, developed through the Council of Great Lakes Governors, detail how the states and provinces will manage and protect the basin and provide a framework for each state and province to enact measures for its protection. This regional management regime bans virtually all new diversions of Great Lakes water, and requires the states and provinces to sustainably manage, conserve and efficiently use their water resources. To inform regional water resource management decisions, the states and provinces are committed to collect and share comparable and reliable water resource management information.

³ Agreement includes the Great Lakes states and provinces while the Compact includes only the Great Lakes states.

Great Lakes Regional Water Use for 2012

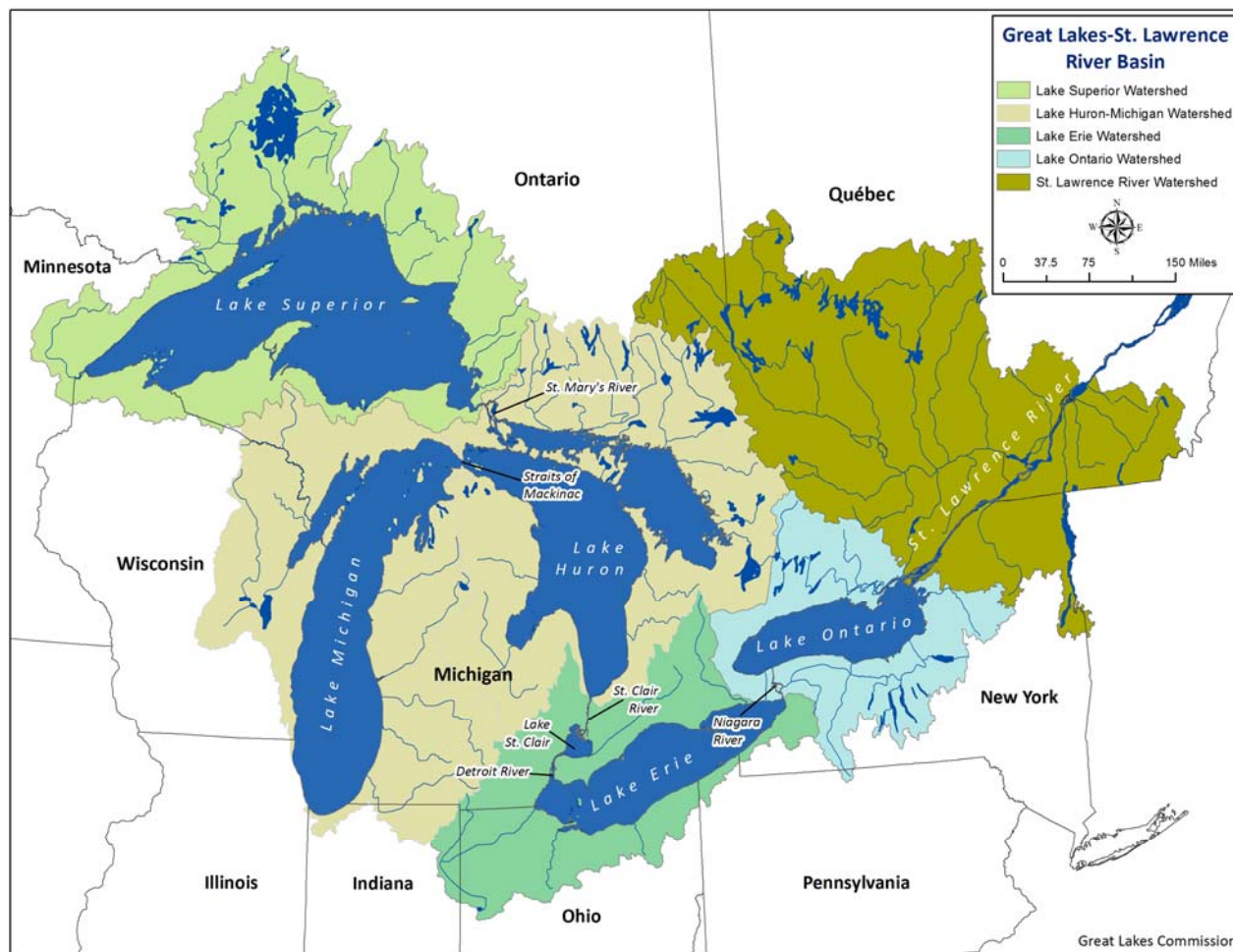


Figure 1. Great Lakes-St. Lawrence River Basin

The Great Lakes-St. Lawrence River – 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, equivalent to 9,066 million Olympic size swimming pools.⁴

In 2012, the total withdrawal amount for the Great Lakes-St. Lawrence River Basin was 44.3 billion gallons per day (bgd) or 167.8 billion liters per day (bld), which is equivalent to 0.68 percent of the total volume of the lakes. Since most of the water withdrawn was returned to the basin, only 7.5 percent of the total amount withdrawn 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 the pie chart below. The 10 water use sectors are defined in Appendix C. Thermoelectric power production, industrial and public water supply are the primary water use sectors, (e.g., those withdrawing the largest volumes of water).

⁴ An Olympic size swimming pool holds at least 2.5 million liters..

Water Withdrawals by Water Use Sector in mgd (excluding in-stream hydroelectric water use)

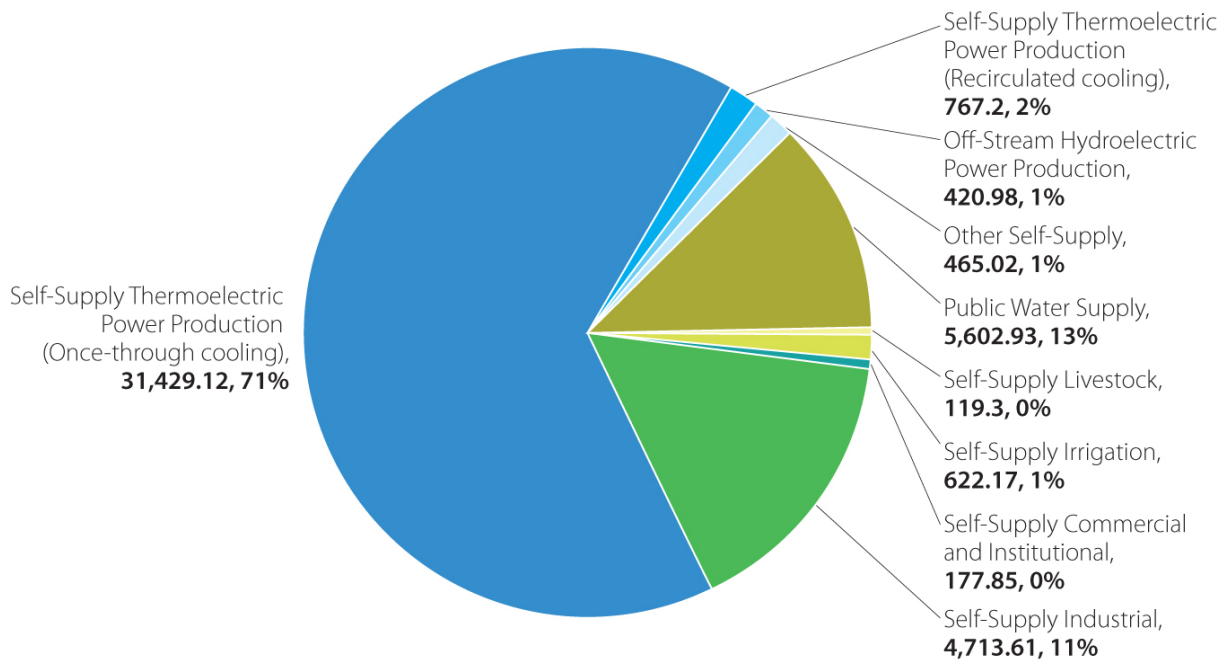


Figure 2.

The lake watershed with the largest withdrawal is Lake Michigan, followed by lakes Erie and Ontario respectively. The graph below shows withdrawals by basin broken down by water source, e.g., Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW).

Water Withdrawals by Basin in mgd (excludes in-stream hydroelectric water use)

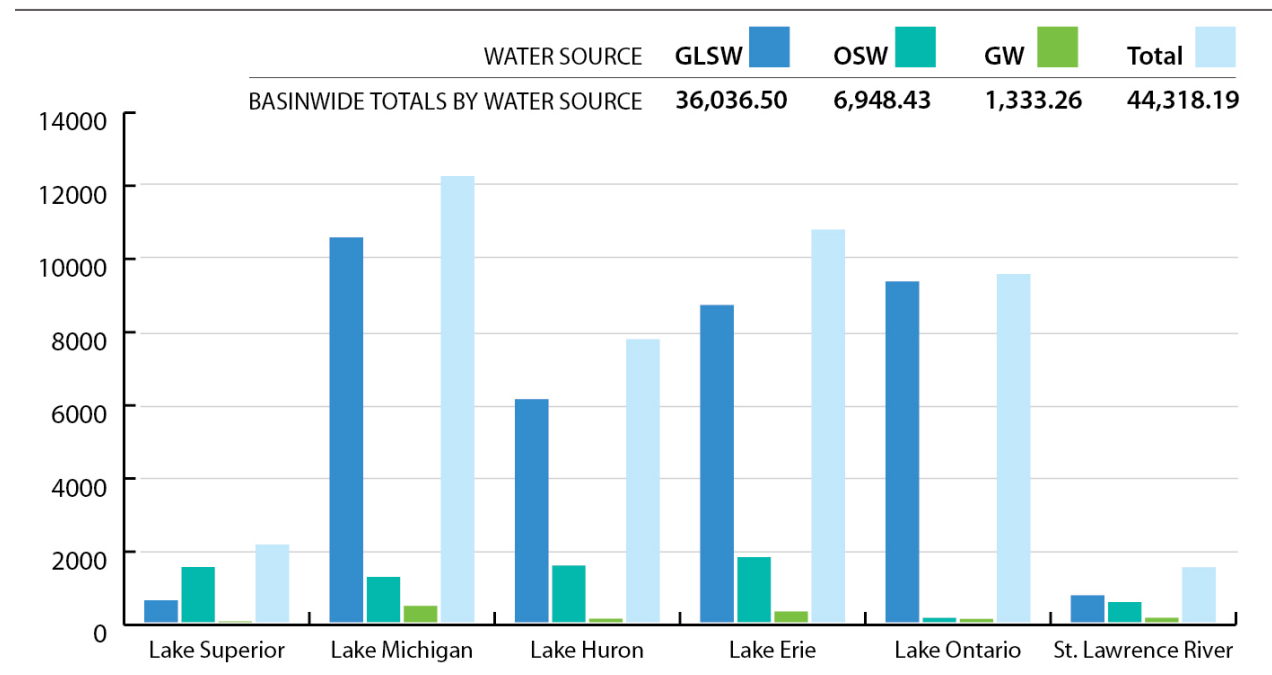


Figure 3.

The pie chart below shows total withdrawals portioned by state and provincial jurisdiction, excluding in-stream hydroelectric water use.

Water Withdrawals by Jurisdiction in mgd (excludes in-stream hydroelectric water use)

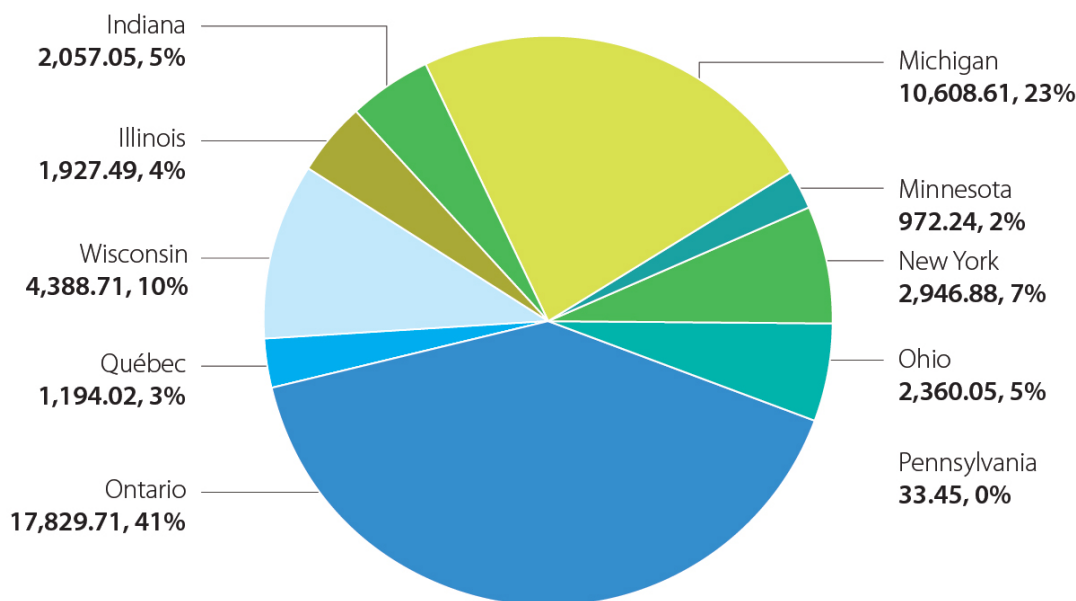


Figure 4.

Hydroelectric Power Generation

In the past years of reporting on annual water use, withdrawals for hydroelectric purposes (both in-stream and off-stream) have been the largest single sector of use, representing more than 95 percent of the region's total water withdrawals. In-stream hydroelectric power production continues to be an important water use for the Great Lakes-St. Lawrence River region (e.g., New York produced more hydroelectric power than any other state east of the Rocky Mountains in 2011⁵). However, beginning in 2012, under the new water use data collection and reporting protocols, the reporting of in-stream hydroelectric power production data is optional.

The regional water use database is designed to receive and report on both 1) off-stream hydroelectric power production water withdrawal; and 2) in-stream hydroelectric water use data submitted by states and provinces. For 2012, the regional database has an incomplete data set related to the in-stream hydroelectric water use sector, therefore it will not be summarized at the regional level in this report. Moreover, in-stream hydroelectric power water use is not considered a withdrawal because the water remains in the water body and is not associated with any water consumption. In contrast, off-stream hydroelectric is considered a withdrawal since the water is removed to a pump-storage system. After being used, it is then returned to the water source. In each state and provincial summary presented below both off-stream and in-stream totals are presented in a chart format.

⁵ U.S. Energy Information Administration. 2012. <http://www.eia.gov/state/?sid=NY>

Diversions, Consumptive Uses and Return Flow

Diversions and consumptive uses of water are key components of the regional water use database. Consumptive uses and diversions (less return flow) reflect water not being returned (e.g., water loss) 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 Compact and Agreement definitions for diversions and consumptive use are presented in Appendix B.

Total diversion from the Great Lakes-St. Lawrence River Basin is 1,241.05 million gallons per day (mgd) or 4,697.92 million liters per day (mld). The majority (82%) of this amount is associated with the Illinois diversion, which takes water from Lake Michigan and discharges it into the Mississippi River watershed. Smaller diversions throughout the region make up the balance of the total, and some of the diverted water is returned to the basin as return flow. There are a number of diversions into the basin, including the Long Lac and Ogoki diversions (two incoming diversions from the Albany River basin into northern Lake Superior). Overall, net diversion is -2,599.06 mgd (-9,687.08 mld), meaning that more water is diverted into the basin than is diverted out of the basin.

According to the 2009 Water Use Reporting Protocols: “Annual water use reporting for diversions must account for water returned to the basin or to the source Great Lake-St. Lawrence watershed. However, with Ohio as the exception, no return flow data and net diversion amounts have been reported for 2012 by the states and provinces.

Consumptive use is defined as 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 calculated by applying a consumptive use coefficient to the reported withdrawal amount. The current database framework documents the consumptive use coefficient used for each water withdrawal record and the percentage of the consumptive use amount that was determined through actual measurement. Total consumptive use for the Great Lakes-St. Lawrence River Basin is 3,347.68 mgd (12,672.34 mld). At 1,185.62 mgd (4,488.06 mld), Lake Erie has the largest consumptive use total among the five lake watersheds.

Lake Watershed Summaries

Lake Superior

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, approximately 31,700 square miles (82,103 square kilometers). The majority (91%) of the watershed is covered by forest, which has supported the logging industry in the region. The remaining major land uses are agriculture (3%) and residential (1%).

Water Withdrawals

Four jurisdictions share the Lake Superior watershed – Michigan, Minnesota, Ontario and Wisconsin – which collectively withdrew 2,121.4 mgd of water, excluding in-stream hydroelectric water use (43,322.57 mgd). Waters of the Lake Superior watershed were primarily used to generate electricity with self-supply thermoelectric power, both once-through and recirculated cooling (1,341.48 mgd) and off-stream hydroelectric power production (401.39 mgd) being the major water use sectors. Other major water uses include industrial at 287.78 mgd and public water supply at 7202 mgd, which were primarily within the Ontario and Minnesota portions of the watershed. Excluding in-stream hydroelectric water use, 71 percent (1,507.5 mgd) of the total withdrawals came from other surface water of the Lake Superior watershed. The remaining withdrawals came directly from Lake Superior (28% or 594.34 mgd) and groundwater (1% or 19.47 mgd).

Water Diversions and Consumptive Uses

Water loss in the Lake Superior watershed totaled 67.48 mgd (4 percent of total withdrawals). It was comprised mainly of the aggregated industrial water diversion in Minnesota of 10.98 mgd and the total watershed consumptive use for all four jurisdictions of 67.03 mgd. Industrial use (28.3 mgd), use for thermoelectric power – recirculated cooling (16.28 mgd) and the public water supply (7.66 mgd) sectors were the largest contributors, respectively, to the total consumptive use of the watershed.

Water gain (3,800.11 mgd) in the Lake Superior watershed came from the historic Long Lac and Ogoki diversion in Northern Ontario. On average, these diversions into the basin were about 25 percent larger by volume than the Illinois diversion out of the basin.

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 Time¹:
191 years

Population in the Watershed: United
States 444,000; Canada 229,000.
Total: 673,000

⁶Minnesota Sea Grant. 2012. <http://www.seagrants.umn.edu/superior/facts>

Lake Superior Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	53.06	3.11	15.84	72.02	0.04	0	7.66
Self-Supply Commercial & Industrial	0.71	0.68	0.13	1.53	0	0	0.16
Self-Supply Irrigation	0	0.61	0.63	1.24	0	0.01	1.11
Self-Supply Livestock	0.64	13	1.58	15.22	0	0	0.58
Self-Supply Industrial	141.5	144.99	1.29	287.78	0	10.98	28.3
Self-Supply Thermoelectric Power Production (Once-through cooling)	371.31	943.03	0	1,314.34	0	0	13.39
Self-Supply Thermoelectric Power Production (Recirculated cooling)	27.12	0.02	0	27.14	0	0	16.28
Off-Stream Hydroelectric Power Production	0	401.39	0	401.39	0	0	0
In-Stream Hydroelectric Water Use	0	43,322.57	0	43,322.57	0	0	0
Other Self Supply	0	0.74	0	0.74	0	-3,800.11	0
Total	594.34	44,830.147	19.47	45,443.97	0.04	-3,789.12	67.483

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Lake Michigan

Overview of Watershed Characteristics

Lake Michigan is the only one of the Great Lakes 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). Agriculture (44%) and forest (41%) are the major land uses in the watershed, followed by residential land use (9%). 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.

Water Withdrawals

Four jurisdictions share the Lake Michigan watershed – Illinois, Indiana, Michigan, and Wisconsin – and collectively used 12,588.34 mgd of water. The primary water uses were thermoelectric power, both once-through and recirculated cooling (8,189.79 mgd), industrial (1,976.19 mgd) and public water supply (1,680.01 mgd).

While the Lake Michigan surface water (86% of total withdrawals or 10,558.55 mgd) was the primary source of water withdrawals in the watershed.

Water Diversions and Consumptive Uses

Water loss in the Lake Michigan watershed, totaling 1,409.11 mgd and representing 11 percent of total withdrawals, was comprised mainly of the Illinois diversion (1,125.26 mgd for public water supply and other purposes) and the total consumptive use of the four jurisdictions (999.72 mgd). Industrial (383.16 mgd), irrigation (406.81 mgd) and public water supply (91.78 mgd) were the water use sectors that contribute the majority of the consumptive uses in the 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

Lake Michigan Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,414.43	22.93	242.65	1,680.01	0.035	987.35	91.78
Self-Supply Commercial & Industrial	2.45	28.21	9.67	40.34	0	2.13	4.64
Self-Supply Irrigation	0.43	106.59	359.06	466.09	0	0.35	406.81
Self-Supply Livestock	0	7.31	20.38	27.69	0	0	9.1
Self-Supply Industrial	1,396.81	505.45	69.92	1,972.19	3	23.54	383.16
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,418.89	643.39	0.98	8,063.04	0	0	74
Self-Supply Thermoelectric Power Production (Recirculated cooling)	122.87	2.48	1.4	126.75	0	0	26.89
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	202.67	1.06	8.49	212.23	0	197.87	3.34
Total	10,558.55	1,317.47	712.55	12,588.34	3.035	1,211.24	999.72

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Lake Huron

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 volume however, Lake Huron is only the third largest of the Great Lakes. The Lake Huron watershed is dominated by forest (86%) and agricultural (27%) land uses. Residential is only 2 percent of the total land use.

Water Withdrawals

Two jurisdictions – Michigan and Ontario – share the watershed and collectively used 7,779.59 mgd of the water, excluding in-stream hydroelectric water use. The primary water uses were industrial (389.24 mgd), thermoelectric power (7,038.58 mgd) and public water supply (246.63 mgd).

Lake Huron surface water was the source of 78 percent of the total withdrawals in the watershed. Most of these withdrawals were used for industrial purposes in Ontario and thermoelectric power purposes in Michigan. Lake Huron surface water provided half of the total public water supply for Ontario and the entire public water supply for Michigan's portion of the watershed.

Water Diversions and Consumptive Uses

Water loss to the Lake Huron watershed totaled 193.85 mgd, which represented nearly 2.5 percent of total withdrawals. This total includes an intrabasin transfer of 42.73 mgd 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 (25.63 mgd) and thermoelectric power production (74.46 mgd) made up the majority (89%) of the consumptive uses in the watershed.

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

Lake Huron Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	151.16	42.48	52.99	246.63	42.73	0	25.63
Self-Supply Commercial & Industrial	1.22	2.05	1.42	4.69	0	0	0.29
Self-Supply Irrigation	0.43	19.46	32.25	52.14	0	0	46.45
Self-Supply Livestock	0.32	6.01	11.41	17.74	0	0	0
Self-Supply Industrial	255.12	112.28	21.84	389.24	0	0	16.83
Self-Supply Thermoelectric Power Production (Once-through cooling)	5,683.95	1,345.81	0	7,029.76	0	0	57.63
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	3.89	4.92	8.82	0	0	4.29
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	1,674.9	16521.83	0	18,196.73	0	0	0
Other Self Supply	0.45	29.96	0.16	30.57	0	0	0
Total	7,767.55	18,083.77	124.99	25,976.32	42.73	0	151.12

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Lake Erie

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 the greatest depth is 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 also helps make it the most productive. However, its size also makes it more ecologically sensitive than the other Great Lakes.

The Lake Erie watershed is dominated by agricultural land use, covering more than two-thirds of the watershed's land mass. Other significant land uses include residential (10%) and forest (21%). The watershed is home to over 12.5 million people, representing more than one-third of the entire population of the Great Lakes-St. Lawrence River Basin.

Water Withdrawals

Six jurisdictions – Indiana, Michigan, New York, Ohio, Ontario and Pennsylvania – share the watershed and collectively used 10,745.28 mgd of the water, excluding in-stream hydroelectric water use, which accounted for 86,455.48 mgd. Aside from water used for hydroelectric power generation purposes, the primary water uses were thermoelectric power, both once-through and recirculated cooling (7,162.65 mgd), public water supply (1,656.37 mgd) and industrial (1,066.8 mgd).

Lake Erie surface water was the source of 87 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

Water loss in the Lake Erie watershed totaled 7,077.87 mgd. This amount includes diversions for public water supply purposes totaling 21.64 mgd, intrabasin transfers totaling 5,884.55 mgd, and a total consumptive use amount of 1,185.62 mgd. The major consumptive uses were from public water supply (210.08 mgd) and industrial uses (98.78 mgd).

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

Lake Erie Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	1,326.65	200.36	129.36	1,656.37	0	21.64	210.08
Self-Supply Commercial & Industrial	0.47	3.28	1.05	4.8	0	0	0.46
Self-Supply Irrigation	1.49	46.57	18.49	66.55	0	0	58.94
Self-Supply Livestock	0	3.37	6.51	9.88	0	-0.18	1.69
Self-Supply Industrial	783.78	151.69	131.78	1,066.8	0	0	98.78
Self-Supply Thermoelectric Power Production (Once-through cooling)	6,370.01	610.23	0.38	6,980.62	0	0	67.59
Self-Supply Thermoelectric Power Production (Recirculated cooling)	182.03	0	0	182.03	0	0	31.82
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	85,838	617.48	0	86,455.48	0	0	0
Other Self Supply	714.97	55.94	7.31	778.23	5,884.55	-13.76	716.26
Total	95,217.4	1,688.92	294.88	97,200.76	5,884.55	7.7	1,185.62

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Lake Ontario

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 in some areas and exceeds Lake Erie in volume (393 cubic miles, 1,639 cubic kilometers). By surface area, it is the 14th largest lake in the world.

The primary land uses in the Lake Ontario watershed are forest (49%) and agricultural (39%). Residential land use makes up 7 percent of the total. Nearly 5.7 million people reside in the watershed.

Water Withdrawals

Three jurisdictions – New York, Ontario and Pennsylvania – share the watershed and collectively used 9,511.35 mgd of the water, excluding in-stream hydroelectric water use, which accounted for 58,591.68 mgd. Aside from withdrawals for hydroelectric power generation purposes, the primary water uses were for public water supply (960.3 mgd), industrial uses (555.14 mgd) and thermoelectric power generation, both once-through and recirculated cooling (8,457.07 mgd).

Lake Ontario surface water was the source for 90 percent of the total withdrawals in the watershed. It was the source for most of the water use sectors, except for irrigation and livestock where other surface water in the watershed was the predominant source.

Water Diversions and Consumptive Uses

Water loss in the Lake Ontario watershed totaled 546.64 mgd. This amount includes diversions totaling 8.7 mgd for public supply purposes in New York and a combined consumptive use amount of 546.34 mgd. For New York, the thermoelectric power sector was the largest consumptive use at 211.23 mgd. For the province of Ontario, the public water supply sector was the largest consumptive use at 85 mgd. An intrabasin diversion into Lake Ontario totaled 711 mgd, which was used for navigation purposes.

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

Lake Ontario Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	689.22	249.71	21.37	960.3	6.18	8.7	116.53
Self-Supply Commercial & Industrial	51.43	63.92	0.58	115.93	0	0	14.03
Self-Supply Irrigation	0	29.55	2.35	31.9	0	0	28.45
Self-Supply Livestock	0	21.11	3.62	24.74	0	0	2.38
Self-Supply Industrial	333.05	165.89	56.19	555.14	0	0	77.84
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,806.07	228.3	0.23	8,034.61	0	0	87.14
Self-Supply Thermoelectric Power Production (Recirculated cooling)	422.2	0.26	0	422.46	0	0	211.23
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	1,900.13	56,691.55	0	58,591.68	0	0	0
Other Self Supply	5.4	-639.81	0.69	-633.73	-711	0	0.04
Total	11,207.5	56,810.48	85.03	68,103.03	-704.82	8.7	537.64

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

St. Lawrence River

Overview of Watershed Characteristics

Running 744 miles (1,198 kilometers) in length, the St. Lawrence River is one of the major rivers 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 used 1,567.2 mgd of the water, excluding in-stream hydroelectric water use, which accounted for 286,423.7 mgd. Aside from hydroelectric, the primary water uses were public water supply (987.6 mgd), and industrial (442.47 mgd).

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

St. Lawrence River surface water was the source for over half (52%) of the total withdrawals from the watershed. It was the primary source for the public supply, industrial and off-stream hydroelectric power production sectors.

Water Diversions and Consumptive Uses

Water loss in the St. Lawrence River basin totaled 408.34 mgd. This total includes a diversion amount of 2.42 mgd for public supply purposes in New York and Québec and a combined consumptive use amount of 405.92 mgd. The largest consumptive uses were the public water supply sector at 287.64 mgd and industrial at 104.1 mgd.

St. Lawrence River Watershed 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	570.85	365.12	51.63	987.6	0	2.42	287.64
Self-Supply Commercial & Industrial	0.73	7.95	1.89	10.57	0	0	2.66
Self-Supply Irrigation	0.49	3.55	0.22	4.27	0	0	3.38
Self-Supply Livestock	0	18.57	5.47	24.04	0	0	0.58
Self-Supply Industrial	217.65	188.53	36.29	442.47	0	0	104.1
Self-Supply Thermoelectric Power Production (Once-through cooling)	0	1.76	0	1.76	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	19.55	0.04	0	19.59	0	0	1.76
In-Stream Hydroelectric Water Use	249,198.3	37,225.38	0	286,423.7	0	0	0
Other Self Supply	5.9	70.28	0.81	76.98	0	0	5.8
Total	250,013.4	37,881.18	96.31	287,990.9	0	2.42	405.92

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

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 of Illinois. The Lake Michigan coastline of Illinois is 63 miles long, which is a small fraction of the 1,640 miles that make up the total Lake Michigan shoreline. Despite its relatively small size, the Illinois Lake Michigan service area is home to half of the total population of Illinois and the lake itself is the largest public drinking water supply in the state, serving nearly 7 million people. Lake Michigan is also Illinois' largest recreational resource and one of its biggest economic assets.⁷

The total withdrawal amount for Illinois in 2012 was 1,927.49 mgd. The largest uses of water were public water supply at 927.39 mgd (48% of total withdrawals) and thermoelectric power production, once through cooling at 778.54 mgd (40% of total withdrawals). The primary source for all withdrawals was Lake Michigan surface water.

The Illinois Diversion, which takes water from Lake Michigan and discharges it into the Mississippi River watershed, is comprised of three elements: public water supply; stormwater runoff; and support for control structures for navigation and discretionary diversion for other purposes such as low flow augmentation and water quality enhancement.

The amount of water diverted for public water supply was 927.39 mgd. The diversion amount supporting other uses (i.e., discretionary diversion) was 197.87 mgd. Stormwater runoff from the diverted Lake Michigan (673 square mile) watershed was calculated by the U.S. Army Corps of Engineers and is dependent on the amount of rainfall each year. In the 2009 accounting year, it was 40 percent of Illinois' total diversion. This number is not included in the data Illinois submits to the GLC every year.

A consumptive use amount was reported for the industrial sector at 0.01 mgd.

⁷ Illinois Environmental Protection Agency. <http://www.epa.state.il.us/water/surface-water/lake-michigan-mon.html>

Illinois 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	927.39	0	0	927.39	0	927.39	0
Self-Supply Commercial & Industrial	2.13	0	0.01	2.14	0	2.13	0
Self-Supply Irrigation	0.05	0	0	0.05	0	0	0
Self-Supply Livestock	0	0	0	0	0	0	0
Self-Supply Industrial	21.5	0	0	21.5	3	0	0.01
Self-Supply Thermoelectric Power Production (Once-through cooling)	778.54	0	0	778.54	0	0	0
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	1,97.87	0	0	197.87	0	197.87	0
Total	1,927.48	0	0.01	1,927.49	3	1,127.39	0.01

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Indiana

The state of Indiana relies on 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 the Lake Michigan watershed, but three counties (Lake, Porter and LaPorte) constitute more than 99.5 percent of the land area. Abundant freshwater from Lake Michigan has promoted the development of an extensive urban and industrial belt along the Indiana coast of Lake Michigan. Water supplies in Indiana's non-coastal counties in the Lake Michigan watershed are drawn primarily from groundwater sources.

Indiana shares a portion of the Maumee River watershed that flows into Lake Erie. The Maumee River watershed encompasses a total of 1,283 square miles of northeast Indiana. Six Indiana counties lie partially within this watershed. The largest withdrawals come from the surface waters of the St. Joseph (a major tributary within the Maumee watershed) and the Maumee River, used for public supply and industrial purposes. Groundwater withdrawals in the Maumee River watershed are used primarily for public and domestic water supply and dewatering for industrial purposes.⁸

In 2012, the total water withdrawals for Indiana were 2,057.05 mgd. The largest uses were for industrial (1,562 mgd), thermoelectric power (216.44 mgd) and public water supply (177.34 mgd). The majority (81%) of the withdrawals within the Lake Michigan watershed came from Lake Michigan surface water. The majority (74%) of the withdrawals within the Lake Erie watershed came from other surface waters; groundwater supplied the remaining withdrawals.

The total diversion amount for Indiana was 85.5 mgd. Because a small, 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. The majority of reported diversions for Indiana (53.65 mgd) were distributed for public supply purposes from Lake Michigan surface water and discharged to the "Illinois Diversion" area, with about 0.93 mgd reported as a diversion from groundwater for public supply. The industrial sector was responsible for about 23.54 mgd of the reported diversion from the Lake Michigan watershed to the Illinois Diversion (about 22.45 mgd from Lake Michigan surface water and 1.09 mgd from other surface waters). For the Lake Erie watershed, a portion of the town of Fort Wayne's public water supply distribution system is located in the Upper Wabash watershed. The amount of water (about 7.38 mgd 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 totaled 452.68 mgd, with the industrial sector in the Lake Michigan watershed (348.13 mgd or 77%) as the primary contributor to the total.

⁸ 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

Indiana 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	92.12	33.37	51.85	177.34	0	61.96	21.51
Self-Supply Commercial & Industrial	0	23.85	1.6	25.45	0	0	3.05
Self-Supply Irrigation	0	12.39	55.4	67.79	0	0	60.7
Self-Supply Livestock	0	0.27	5.79	6.06	0	0	3.58
Self-Supply Industrial	1,326.65	227	8.81	1,562.46	0	23.54	350.6
Self-Supply Thermoelectric Power Production (Once-through cooling)	216.17	0	0.27	216.44	0	0	13.07
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	0.32	1.19	1.51	0	0	0.17
Total	1,634.94	297.2	124.91	2,057.05	0	85.5	452.68

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Michigan

Home to over 9.8 million people, Michigan borders four of the Great Lakes (Superior, Michigan, Huron and Erie). Some unique features of Michigan include:

- 57,022 square miles of land area in two peninsulas (40,583 square miles in the Lower Peninsula and 16,439 square miles in the Upper Peninsula);
- Virtually the entire land area of the state lies within the Great Lakes basin;
- 38,575 square miles of Great Lake water area; and
3,126 miles of Great Lakes shoreline (more fresh water coastline than any other state).⁹

In 2012, the total water withdrawal amount for Michigan was 10,278.6 mgd. The largest use was thermoelectric power production (once-through and recirculated cooling), totaling 8,328.61mgd or 79 percent of the total withdrawal amount. Great Lakes surface water was the largest source for withdrawals at 88 percent of the total. Nearly half of the total water withdrawals (4,873.38 mgd, 48%) were in the Lake Erie watershed, mainly used for thermoelectric power production.

Michigan reported no diversions. The total amount of consumptive use was 689.88 mgd (nearly 7% of total withdrawals), with public water supply being the largest contributor to consumptive use at 133.99 mgd. Two intrabasin transfers were reported, both from the Lake Michigan watershed and both for public supply purposes. One intrabasin transfer (0.28 mgd) discharges to the Lake Superior basin, and the other (0.07 mgd) discharges to the Lake Erie basin.

Michigan 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	840.11	20.5	211.29	1071.9	0.35	0	133.99
Self-Supply Commercial & Industrial	0	2.79	5.53	8.32	0	0	1.04
Self-Supply Irrigation	0.63	120.88	294.78	416.28	0	0	374.65
Self-Supply Livestock	0	0	0.53	0.53	0	0	0.42
Self-Supply Industrial	515.04	173.42	82.32	440.81	0	0	77.08
Self-Supply Thermoelectric Power Production (Once-through cooling)	7,564.5	586.27	1.02	8,151.79	0	0	59.6
Self-Supply Thermoelectric Power Production (Recirculated cooling)	164.12	6.37	6.33	176.82	0	0	43.1
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	0.45	2.51	9.19	12.15	0	0	0
Total	9,084.85	912.74	610.99	10,278.6	0.35	0	689.88

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

⁹ Michigan Dept. of Transportation. http://www.michigan.gov/mdot/0,4616,7-151-9622_11033_11151-67959--,00.html

Minnesota

The Minnesota part of the Lake Superior watershed encompasses covers 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.¹⁰

Excluding in-stream hydrologic water use (1,691.48 mgd), the total withdrawal amount for Minnesota was 972.24 mgd. The major water use sectors include industrial at 222.68 mgd and thermoelectric power production (once-through cooling) at 306.25 mgd. These water use sectors were about equally supplied by Lake Superior surface water and other surface waters.

The total diversion amount was 10.99 mgd. Nearly the entire amount (10.98 mgd) was for industrial purposes. The remaining 0.01 mgd was for irrigation. Total consumptive use was 33.23 mgd; the majority of that amount (22.27 mgd) was for industrial purposes.

Minnesota 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	29.97	1.69	7.47	39.13	0	0	3.92
Self-Supply Commercial & Industrial	0.71	0.46	0	1.17	0	0	0.12
Self-Supply Irrigation	0	0.24	0	0.24	0	0.01	0.22
Self-Supply Livestock	0.64	0	0	0.64	0	0	0.58
Self-Supply Industrial	128.64	93.58	0.46	222.68	0	10.98	22.27
Self-Supply Thermoelectric Power Production (Once-through cooling)	147.64	158.61	0	306.25	0	0	6.12
Self-Supply Thermoelectric Power Production (Recirculated cooling)	0	0	0	0	0	0	0
Off-Stream Hydroelectric Power Production	0	401.39	0	401.39	0	0	0
In-Stream Hydroelectric Water Use	0	1,691.48	0	1,691.48	0	0	0
Other Self Supply	0	0.74	0	0.74	0	0	0
Total	307.6	2,348.19	7.93	2,663.72	0	10.99	33.23

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

¹⁰ 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>

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, which includes the Lake Champlain/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.¹¹

Excluding both in-stream hydrologic water use (241,868 mgd), the total withdrawal amount for New York was 2,946.88 mgd. The Lake Ontario watershed was the source of the majority of New York's water withdrawals at 1,636.69 mgd or 43 percent of total withdrawals. Thermoelectric power production (both once-through and recirculated cooling) at 2,026.57 mgd represented nearly 69 percent of total withdrawals; public water supply (468.2 mgd) represented nearly 16 percent of total withdrawals; and industrial water supply (310.92 mgd) represented 10 percent of the total withdrawals. For the Lake Erie and Lake Ontario watersheds, Great Lakes surface water was the primary source of water. For the St. Lawrence River watershed, groundwater was the primary source of water.

The 2012 total diversion amount for New York was 10.9 mgd for public supply purposes. The total consumptive use amount was 410.23 mgd. The largest consumptive use was attributed to thermoelectric power recirculated-cooling purposes at 211.23 mgd.

New York 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	238.05	214.87	15.28	468.2	0	10.9	56.63
Self-Supply Commercial & Industrial	0	67.49	1.12	68.61	0	0	6.86
Self-Supply Irrigation	0.35	34.73	2.87	37.95	0	0	34.15
Self-Supply Livestock	0	23.72	0.39	24.11	0	0	2.96
Self-Supply Industrial	160.36	133.19	17.37	310.92	0	0	66.28
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,420.28	183.83	0	1,604.11	0	0	32.08
Self-Supply Thermoelectric Power Production (Recirculated cooling)	422.2	0.26	0	422.46	0	0	211.23
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	241,868	0	0	241,868	0	0	0
Other Self Supply	0	9.07	1.45	10.52	0	0	0.04
Total	244,109.2	667.16	38.48	244,814.9	0	10.9	410.23

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

¹¹ 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

Ohio

Ohio's portion of the Lake Erie watershed drains 11,649 square miles and is home to 4.65 million people. Toledo, Sandusky and Cleveland are some of the communities that dot Ohio's 312-mile-long shoreline. 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 were from forested lands and wetlands, combined with pasture land making up 5 percent of total land use.¹²

The 2012 total withdrawal amount for Ohio was 2,360.05 mgd. Primary water use sectors included thermoelectric power production (once-through and recirculated cooling) at 1563.42 mgd, representing 66 percent of total withdrawals; public water supply (544.42 mgd), representing 23 percent; and industrial water supply (209.91 mgd), representing 9 percent. The source for the majority (72%) of the withdrawals was Lake Erie surface water. However, within the irrigation and industrial water use sectors, other surface water was the primary source at 88 percent and 50 percent of total withdrawals, respectively, within those sectors.

The total diversion amount of 14.26 mgd was reported primarily for public water supply purposes, and a net diversion amount (the summation of diversions going into and out of the Lake Erie watershed) of 0.32 mgd. The amount includes 14 diversions out of the Great Lakes basin under the 2009 Water Use Data Protocols. Additionally, 11 diversions, totaling 13.94 mgd were reported into the Lake Erie watershed were reported¹³.

Total consumptive use was 150.08 mgd. Over half (54%) of the total consumptive use was attributed to the public water supply sector.

¹² 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

¹³ The definition of diversion changed in Ohio statute to comply with the 2009 Water Use Data Protocols. Under Ohio's previous diversion statute, transfers of water across the Great Lakes-Ohio River basin divide (wherein the unconsumed portion was returned to the basin of origin) were not considered to be diversions. Additionally, only diversions greater than 100,000 gallon per day were regulated. So, consistent with the statute, Ohio reported two diversions out of the Great Lakes basin. Under the 2009 protocols, all transfers of water out of the Great Lakes basin, regardless of quantity, are considered diversions, even if the unconsumed portion is returned to the basin of origin. Therefore, instead of reporting two diversions out of the Great Lakes basin, as under the previous statute, Ohio currently reports 14 diversions out of the Great Lakes basin.

Ohio 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	400.57	115.81	28.04	544.42	0	14.26	81.67
Self-Supply Commercial & Industrial	0.3	0.05	0	0.35	0	0	0.06
Self-Supply Irrigation	0.46	27.2	3.33	30.99	0	0	27.89
Self-Supply Livestock	0	0.18	0.62	0.8	0	-0.18	0.64
Self-Supply Industrial	53.83	104.57	51.51	209.91	0	0	7.42
Self-Supply Thermoelectric Power Production (Once-through cooling)	1,117.57	316.55	0	1,434.12	0	0	14.34
Self-Supply Thermoelectric Power Production (Recirculated cooling)	129.13	0	0	129.13	0	0	12.91
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	3.29	6.37	0.67	10.33	0	-13.76	5.15
Total	1,705.15	570.73	84.17	2,360.05	0	0.32	150.08

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

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.¹⁴ Ontario's portion of the Great Lakes forms the longest freshwater coastline in the world stretching more than 6,800 miles (11,000 kilometers)¹⁵ 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.

Although this water withdrawal report accounts for the majority of water use within Ontario, data for a limited number of water users were not available. Data for the power sector categories were obtained through contact with individual operators, generating companies and other sources (using data from 2009-2011). Inter- and intrabasin diversions were reported using 2009 data. Excluding instream hydroelectric water use (reported amount of 249,430.63 mgd, or 944,197.64 million liters per day [mld]), the total water withdrawal amount was approximately 17,829.71 mgd (67,492.79 mld). The three largest water use categories were thermoelectric power (once-through cooling) at 15,188.19 mgd (57,493.54 mld) or 85 percent of total withdrawals; public supply at 1,188.84 mgd (4,500.25 mld); and industrial at 1,125.63 mgd (4,260.98 mld). Except for the Lake Superior and St. Lawrence River watersheds, where other surface water was the primary source for withdrawals, the primary source for withdrawals came from Great Lakes surface water.

No diversions from the Great Lakes-St. Lawrence River Basin were reported for Ontario in 2012, while diversions into the basin were approximately 14,385 mld. The total consumptive use amount was approximately 351.72 mgd (1,331.4 mld). Three water use sectors, representing the largest consumptive uses, included thermoelectric power at 136.59 mgd (517.04 mld), public water supply at 131.08 mgd (496.18 mld) and industrial at 72.64 mgd (274.98 mld). Ontario has intrabasin transfers totaling 5,222.46 mgd (19,769.15 mld).

¹⁴ Ontario Ministry of Natural Resources. 2012. http://www.mnr.gov.on.ca/en/Business/GreatLakes/2ColumnSubPage/STEL02_173888.html

¹⁵ Ontario Ministry of the Environment. 2012,

http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_096933.pdf

Ontario 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	845.15	237.73	105.96	1,188.84	48.91	0	131.08
Self-Supply Commercial & Industrial	52.81	6.72	2.55	62.08	0	0	8.23
Self-Supply Irrigation	0.85	3.09	1.56	5.5	0	0	3.16
Self-Supply Livestock	0.32	18.12	24.89	43.33	0	0	0
Self-Supply Industrial	773.47	229.21	122.94	1,125.63	0	0	72.64
Self-Supply Thermoelectric Power Production (Once-through cooling)	12,892.58	2,295.38	0.23	15,188.19	0	0	136.59
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	9,643.29	152,687.3	0	249,430.6	0	0	0
Other Self Supply	6.66	206.26	3.21	216.14	5,173.55	-3,800.11	0
Total	111,315.1	155,683.8	261.34	267,260.3	5,222.46	-3,800.11	351.7

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

Pennsylvania

The Pennsylvania Lake Erie watershed spans 508 square miles. The largest land uses in Pennsylvania's Great Lakes basin are agriculture and forest.¹⁶ While it is the smallest watershed in the state, it is home to more than 240,000 people with the majority concentrated along the 76.6 miles of Lake Erie coastline.

The total withdrawal amount for Pennsylvania was 33.45 mgd. The majority (26.59 mgd or 79% of total withdrawals) was used for public water supply purposes.

No diversions were reported in 2012. The total consumptive use was 4.37 mgd. The public water supply sector made up the majority (61%) of the total consumptive use amount.

Pennsylvania 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	24.89	0.11	1.68	26.67	0	0	2.67
Self-Supply Commercial & Industrial	0	0	0	0	0	0	0
Self-Supply Irrigation	0	0.13	0	0.13	0	0	0.12
Self-Supply Livestock	0	0.2	1.11	1.31	0	0	1.05
Self-Supply Industrial	5.34	0	0	5.34	0	0	0.53
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	30.23	0.44	2.79	33.45	0	0	4.37

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

¹⁶ Email communications with David Skellie, Pennsylvania Sea Grant. 2013.

Québec

Eighty percent of Québec's population lives in the St. Lawrence River watershed. The Québec portion of the St. Lawrence River is fed by 244 tributaries. The tributaries with the greatest flow are the Ottawa, Saguenay, Manicouagan and Saint-Maurice rivers, and the Rivière aux Outardes.¹⁷

The total withdrawal amount for Québec was 5,471.43 mgd (20,711.64 mld). Most data were from 2012, except for the public water supply sector for which data from a 1993 survey were used. The majority (69%) of this amount was used for industrial purposes at 3,806.31 mgd (14,408.44 mld).

The total consumptive use amount was 1,455.04 mgd (5,507.94 mld), representing 26 percent of total withdrawals. The primary water use sectors contributing to the total consumptive use were public supply at 109.9 mgd (416 mld) and industrial at 1,199.27 mgd (4,539.74 mld).

Québec 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	550.89	236.7	42.07	829.66	0	0.22	268.29
Self-Supply Commercial & Industrial	0.73	2.94	0.29	3.97	0	0	2.17
Self-Supply Irrigation	0.49	2.3	0.22	3.02	0	0	2.45
Self-Supply Livestock	0	11.91	0	11.91	0	0	0
Self-Supply Industrial	142.81	153.95	20.44	317.19	0	0	99.94
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	19.55	0.04	0	19.59	0	0	1.76
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	5.31	3.15	0.22	8.68	0	0	5.79
Total	719.78	410.99	63.24	1,194.02	0	0.22	380.4

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

¹⁷ Environment Canada. 2013. <https://www.ec.gc.ca/stl/default.asp?lang=En&n=49C847E2-1>

Wisconsin

About 10,000 square miles of lakes Michigan and Superior lie within Wisconsin's borders.¹⁸ 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 Great Lakes 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.¹⁹

The total water withdrawal amount for Wisconsin was 4,388.71 mgd. The majority (99%) of the withdrawals came from the Lake Michigan watershed. The primary water use sectors were thermoelectric power production (once-through and recirculated cooling) at 3,783.25 mgd (86% of total withdrawals), public water supply at 329.38 mgd, and industrial at 172.2 mgd.

Total diversions were 5.74 mgd from the Lake Michigan watershed, mainly for public water supply purposes. The total consumptive use was 163.97 mgd. The primary consumptive uses came from the thermoelectric power (60.72 mgd), irrigation (41.8 mgd) and public water supply (39.56 mgd) sectors.

Wisconsin 2012 Water Use Data Summary

Sector	Withdrawals				Diversions		Consumptive Use
	GLWS	OSW	GS	TOTAL	Intrabasin	Interbasin	
Public Water Supply	256.25	22.93	50.2	329.38	0	5.39	39.56
Self-Supply Commercial & Industrial	0.33	1.8	3.64	5.77	0	0	0.89
Self-Supply Irrigation	0	5.38	54.85	60.23	0	0.35	41.8
Self-Supply Livestock	0	14.97	15.64	30.61	0	0	5.09
Self-Supply Industrial	0.28	158.66	13.46	172.4	0	0	12.71
Self-Supply Thermoelectric Power Production (Once-through cooling)	3,512.96	231.43	0.07	3,744.46	0	0	37.44
Self-Supply Thermoelectric Power Production (Recirculated cooling)	38.78	0.02	0	38.79	0	0	23.28
Off-Stream Hydroelectric Power Production	0	0	0	0	0	0	0
In-Stream Hydroelectric Water Use	0	0	0	0	0	0	0
Other Self Supply	4.8	0.74	1.53	7.07	0	0	3.19
Total	3,813.4	435.93	139.39	4,388.71	0	5.74	163.96

In millions of gallons per day

Water Sources: Great Lakes surface water (GLSW), other surface water (OSW) and groundwater (GW)

¹⁸ Wisconsin Sea Grant. 2013. <http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=796>

¹⁹ Wisconsin Department of Natural Resources. 2013. <http://dnr.wi.gov/topic/greatlakes/learn.html>

Appendices

Appendix A. Revised protocols for the collection and reporting of water use data

The 2012 regional water use data set is the first to be completed under the new data reporting protocols. The new database and this annual report are expanded and enhanced with the inclusion of new and reformatted water use data and information. Summarized below are the main changes to the database, which are reflected in this report.

1. Water use sectors – The number of sectors increased from 9 to 10. The Self-Supply Domestic sector is replaced with Self-Supply Commercial and Institutional. The Hydroelectric Power sector is broken down into Off-stream Hydroelectric Power Production and In-stream Hydroelectric Water Use.
2. Diversions - Three new fields (diversion return flow, net diversion change and diversion return) were added to meet the standards set forth in the new protocols.
3. Intrabasin transfers – Two additional fields, intrabasin return flow and intrabasin consumptive use, were added to meet the standards set forth in the protocols.
4. Two new consumptive use (CU) data fields – These fields now more accurately describe how the CU amounts are calculated. The first field documents the percentage of reported consumptive uses that were determined through actual measurement. The second field documents the coefficient or the range of coefficients used to calculate CU. Under the old database regime, a summary chart of the range of CU coefficients was inserted in the annual reports for reference.
5. Aggregation – The level of aggregation of data was dropped since the protocols do not call for such a field. In its place a “methods” field describes the method used to determine withdrawal amount.

Appendix B. General Definitions from the Compact and Agreement

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

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

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

Divert has a corresponding meaning.

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

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

Appendix C. 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 water²⁰” 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.

²⁰ 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.