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**2025 Review of the
International Joint Commission's Report on the
"Protection of the Waters of the Great Lakes"**

DRAFT REPORT

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July 2025

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Executive Summary

At the request of the United States (U.S.) and Canadian governments, the removal of water from and within the Great Lakes Basin has been studied by the International Joint Commission (IJC) since 1985.

An IJC 2000 report, *Protection of the Waters of the Great Lakes*, contained 12 recommendations focused on several wide-ranging important issues including ecosystem needs, removals/diversions, consumptive use, cumulative impacts, conservation, international trade and water law, and water use data monitoring and reporting. The IJC published a [three-year review](#) of the issues and recommendations in its 2000 report in 2004, and completed a [ten-year review](#) in 2015.

Since the effective date of the U.S. interstate Great Lakes-St. Lawrence River Basin Water Resources Compact in 2008 and parallel Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement among the Great Lakes states and provinces, no new or increased diversion of Great Lakes water outside the Great Lakes states or provinces has been approved. Under exceptions to the Compact and Agreement, three new diversions have been authorized since 2015 for the cities of Waukesha and Racine and the Village of Somers, all in Wisconsin.

The Waukesha diversion is for a community within a “straddling county,” the only such diversion authorized to date. This is also the only diversion proposal that has come before the Great Lakes Compact Council for formal approval. The public raised issues concerning reasonable alternatives to the proposed diversion, the volume of water requested by Waukesha, and the impact of the return flow from the diversion on an affected community. Following approval by the Great Lakes-St. Lawrence River Compact Council, final approval by the Wisconsin Department of Natural Resources (WDNR) came in 2019 and the necessary infrastructure in Waukesha began operation in October 2023.

Required by the Compact and Agreement, improved reporting of water use is ongoing. Annual data provided by the parties on consumptive uses, diversions and withdrawals is compiled and published by the Great Lakes Commission in the Great Lakes Regional Water Use Database (GLRWUD) according to water use category, sub-basin and jurisdiction. Recent data published by the Commission show:

- For the most recent GLRWUD reporting year of 2023, total withdrawals (excluding in-stream hydroelectric water use) were 134,132 MLD (35,434 MGD) representing a decrease of about 13% from 2022.
- The Lake Ontario watershed had the greatest withdrawal amount, followed closely by Lake Michigan. In most watersheds, Great Lakes surface water was the predominant source of water withdrawals with the exception of the Lake Superior and Lake Huron watersheds, whose main source was other surface water.
- The total reported 2023 consumptive use for the basin was 7,162 MLD (1,892 MGD) a 2% decrease from 2022.
- The total reported 2023 diversion out of the basin was 4,021 MLD (1,062 MGD) of which about 86% (3,462 MLD or 915 MGD) was associated with the Chicago Diversion.

120 There were also diversions into the basin including the Long Lac and Ogoki diversions
121 which contributed 8,993 MLD (2,376 MGD) to the basin, a 38% decrease from 2022..
122 Overall, the net diversion in 2023 was a gain of 5,100MLD (1,347 MGD).
123

- 124 • Considering both consumptive uses and diversions, the basin lost a total of 2,062 MLD
125 (545 MGD) in 2023 compared to a gain of 3,100 MLD (819 MGD) in 2022. The change
126 between 2022 and 2023 was due to a decrease in the diversion from Long Lac and Ogoki
127 into Lake Superior.

128
129 Further refinement of estimates of consumptive use and groundwater impacts is needed. The
130 five-year cumulative impact assessments also required by the Compact have been prepared and
131 submitted. They show that the cumulative hydrologic effect of Consumptive Uses and Diversions
132 (annual averages) for the Basin are small relative to inflows (runoff plus precipitation). But
133 further refinement of these estimates would be helpful in better understanding the incremental
134 impacts on the watershed of new and increased diversions and large withdrawals within the
135 Basin.
136

137 A literature review and interviews with almost 40 individuals representing a broad array
138 of interests and perspectives were conducted for this report. Among themes and issues raised in
139 the interviews, several stand out:
140

- 141 • There was general agreement that the role of First Nations, Tribes, and Métis was not
142 sufficiently recognized by the states and provinces in the process of drawing up and seeking
143 formal approval of the Compact and Agreement. Solutions that strengthen collaboration
144 between First Nations, Tribes, and Métis and the Compact/Agreement members are
145 suggested.
- 146 • Several Compact/Agreement definitions of terms, including “reasonable water supply
147 alternative,” “largely residential,” and an exception to the diversion ban for “humanitarian”
148 purposes, should be clarified.
- 149 • Current collaboration between the U.S. states and Canadian provinces is effective in
150 implementing the goals of the Compact and Agreement and the Regional Body, the
151 coordinating mechanism of states and provinces under the Agreement is serving as an
152 effective tool for coordination among the states and provinces, as well as for public
153 engagement.
- 154 • Although there are differences of opinion on the level of public awareness with respect to
155 the Great Lakes Compact and Agreement, increased efforts to engage younger residents of
156 the basin would be especially valuable.
- 157 • Most interviewees observed that communication and outreach efforts generally have
158 improved over the years since the Compact and Agreement came into force and that the
159 Regional Body and the jurisdictions have effectively kept stakeholders aware of issues as
160 they arose.
- 161 • Additional attention should be paid by the Compact Council to climate variation, which
162 strongly influences water levels and the impact of diversions as it affects precipitation,
163 evaporation, flow variability and other factors.

- 164 • Potential complicating factors for implementation of the Compact and Agreement are budget
165 cuts and difficulties in cross-border communication.

166

167 Finally, there has been some progress by the Compact/Agreement parties in
168 implementing the eight recommendations in the IJC's 2015 [report](#), but several of the
169 recommendations have not generated a significant response. This report contains updates on
170 these recommendations as well as new recommendations to better achieve the Compact and
171 Agreement goals. New recommendations include:

172

173

174

175 *1. It is recommended that the parties to the Compact and Agreement make no changes in the*
176 *near future and remain vigilant as water scarcity outside the basin and water demand within the*
177 *basin (particularly with respect to burgeoning industries such as data centers) strain available*
178 *water resources. Further, the Regional Body and Compact Council continue their policies of*
179 *transparency to build public awareness of and confidence in their processes.*

180

181 *2. It is recommended that the parties to the Compact and Agreement commit to greater*
182 *collaboration with Indigenous Nations and engage Indigenous Nations to determine whether and*
183 *how they would like to contribute to decision making. For example, governments could explore*
184 *the possibility of Secretariat meetings with Tribes and First Nations prior to Council and*
185 *Regional Body meetings.*

186

187 *3. It is recommended that, by the next IJC review, the Regional Body and Compact Council*
188 *formally recognize that First Nations, Tribes, and Métis are not "stakeholders" and recognize*
189 *the ways in which they are distinct rights holders, as well as recognize the interests, needs and*
190 *concerns, distinct ways of knowing (such as traditional ecological knowledge practices) and*
191 *institutions for governance of Tribes, First Nations, and Métis peoples.*

192

193 *4. It is recommended that, by the next IJC review, the Regional Body add Indigenous*
194 *representation to its membership.*

195

196 *5. It is recommended that by the next IJC review, the Compact Council and Regional Body hold*
197 *public engagement opportunities to help define "reasonable water supply alternative," "largely*
198 *residential" and the "humanitarian exception" and make appropriate adjustments to the*
199 *Compact and Agreement.*

200

201 *6. It is recommended that the Regional Body and Compact Council oversee continued*
202 *improvements in climate modeling and organize workshops and other fora to share knowledge*
203 *and improve collaboration.*

204

205 *7. It is recommended that the federal, state, and provincial governments encourage*
206 *advancements in the state of science on climate variation impacts in the Great Lakes through*
207 *additional funding and synthesis of the state of the science.*

208

209

210 *8. It is recommended that, consistent with the availability of funds and development of an*
211 *education plan by the next IJC review, the Compact/Agreement parties should increase outreach*

212 *not related to a specific diversion proposal, but targeted at all relevant stakeholders including*
213 *Indigenous communities, businesses, local governments and youth.*
214
215 *9. It is recommended that the Parties establish a uniform methodology for reporting consumptive*
216 *use by all jurisdictions by the next IJC review.*
217
218 *10. It is recommended that the Parties continue and strengthen research and monitoring of*
219 *groundwater use and develop a groundwater plan by the next IJC review.*
220
221 *11. It is recommended that the criteria for initiating interim cumulative impact assessments be*
222 *reviewed and adjusted as necessary.*
223
224 *12. It is recommended that care should be taken by the Great Lakes Commission, which is well*
225 *placed to continue to be the repository for water use data, to ensure that this data is secure.*
226
227 *13. It is recommended that the Compact Council and Regional Body provide guidance regarding*
228 *the rigor needed in jurisdictional water conservation and efficiency plans and assure their*
229 *implementation.*
230
231 *14. It is recommended that before further pursuing AI and data center projects for siting within*
232 *their boundaries, the states and provinces consult with experts on the volume and impacts of*
233 *these growing uses on the Great Lakes basin.*
234
235 *15. It is recommended that the States and Provinces convene a panel of legal experts to ascertain*
236 *the significance and potential of the public trust doctrine to assist in protection of the waters of*
237 *the Great Lakes while allowing for a public comment period on this matter.*
238
239 *16. In preparation for the IJC's next 10-year review of its recommendations for the protection of*
240 *the waters of the Great Lakes, it is recommended that the IJC monitor climate variability, new*
241 *and increased water uses, population trends and emerging science on an ongoing basis.*
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1. Introduction

The consumptive use, diversion, and removal of water from the Great Lakes has been a controversial topic spanning many decades. At the request of the governments of Canada and the United States, the International Joint Commission (IJC or Commission) has investigated and reported on the topic several times.¹ In February 2000, the IJC submitted its report on *Protection of the Waters of the Great Lakes* (in response to a 1999 Reference from governments - see Reference in Appendix A) which contained 12 recommendations, including a request for a standing reference from governments to review its recommendations in three years and in 10-year intervals thereafter. Both governments supported this recommendation

The IJC completed its three-year review of the recommendations in 2004, and its first 10-year review in 2015, which included eight recommendations. The IJC's second 10-year review is due by the end of 2025. This Draft Report represents the preliminary findings of two contractors retained by the Commission to assist with their 2025 review. It will be subject to a public comment period, following which a final report will be prepared and submitted to governments by IJC by the end of 2025.

The IJC's 2000 report and its 12 recommendations focused on several wide-ranging and important issues including, but not limited to, ecosystem needs, removals/diversions, consumptives use, cumulative impacts, conservation, international trade and water law, water use data monitoring and reporting including groundwater, institutional arrangements including the Great Lakes Charter, and climate change. The full recommendations are reproduced in Appendix B. The report provided "a blueprint for protecting the waters of the world's largest freshwater ecosystem, the Great Lakes Basin, from the potential impacts of water removals and consumptive uses"² and was broadly welcomed by governments and the Great Lakes community.

In its August 2004 Report, the IJC undertook the three-year review of the status of each of the recommendations in its 2000 report, and highlighted key developments that had taken place since the 2000 report was issued. Key developments included, in Canada, amendments to the *International Boundary Waters Treaty Act* (Bill C-6) and, in the United States, amendments to the *Water Resources Development Act* (WRDA) of 1986, and an annex (Annex 2001) to the 1985 Great Lakes Charter.

The IJC's first [10-year review](#) of its 2000 recommendations was completed in December 2015. It endorsed the consultants' findings that the Great Lakes states and provinces had made great strides since the 2000 report and enacted the "historic" 2008 Great Lakes-St. Lawrence River Basin Water Resources Compact (GLC or Compact) and parallel Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (GLA or Agreement). The Commission concluded that these developments were "for the most part a good news story" and submitted eight recommendations to governments (see Section 4 for the recommendations and their status). This Draft Report provides a preliminary evaluation of the relevance and implementation status of the 2015 IJC recommendations and proposes new recommendations for the IJC to submit to governments. In doing so, a number of tasks were conducted, including:

¹ See IJC Reports: "Further Regulation of the Great Lakes" 1976," Great Lakes Diversions and Consumptive Uses" 1985, "Interim Report on 1985-86 High Water Levels in the Great Lakes-St. Lawrence River Basin" 1988, "Protection of the Waters of the Great Lakes" 2000 and the 2004 and 2015 "Reviews of the Recommendations" in that Report

² IJC Media Release March 15, 2000

306
307 - a review of literature published since 2014 about actual or predicted changes in institutional
308 arrangements and environmental conditions that may impact consumptive uses, diversions, and
309 withdrawals

310
311 - an assessment of the effectiveness of the Compact and Agreement by identifying and
312 conducting focused interviews with almost 40 key stakeholders and subject matter experts
313 including First Nations and Tribal communities and with parties to the Compact and Agreement.

314
315 Following a public comment period on the draft report, a revised report will be submitted
316 to the IJC.

317
318 What follows is a description to date of major developments since 2015, a history of the
319 Compact and Agreement, results of the focused interviews, the issues and themes that have
320 emerged, a preliminary assessment of the status of the IJC's 2015 recommendations and, finally,
321 our own preliminary findings and recommendations.

322 323 **2. Developments since 2015**

324 325 2.1 Diversions

326
327 Since the Compact's effective date in 2008, no new or increased diversion of Great Lakes
328 water outside the Great Lakes states or provinces has been approved. Several persons
329 interviewed for this report said the mere existence of the Compact and Agreement deterred
330 proposals from going beyond the drawing board – if even that far. Five new or increased
331 diversions have been authorized within one Great Lakes state, Wisconsin. Two of the diversions
332 were approved before the IJC's 2015 report.

333
334 The Compact prohibits diversions with limited exceptions for diversions in straddling
335 counties or straddling communities. Straddling counties contain areas both within and outside of
336 the Great Lakes basin. Straddling county diversions send water to communities that are
337 *completely outside* the Great Lakes basin but within the straddling county. The Compact Council
338 must unanimously approve a straddling county diversion. Straddling communities contain areas
339 both within and outside of the Great Lakes basin – that is, parts of these *communities* straddle the
340 Great Lakes basin boundary. The Compact leaves decisions about straddling community
341 diversions largely to the discretion of the state government in which the proposed diversion
342 would take place, although public notice and notice to Compact governments is required.

343
344 The Compact spells out strict criteria that must be met before a new or increased
345 diversion can be authorized for a straddling community:

- 346 • All the water transferred is to be used solely for public water supply purposes.
- 347 • All water withdrawn from the basin is returned, either naturally or after use, to the
348 Great Lakes, less an allowance for consumptive use.
- 349 • The diversion maximizes the portion of water returned to the source basin.

350
351
352 Straddling county diversions must meet the above criteria plus:

- The water must be used solely for the public water supply purposes of the community within a straddling county that is without adequate supplies of potable water.
- There is no reasonable water supply alternative within the basin in which the community is located, including conservation of existing water supplies.
- The exception should not be authorized unless it can be shown that it will not endanger the integrity of the Basin Ecosystem.

2.2 Approved Straddling Community Diversions

Before the IJC’s 2015 report, the Wisconsin Department of Natural Resources (WDNR) approved a straddling community diversion by the City of New Berlin of 2.42 million gallons per day (2009) and an increase in the existing Pleasant Prairie straddling community diversion to 10.69 million gallons per day (2010).

The City of Racine, Wisconsin, applied for a straddling community exception to the diversion ban on January 26, 2018, proposing to divert 7 million gallons per day from the Lake Michigan basin. The city proposed to expand its public water services to the incorporated Village of Mount Pleasant, which had no municipal water system. Approximately 70 percent of the diverted water going to Mount Pleasant would support a proposed \$10 billion manufacturing plant.

As previously noted, the Compact requires that proposed diversions be used “solely for public water supply purposes in the straddling community” and must serve “a group of largely residential customers.” Critics of the proposed Racine diversion said it was intended to serve largely one customer, and not a residential one. But Racine argued that because its municipal water system, as it existed at the time of the proposal, primarily served residential users—unlike the area served by the proposed diversion itself—it satisfied the “largely residential” mandate of the compact. On April 25, 2018, the WDNR approved Racine’s application.

In February 2021, the Village of Somers, Wisconsin, submitted a straddling community diversion request, seeking 1.2 million gallons per day. On February 3, 2022, the WDNR approved the diversion by Somers.

2.3 The Approved Straddling County Diversion: The City of Waukesha, Wisconsin

In May 2010, the City of Waukesha applied for a 10.1 million gallon per day diversion from Lake Michigan. Because it was the first “straddling county” proposal under the Compact, it received close scrutiny in a process that lasted years. After years of over pumping, Waukesha’s water supply source, groundwater, was contaminated by naturally occurring radium, and the city was under a federal order to bring a cleaner supply online. Waukesha applied to the WDNR for a diversion of Lake Michigan water under the Great Lakes Compact and Agreement as a “community in a straddling county” in a revised application in October 2013. Following WDNR approval, the Waukesha diversion proposal was forwarded to and approved by the Compact Council in 2016. The WDNR’s final approval came in 2019 and the necessary infrastructure in Waukesha went online in October 2023.

Under the diversion authorization that resulted from the extensive review process, the following terms apply:

- 401 • The City of Waukesha purchases drinking water from the city of Milwaukee, whose
- 402 water source is Lake Michigan.
- 403 • Waukesha discharges its treated wastewater to the Root River, a tributary of Lake
- 404 Michigan and the Fox River.
- 405 • Annual reporting to the Great Lakes states and provinces on the diversion is required.
- 406

407 During the review process prescribed by the Compact, several key concerns were raised.
408 Critics questioned what they argued was the city’s failure adequately to consider reasonable
409 alternatives to the diversion and the volume of water requested, which was greater than needed to
410 supply potable water to existing customers. They suggested that this margin would support urban
411 growth, not solely the need for clean drinking water for existing customers. Alternatives
412 suggested included water conservation and enhanced treatment technologies.

413
414 Waukesha officials rejected criticism of its consideration of alternatives, arguing it had
415 thoroughly studied them. But, responding to the concern expressed by critics that the diversion
416 would be used to support growth as well as address a public health concern, Waukesha revised
417 the area served by the diversion. The volume of water requested was scaled back to 8.2 million
418 gallons per day, or almost 3 billion gallons per year.

419
420 The Great Lakes – St. Lawrence Cities Initiative, consisting of mayors from hundreds of
421 communities in the basin, sued the Council after its approval of the Waukesha diversion. The
422 Initiative argued that the revised final proposal should have had its own public review and
423 comment period before Compact Council approval. The parties settled the case, reaching
424 agreement to collaborate on improving the review of water diversion applications in the future.
425 The agreement called for “a rigorous review” of the Compact Council and Regional Body’s
426 process for considering diversions.

427 428 2.4 Sale of Water by the City of Chicago to the City of Joliet, Illinois

429
430 Although the City of Chicago’s sale of water to the City of Joliet, Illinois, approximately
431 40 miles to the southwest and part of the Mississippi River Basin is not a diversion as defined by
432 the Compact and Agreement, the transaction stimulated public interest in this use of Lake
433 Michigan water. Under a U.S. Supreme Court decree, reflected in the Compact and Agreement,
434 Chicago is entitled to divert up to 3200 cubic feet per second of Lake Michigan water for its
435 public supply and for reversing the flow of the Chicago River into the Mississippi River basin.
436 Chicago may legally sell any increment not needed for these purposes.

437
438 The City of Joliet draws its current groundwater supply from wells located throughout the
439 city. In the mid-2010s, groundwater modeling studies conducted by the Illinois State Water
440 Survey determined that the aquifer supplying the wells would not be able to meet maximum day
441 water demands by 2030. Joliet examined several alternatives and determined that purchasing
442 water from Chicago was the most cost-effective. In April 2023, the City of Joliet announced a
443 100-year agreement to purchase treated Lake Michigan water from the city of Chicago beginning
444 in 2030.

445 446 447 448 2.5 Water Use

449

450 2.5.1 Overview

451
 452 Water use data reporting is a vital component of the Compact and Agreement framework.
 453 Annual data provided by the parties on consumptive uses, diversions and withdrawals is
 454 compiled and published by the Great Lakes Commission in the Great Lakes Regional Water Use
 455 Database (GLRWUD) according to water use category, sub-basin and jurisdiction. In addition, a
 456 cumulative impact assessment report, which forms the basis for a review of the Standard of
 457 Review and Decision, Council and Party regulations and their application, is released every five
 458 years. Since 1987, the Great Lakes Commission has served as the Database repository.

459
 460 In its 2015 review report, the IJC noted that protocols for reporting water withdrawals
 461 adopted by the Council and Regional Body in 2009 should improve the accuracy of water use
 462 data. Since that time further progress has been made to improve data collection, reporting,
 463 quality, accuracy, and compatibility.

464
 465 2.5.2 Improvements Since 2015

466
 467 "Starting with the 2014 water use year³, the Great Lakes Commission collected
 468 information from each jurisdiction that describes water use data and includes information related
 469 to data sources, rates of reporting compliance (i.e., the percentage of users submitting the
 470 required reports to their respective jurisdiction) by water use sector, the year from which the data
 471 was collected, significant changes in the data between the current year and previous years and
 472 reasons for those changes. To achieve this, the Great Lakes Commission created an online data
 473 management system that assists in the creation of metadata. For the 2023 annual report, the states
 474 and provinces submitted metadata along with their associated 2023 water use data. Project staff
 475 met by phone with representatives from each jurisdiction to discuss changes in compliance rates
 476 and reported water use from the previous year. Implementing this process has resulted in
 477 improvements to the database in both compliance rates and data quality".⁴

478
 479 The states and provinces have reporting programs in place that require users to report
 480 their water use each year to their respective jurisdictions. Reporting compliance varies across the
 481 basin by jurisdiction and sector, affecting the quality of the data.

482
 483 **Table 1. 2023 State and Provincial Reporting Compliance Percentage by Water Use Sector***

Sector	IL	IN	MI	MN	NY	OH	ON	PA	QC	WI
Public Water Supply	100	92	95	100	100	100	100	100	95	100
Self-Supply Commercial & Institutional	100	83	90	100	100	100	100	-	79	95
Self-Supply Irrigation	100	88	85	100	100	100	100	100	66	97
Self-Supply Livestock	-	89	90	-	100	100	93	100	49	96
Self-Supply Industrial	100	82	90	100	100	100	100	-	76	96
Self-Supply Thermoelectric Power Production (Once-through cooling)	100	-	100	100	100	100	93	-	-	90

³ "Water use year" simply refers to the year in which particular water use data is collected.

⁴ Great Lakes Commission 2023 annual GLRWUD report pg 4

Self-Supply Thermoelectric Power Production (Recirculated cooling)	-	100	100	-	100	100	-	-	-	-
Off-Stream Hydroelectric Power Production	-	-	N/A	100	100	N/A	-	-	N/A	N/A
In-Stream Hydroelectric Water Use	-	N/A	N/A	100	100	N/A	100	-	N/A	N/A
Other Self Supply	100	82	90	100	100	100	100	-	50	100

484 *A blank indicates that the jurisdiction did not report any water use figures for that particular sector. N/A indicates that*
485 *facilities are not required by jurisdiction policy to report water use for that particular sector. Some jurisdictions updated*
486 *their compliance reporting methodology starting with the 2022 water use data reporting process; in previous years, some*
487 *jurisdictions reported numerical compliance rates where blanks or N/As should have been reported.*

488 **For each water use category, the compliance rate measures the percentage of active, registered facilities with the capacity*
489 *to withdraw 100,000 gallons per day or more averaged over a 30-day period that have reported to the relevant*
490 *state/provincial program compared with the total number of facilities required to report.*

491
492

Source: Great Lakes Commission Great Lakes Regional Water Use Database

493

494 Table 1 summarizes reporting compliance rates by jurisdiction in 2023. Illinois,
495 Minnesota, New York, Ohio, and Pennsylvania each indicated 100% reporting compliance by
496 water users in their respective jurisdictions. Beyond compliance, the number of reported users
497 can also vary from year to year due to a change in status as a threshold facility. Only water use
498 data from facilities that withdraw more than 100,000 gallons per day (or 380,000 liters per day)
499 averaged over a 30-day period (referred to as the trigger level for reporting) are included in the
500 database, per the Compact and Agreement. The 100,000-gallon threshold was selected to capture
501 significant water users while avoiding overly burdensome regulations on smaller users and
502 everyday activities. Some facilities that tend to withdraw water in volumes close to the reporting
503 trigger level may therefore change from being a threshold facility (defined as a water user
504 withdrawing water at or above the trigger level) from one year to the next based on weather
505 conditions, business operations or other factors. Water use sectors that see more interannual
506 variability in use (e.g., self-supply irrigation) may have greater changes in the number of
507 threshold facilities than other use sectors. These changes are discussed in the jurisdiction report
508 sections.⁵

509

510 From winter 2023 to summer 2024, the Great Lakes Commission contracted with the
511 Digital Industry Group (DIG) to release an updated GLRWUD website that is more secure and
512 reportedly makes it easier for the public to access water use data. Upgrades to the site include: a
513 streamlined, more intuitive process for water use data managers to report their jurisdictions' data
514 and metadata; an improved public-facing “create a query” tool that allows users to create charts
515 based on their specific data selections; and enhanced security features to better protect data
516 before it is published.⁶

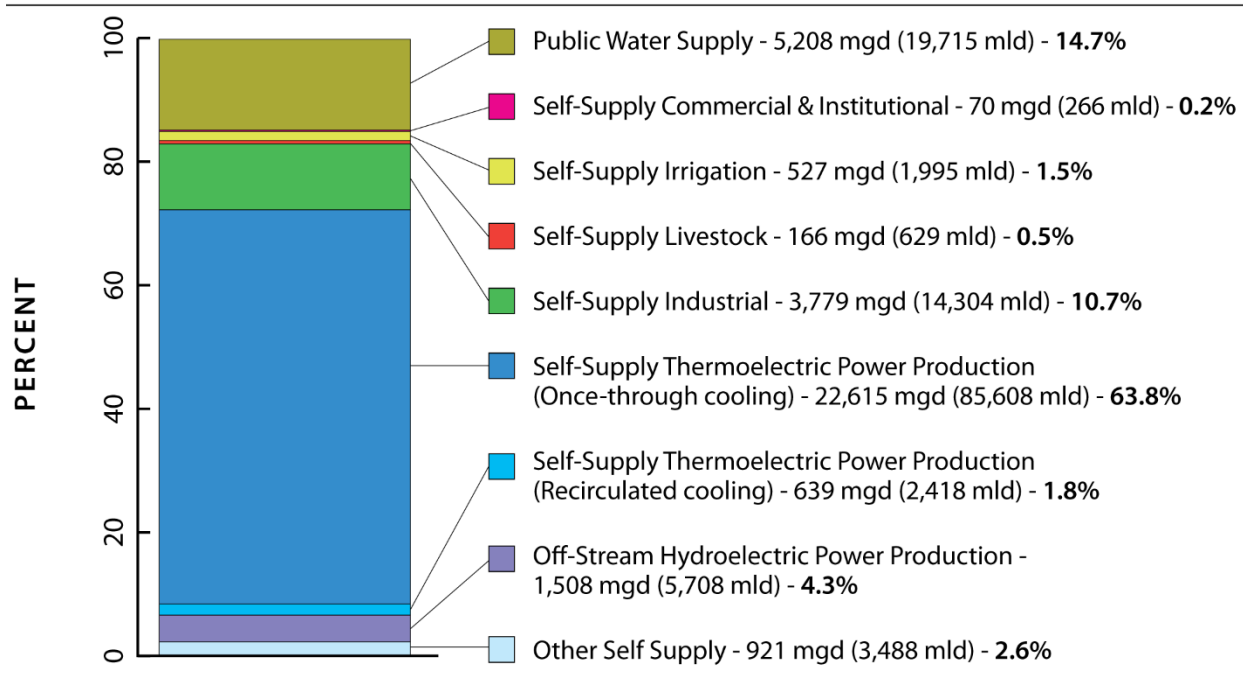
517 2.5.3 Withdrawals

518

⁵ Ibid.

⁶ Great Lakes Commission 2023 annual GLRWUD report pg 5

519 For the most recent GLRWUD reporting year of 2023, total withdrawals (excluding in-
 520 stream hydroelectric water use⁷) were 134,132 MLD (35,434 MGD) representing a decrease of
 521 about 13% from 2022.
 522

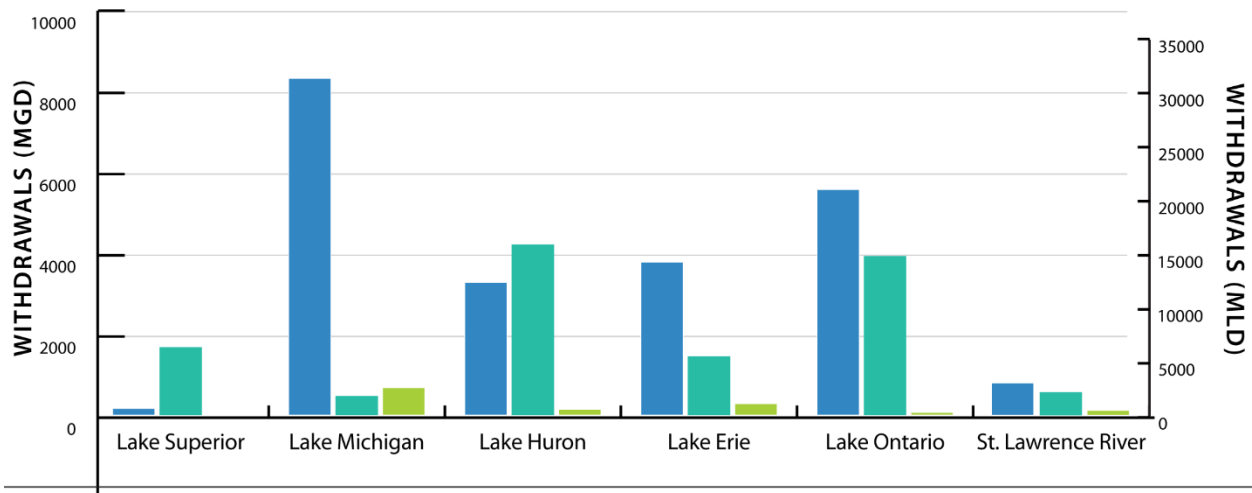


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 525 *Source: Great Lakes Commission Great Lakes Regional Water Use Database*

526
 527 Figure 2 shows basin-wide withdrawals by water use sector in 2023. Self-supply
 528 thermoelectric power production, public water supply, and self-supply industrial are the primary
 529 water use sectors.
 530

⁷ Water used for in-stream hydroelectric power production accounted for almost 99% of the water use in the region but is not considered a withdrawal in the traditional sense because it includes “run of the river” use, where the water remains in the water body and has negligible water consumption. Therefore, despite being an important water use for the Great Lakes-St. Lawrence River region, in-stream hydroelectric power use is ordinarily excluded from discussion of water use trends and impacts.

WATER SOURCE	GLSW	OSW	GW	Total
BASINWIDE TOTALS BY WATER SOURCE (mgd)	21,846	12,286	1,302	35,434
BASINWIDE TOTALS BY WATER SOURCE (mld)	82,696	46,507	4,929	134,132



Source: Great Lakes Commission Great Lakes Regional Water Use Database

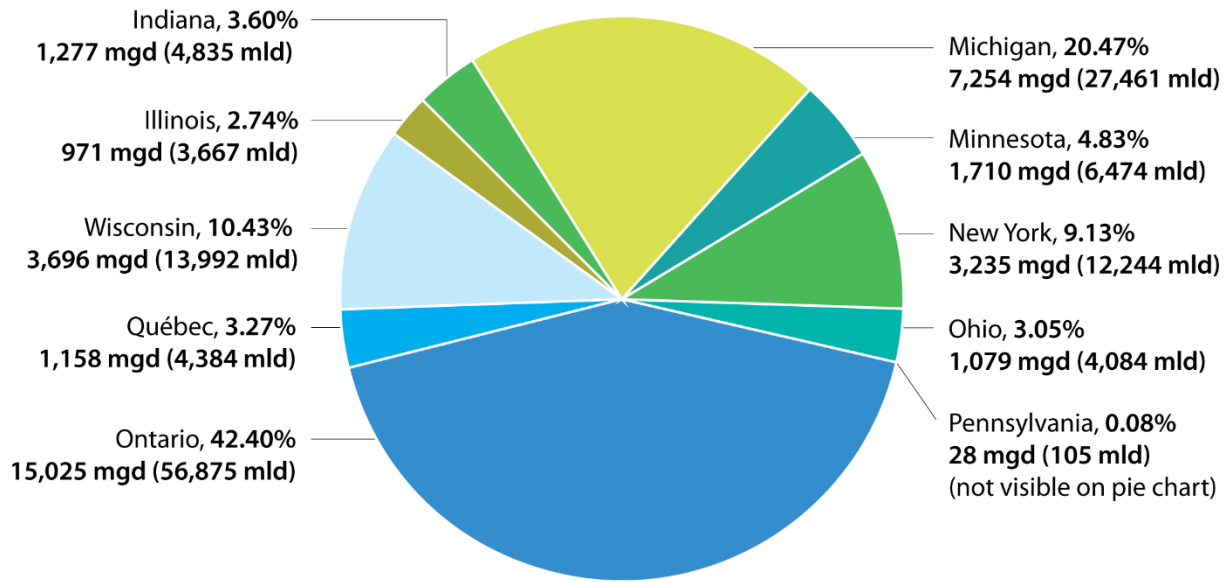
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534

535 Figure 3 shows withdrawals by watershed broken down by water source: Great Lakes
536 surface water (GLSW), other surface water (OSW), and groundwater (GW). The Lake Ontario
537 watershed had the greatest withdrawal amount, followed closely by Lake Michigan. In most
538 watersheds, Great Lakes surface water was the predominant source of water withdrawals with
539 the exception of the Lake Superior and Lake Huron watersheds, whose main source was other
540 surface water⁸.

541

⁸ Other surface water is defined as tributary streams, lakes, ponds, and reservoirs within the Great Lakes basin.

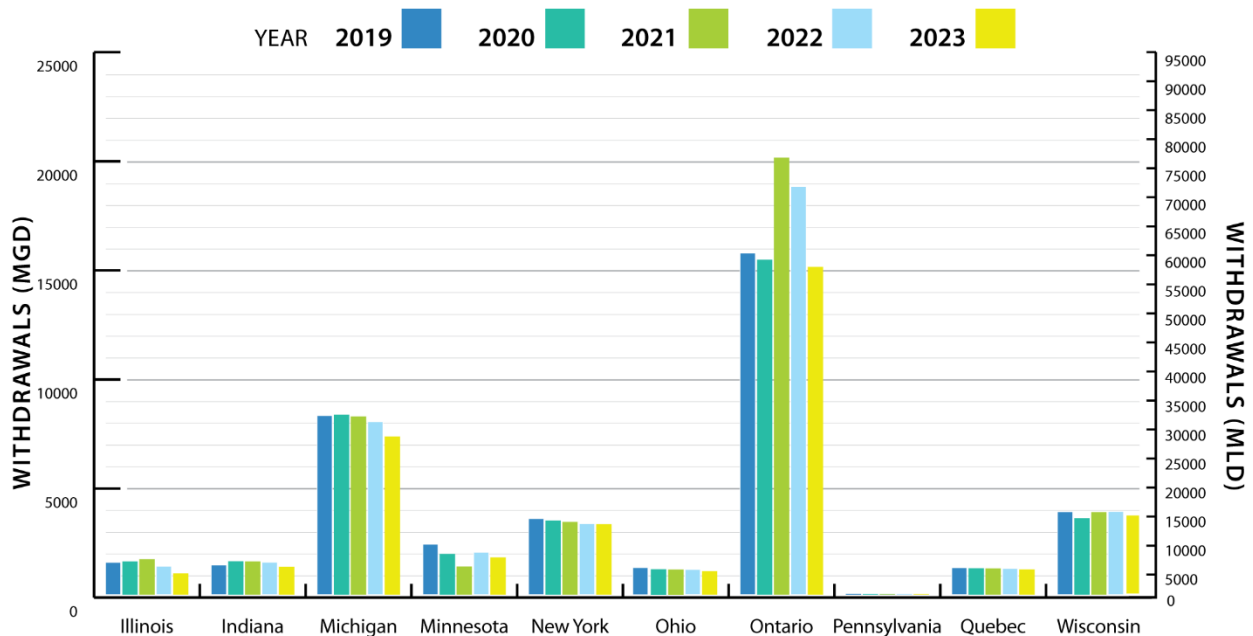


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Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Figure 4 shows total withdrawals by jurisdiction. Ontario withdrew the most and Pennsylvania the least amount.



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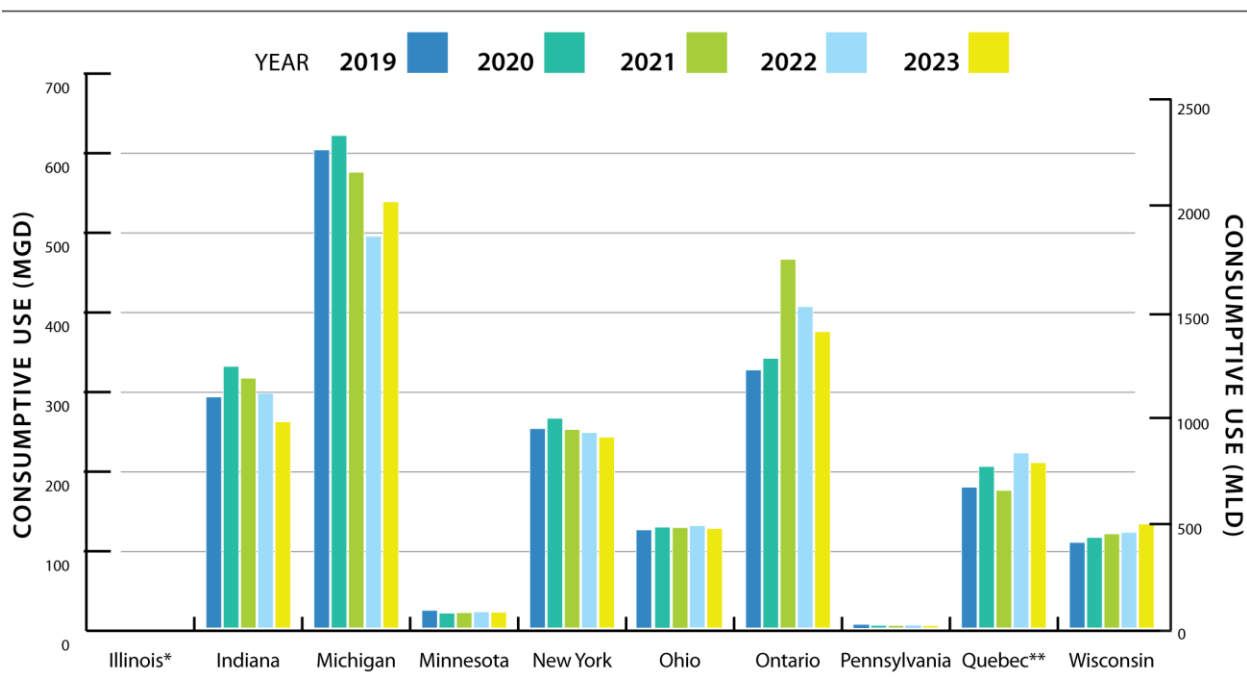
Source: Great Lakes Commission Great Lakes Regional Water Use Database

553 Figure 5 shows water withdrawals by jurisdiction over the past five years which have
 554 generally stayed steady or decreased, except for Ontario which saw a drastic increase in 2020
 555 and 2021 followed by a decrease to more normal levels in 2023.⁹

556
 557 2.5.4 Diversions and Consumptive Uses
 558

559 The total reported 2023 diversion out of the basin was 4,021 MLD (1,062 MGD) of
 560 which about 86% (3,462 MLD or 915 MGD) was associated with the Chicago Diversion. There
 561 were also diversions into the basin including the Long Lac and Ogoki diversions which
 562 contributed 8,993 MLD (2,376 MGD) to the basin, a 38% decrease from 2022. These amounts
 563 are well within the range of flow variability from 1944-2015 which have ranged from 6,219
 564 MLD (1,643 MGD) to 19,612 MLD (5,181 MGD). Overall, the net diversion in 2023 was a gain
 565 of 5,100MLD (1,347 MGD).
 566

567 The total reported 2023 consumptive use for the basin was 7,162 MLD (1,892 MGD) a 2%
 568 decrease from 2022. The public water supply sector had the greatest consumptive use (33% of
 569 the total) while the self-supply industrial and self-supply irrigation sectors comprised most of the
 570 rest. The Lake Michigan watershed had the largest consumptive use at 2,647 MLD (699 MGD)
 571 or 37% of the basin’s total.
 572



573
 574 *Source: Great Lakes Commission Great Lakes Regional Water Use Database*
 575

576
 577 Figure 6 shows total consumptive use by jurisdiction over the past five years.
 578

579 Considering both consumptive uses and diversions, the basin lost a total of 2,062 MLD (545
 580 MGD) in 2023 compared to a gain of 3,100 MLD (819 MGD) in 2022. The change between

⁹ Great Lakes Commission 2023 annual GLRWUD report pgs 6-9.

581 2022 and 2023 was due to a decrease in the diversion from Long Lac and Ogoki into Lake
 582 Superior.¹⁰
 583

Table 2a. Basin-wide 2023 Water Use Data Summary by Watershed (including in-stream hydroelectric water use) in mgd

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	165	31,787	17	31,969	0	-2,364	32
Lake Michigan	8,295	471	677	9,443	0	988	699
Lake Huron	22,131	19,341	142	41,614	41	0	146
Lake Erie	53,766	2,075	280	56,122	4,673	-17	425
Lake Ontario	46,701	102,169	67	148,936	-4,714	41	352
St. Lawrence River	2,125,763	56,868	119	2,182,750	0	5	238
Total	2,256,821	212,710	1,302	2,470,833	0	-1,347	1,892

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Table 2b. Basin-wide 2023 Water Use Data Summary by Watershed (including in-stream hydroelectric water use) in mld

Watershed	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Lake Superior	624	120,326	65	121,015	-1	-8,948	121
Lake Michigan	31,402	1,782	2,563	35,747	1	3,741	2,647
Lake Huron	83,774	73,214	537	157,525	155	0	551
Lake Erie	203,527	7,855	1,061	212,444	17,691	-66	1,609
Lake Ontario	176,783	386,750	252	563,785	-17,846	153	1,334
St. Lawrence River	8,046,888	215,269	451	8,262,607	0	20	899
Total	8,542,998	805,196	4,929	9,353,122	0	-5,100	7,162

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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¹⁰ see also James A. Polidori, Hannah L. Paulson and Andrew D. Gronewold "Assessing trends in urban municipal water use across the Great Lakes Basin" Journal of Great Lakes Research 50 (2024) 102243. and Tim Heinmiller "Institutions and Transboundary Governance Capacity in the Great Lakes Basin: The Case of Irrigation Water-Takings" International Journal of Water Governance (2016) 4:3.

Table 3a. Basin-wide 2023 Water Use Data Summary by Sector (including in-stream hydroelectric water use) in mgd

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	3,743	964	501	5,208	0	852	622
Self-Supply Commercial and Institutional	7	56	7	70	0	2	11
Self-Supply Irrigation	3	155	370	527	0	0	445
Self-Supply Livestock	0	96	70	166	0	0	15
Self-Supply Industrial	1,848	1,605	325	3,779	0	36	471
Self-Supply Thermoelectric Power Production (Once-through cooling)	15,510	7,103	1	22,615	0	0	214
Self-Supply Thermoelectric Power Production (Recirculated cooling)	593	42	4	639	0	0	74
Off-Stream Hydroelectric Power Production	0	1,508	0	1,508	0	0	0
In-Stream Hydroelectric Water Use	2,234,975	200,424	0	2,435,400	0	-2,376	0
Other Self Supply	142	755	24	921	0	138	40
Total	2,256,821	212,710	1,302	2,470,833	0	-1,347	1,892

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Table 3b. Basin-wide 2023 Water Use Data Summary by Sector (including in-stream hydroelectric water use) in mld

Sector	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Public Water Supply	14,168	3,651	1,897	19,715	0	3,226	2,355
Self-Supply Commercial and Institutional	27	213	26	266	0	7	42
Self-Supply Irrigation	10	586	1,400	1,995	0	0	1,684
Self-Supply Livestock	0	365	265	629	0	-1	56
Self-Supply Industrial	6,996	6,077	1,231	14,304	0	137	1,783
Self-Supply Thermoelectric Power Production (Once-through cooling)	58,714	26,889	5	85,608	0	0	811
Self-Supply Thermoelectric Power Production (Recirculated cooling)	2,243	160	15	2,418	0	0	280
Off-Stream Hydroelectric Power Production	0	5,708	0	5,708	0	0	0
In-Stream Hydroelectric Water Use	8,460,301	758,689	0	9,218,991	0	-8,993	0
Other Self Supply	538	2,859	91	3,488	0	523	152
Total	8,542,998	805,196	4,929	9,353,122	0	-5,100	7,162

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Table 4a. Basin-wide 2023 Water Use Data Summary by Jurisdiction (including in-stream hydroelectric water use) in mgd

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	971	0	0	971	0	915	0
Indiana	1,091	87	99	1,277	0	82	259
Michigan	5,928	729	598	7,254	0	0	535
Minnesota	105	3,256	5	3,366	0	12	20
New York	2,099,897	82,220	26	2,182,143	0	43	240
Ohio	595	402	82	1,079	0	-25	125
Ontario	144,211	125,377	273	269,860	0	-2,376	372
Pennsylvania	23	2	3	28	0	0	3
Québec	713	365	80	1,158	0	3	208
Wisconsin	3,287	272	138	3,696	0	-1	131
Total	2,256,821	212,710	1,302	2,470,833	0	-1,347	1,892

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Table 4b. Basin-wide 2023 Water Use Data Summary by Jurisdiction (including in-stream hydroelectric water use) in mld

Jurisdiction	Withdrawals				Diversions		Consumptive Use
	GLSW	OSW	GW	Total	Intrabasin	Interbasin	
Illinois	3,677	0	0	3,677	0	3,464	0
Indiana	4,130	330	376	4,835	0	311	980
Michigan	22,440	2,759	2,262	27,461	0	0	2,026
Minnesota	399	12,326	18	12,743	0	45	74
New York	7,948,974	311,236	99	8,260,308	0	163	907
Ohio	2,253	1,523	309	4,084	0	-96	473
Ontario	545,897	474,603	1,032	1,021,533	0	-8,993	1,409
Pennsylvania	88	6	10	105	0	0	11
Québec	2,700	1,383	301	4,384	0	10	786
Wisconsin	12,441	1,030	521	13,992	0	-3	494
Total	8,542,998	805,196	4,929	9,353,122	0	-5,100	7,162

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.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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598 Tables 2a through 4 b summarize the basin’s total 2023 withdrawals, diversions, and
599 consumptive use by watershed, sector, and jurisdiction to be inserted here.

600

601 Regarding withdrawals, diversions and consumptive uses in the next 10 years, several
602 interviewees believe there is a risk for the growth of large-scale diversions outside the basin by
603 data centres which are both energy and water-intensive, and that the proposed demand for data
604 centres not only includes artificial intelligence (AI) and machine learning, but also crypto
605 currency mining.¹¹

¹¹ see for example Helen Volzer "Data Centers are Increasing in the Great Lakes at What Cost?" Alliance for the Great Lakes Blog March 5, 2025 and Stephen Starr "Are data centres a threat to the Great Lakes?" The Narwhal, May 20, 2025.

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2.5.5 Cumulative Impact¹² Assessment (CIA)

The Compact and Agreement require that a full CIA be prepared every five years and that an Interim CIA be prepared following an increase in net water losses from the basin of more than 50 MGD, (which occurred from 2022-2023), or at the request of one or more of the Parties. The assessment focuses on the hydrologic effects of Withdrawals; Consumptive Uses and Diversions on water supply and flow at Watershed and Basin scales. These hydrologic effects are presented in the context of Watershed and Basin water budgets: that is, the flows into and out of each Watershed and the Basin. The assessments are also used to review the Compact's decision-making standards and their application. To date CIAs have been prepared for the periods 2006-2010, 2011-2015, and 2016-2020 and the next one will be developed for 2021-2025. The CIA is conducted for each Lake and St. Lawrence River watershed and for the entire basin.

2.5.6 2016-2020 CIA

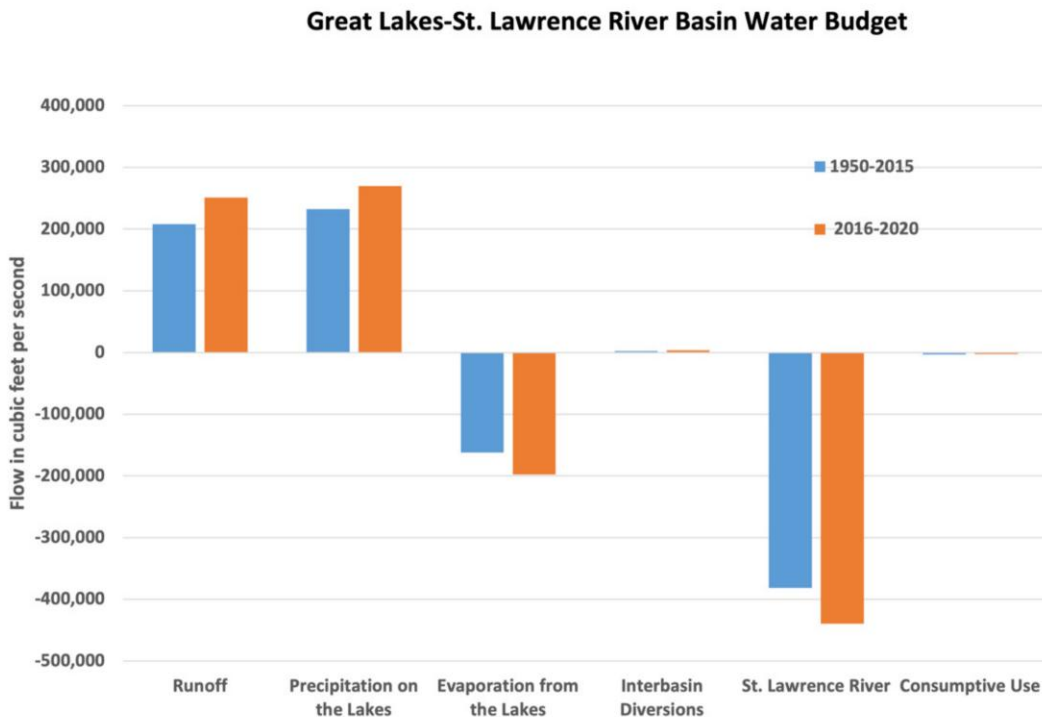


Figure 2. Great Lakes-St. Lawrence River Basin water budget using average annual flows, comparing a five-year period (2016-2020) to a historical 65-year period (1950-2015).

Source: Great Lakes Commission Cumulative Impact Assessment of Withdrawals, Consumptive Uses and Diversions

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¹² “Cumulative impact” mean the impact on the Great Lakes—St. Lawrence River Basin Ecosystem that results from incremental effects of all aspects of a Withdrawal, Diversion or Consumptive Use in addition to other past, present, and reasonably foreseeable future Withdrawals, Diversions and Consumptive Uses regardless of who undertakes the other Withdrawals, Diversions and Consumptive Uses. Cumulative impacts can result from individually minor but collectively significant Withdrawals, Diversions and Consumptive Uses taking place over a period of time.

Water Budget Component	5-year Flow (cfs)	65-year Flow (cfs)
Runoff	250,971	207,924
Precipitation	269,928	232,404
Evaporation	-197,574	-162,033
St. Lawrence River	-439,754	-381,526
Interbasin Diversions	3541	2619
Consumptive Uses	-2,710	-3,283*

Table A. Water budget average flow values for the Great Lakes-St. Lawrence River Basin, comparing 5-year period (2016-2020) to a historical 65-year period (1950-2015). * Average consumptive use for 2006-2015.

Source: Great Lakes Commission Cumulative Impact Assessment of Withdrawals, Consumptive Uses and Diversions

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Figure 2 and Table A present a comparison of five-year reporting period averages and 65-year historical period averages in water budget data for the Basin. As illustrated in Figure 2 and Table A, the largest outflow for the Basin is the St. Lawrence River and the smallest is Consumptive Use. The average Basin water flow components are variable when comparing components during these time periods. All the natural flows in the Basin—runoff, precipitation on the Lakes, evaporation from the Lakes, and St. Lawrence River—are greater during the five-year period compared to the 65-year period. Figure 2 and Table A show that the natural inflows and outflows dominate the water budget. Figure 2 and Table A also illustrate that inflows do not always equal outflows, which is attributable to the imprecisions inherent in the techniques used to estimate average flows and to changes in storage over time. Many of these flows are imprecisely estimated and therefore have significant uncertainties associated with them. These uncertainties are addressed elsewhere in the Report.

Cumulative Hydrologic Effects on Flows for the Great Lakes-St. Lawrence River Basin

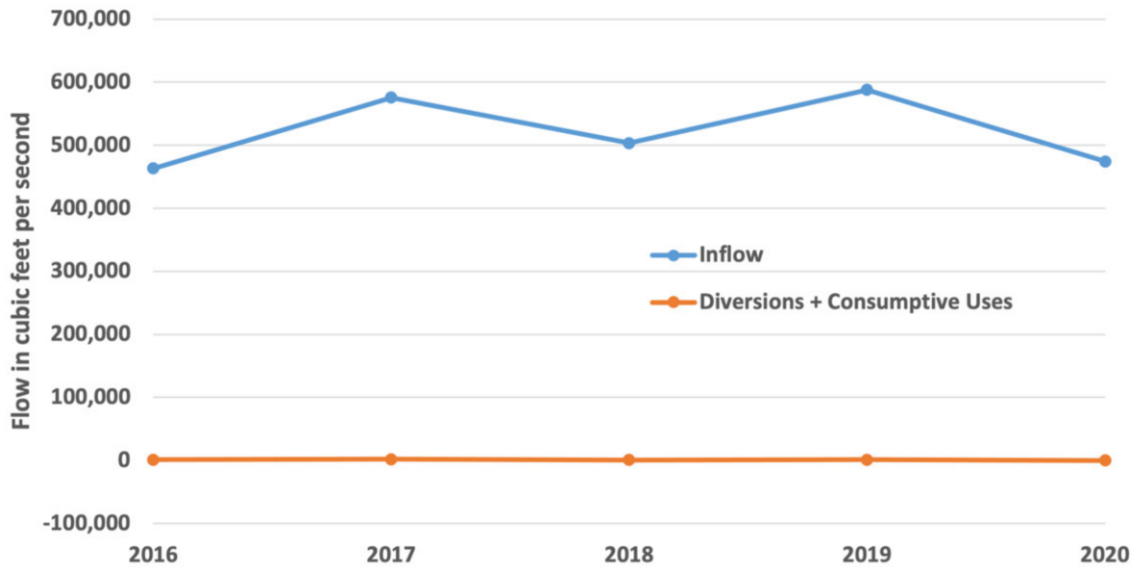


Figure 3. Cumulative hydrologic effects on flows for the Great Lakes-St. Lawrence River Basin, 2016-2020.

Source: Great Lakes Commission Cumulative Impact Assessment of Withdrawals, Consumptive Uses and Diversions

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Year	Runoff + Precipitation (cfs)	Consumptive Uses + Diversions (cfs)
2016	463,342	908
2017	575,703	1,806
2018	503,392	621
2019	587,864	1,056
2020	474,197	-217

Table B. Water budget values in cubic feet per second for the Great Lakes-St. Lawrence River Basin, 2016-2020.

Source: Great Lakes Commission Cumulative Impact Assessment of Withdrawals, Consumptive Uses and Diversions

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The cumulative hydrologic effect of Consumptive Uses and Diversions as compared to natural inflow for 2016-2020 is shown for the Basin in Figure 3. Table B includes the flow values used to construct Figure 3 and shows the amount of Consumptive Uses and Diversions compared to runoff and precipitation. As illustrated in Table B, the cumulative hydrologic effect of Consumptive Uses and Diversions (annual averages) for the Basin is small relative to inflows (runoff plus precipitation). The cumulative hydrologic effect of Consumptive Uses and Diversions is positive for 2016-2019 and negative for 2020. A positive number means more water is diverted into the Basin than the total amount of water diverted out of the Basin.¹³

The 2016-2020 Report addresses the issues of climate change and adaptive management

¹³ Great Lakes -St. Lawrence River Water Resources Regional Body and Basin Water Resources Council "Cumulative Impact Assessment of Withdrawals, Consumptive Uses & Diversions" 2016-2020.

660 and points out several specific areas for near term action/improvement which it is anticipated will
661 be discussed in the upcoming 2021-2025 CIA Report.

662
663 1. Research is needed to improve estimates of Consumptive Use and to improve consistency
664 in application of Consumptive Use coefficients by the Parties.

665 2. Further work is needed to improve understanding of the impacts of new or increased
666 withdrawals on flows, associated chemical and biological conditions, as well as on
667 other water uses at scales from local to regional to Basin.

668 3. Changes to methods to improve calculations of runoff, evaporation from the Lakes, and
669 precipitation on the Lakes are ongoing at Provincial and federal agencies, and
670 universities. This research is vital to understanding the natural variability of the Basin
671 water balance and to assessing potential changes in the future.

672 4. For future assessments, consider using data from Large Lake Statistical Water Balance
673 Model, which has less uncertainty than data used for the Cumulative Impact Assessment
674 section of this and earlier reports.¹⁴

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676 2.5.7 2022-2023 Interim CIA

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678 As noted above, an Interim CIA must be prepared following an increase in net water
679 losses from the basin of more than 50 MGD. Some interviewees suggested that the need for this
680 interim CIA and the threshold should be reviewed. It should be noted that this Interim CIA did
681 not address any of the suggested areas for improvement in previous CIA Reports.

682

683 The approach used for this interim assessment is similar to that of the 2016-2020
684 Cumulative Impact Assessment. The analysis focuses on the hydrologic effects of consumptive
685 uses and diversions on water supply and flow at both the watershed (i.e., lake basin) and Great
686 Lakes-St. Lawrence River basin scales. The most recent data submitted to the Great Lakes-St.
687 Lawrence Regional Water Use Database indicate that incremental water losses¹⁵ to the basin
688 between 2022 to 2023 increased by 1,364 mgd (5,162 mld) or 2,110 cubic feet per second (cfs).
689 In 2022, more water entered the basin from incoming diversions than left from outgoing
690 diversions and consumptive uses, while the basin lost water in 2023 when looking at diversions
691 and consumptive uses. However, for both 2022 and 2023, diversions and consumptive uses were
692 small relative to total inflows or total outflows, including natural inflows and outflows. A more
693 detailed description of the changes from 2022 to 2023 is provided in the diversion and
694 consumptive uses section of the 2023 Annual Water Use Report.¹⁶

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¹⁴ Ibid pg. 53

¹⁵ Incremental water loss is defined as the change in the sum of net diversions and consumptive uses.

¹⁶ Great Lakes Commission 2023 annual GLRWUD report Appendix C

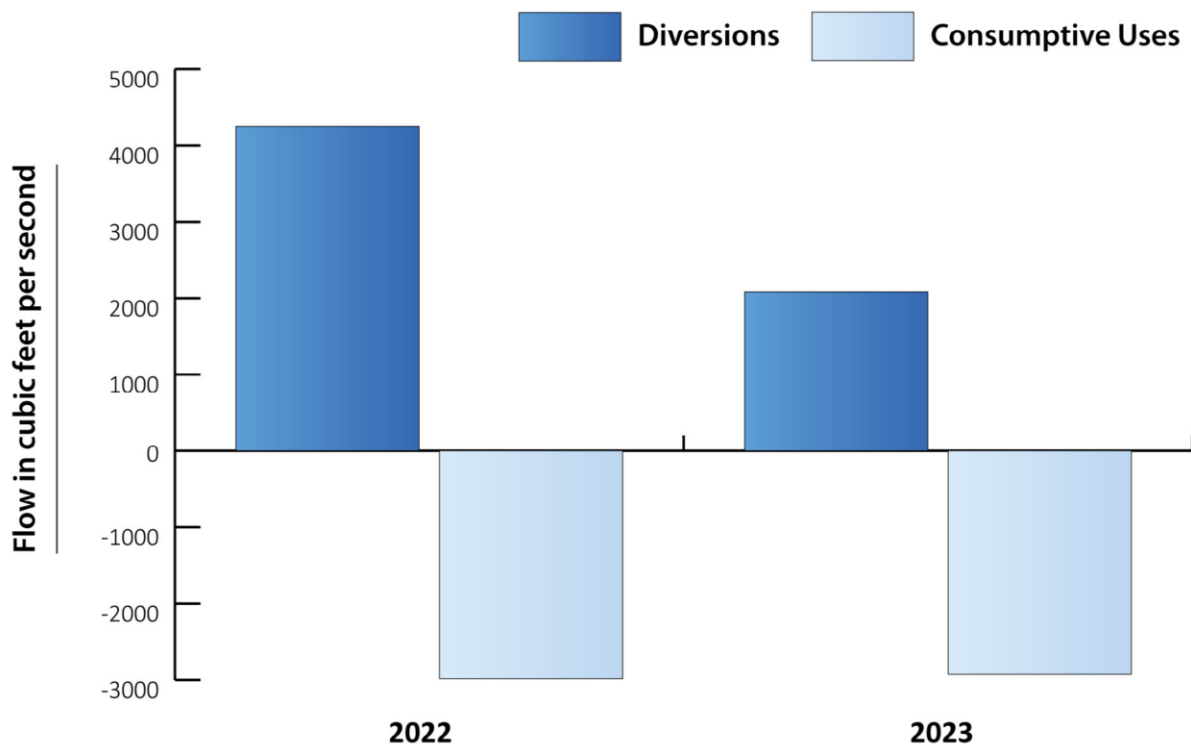


Figure A. Diversions and consumptive uses for the Great Lakes – St. Lawrence basin

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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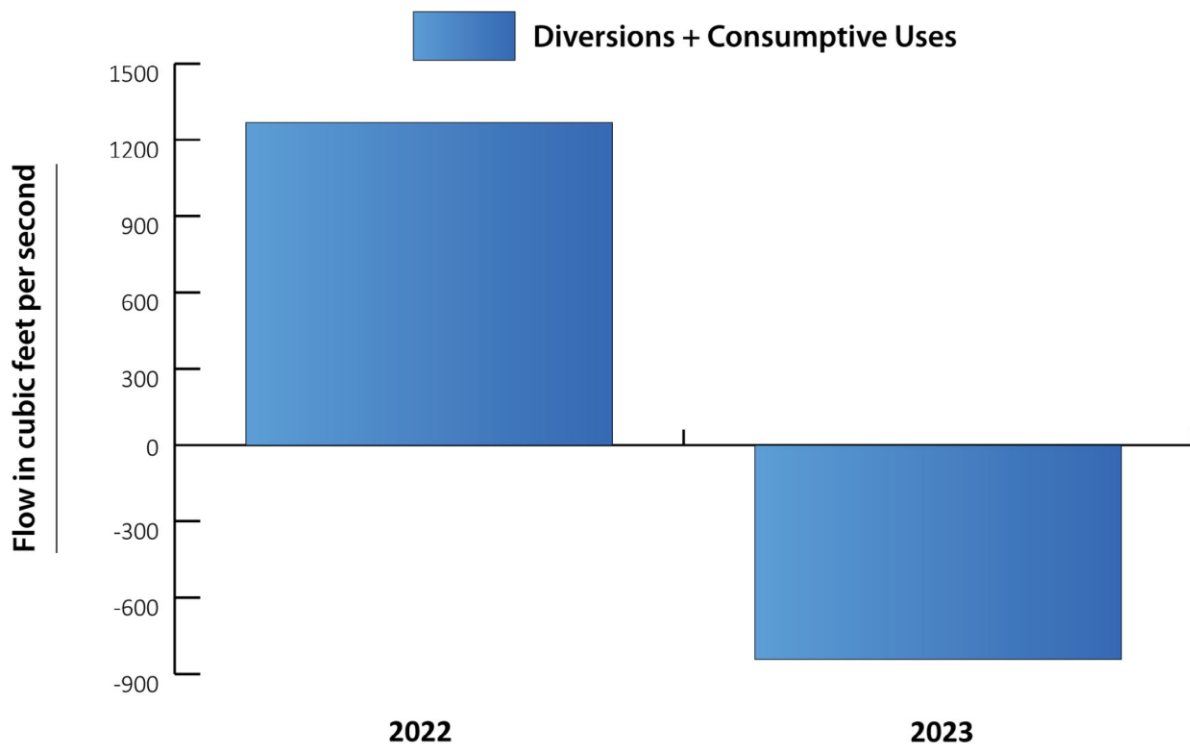


Figure B. Net diversions and consumptive uses for the Great Lakes – St. Lawrence River basin.

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Figure A shows diversions and consumptive uses for the basin in 2022 and 2023. Net diversions are positive, mainly due to the Long Lac and Ogoki diversions which divert water – from the Hudson Bay watershed into the Lake Superior watershed for power generation purposes – at a greater rate than all outgoing diversions. As shown on Figure B, in 2022, the total consumptive use was less than the net diversions, meaning consumptive use and diversions had a net positive flow into the basin. The net flow of diversions and consumptive use was negative in 2023, as consumptive use exceeded the net diversion amount. This shift is attributed to a decrease in incoming diversions from 2022 to 2023; net diversions decreased by 2,166 cfs while consumptive use decreased by only 56 cfs.

Water Budget Component	Average 2022 flow (cfs)	Average 2023 flow (cfs)
Runoff	172,579	183,195
Precipitation	247,015	232,114
Evaporation	-203,300	-181,399
St. Lawrence River	-416,566	-414,678
Interbasin Diversions	4,250	2,085
Consumptive Use	-2,983	-2,927

Table A. Water budget average flows for the Great Lakes-St. Lawrence River basin

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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Water Budget Comparison	2022	2023
Consumptive Uses + Diversions as a percentage of other inflows	1.7	1.2
Consumptive Uses + Diversions as a percentage of other outflows	1.2	0.8

Table B. Relative hydrologic effect of consumptive uses and diversions in the Great Lakes-St. Lawrence River basin (directional aspect of flow removed)

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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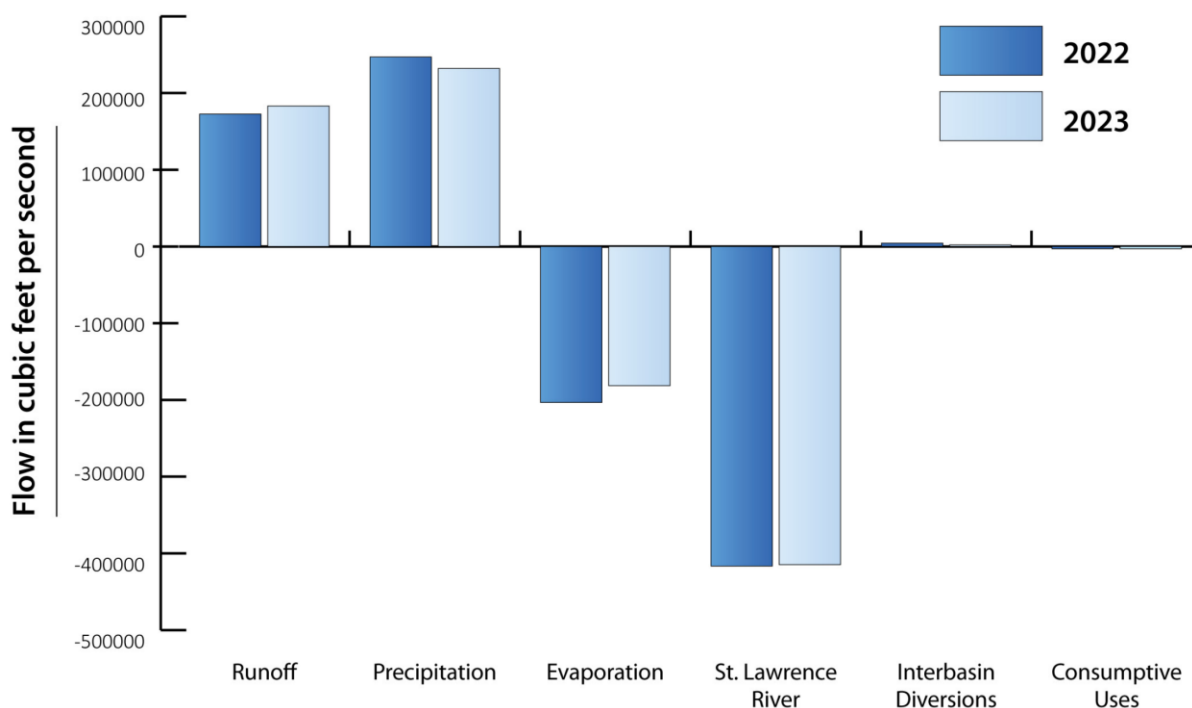


Figure C. Water budget average flows for the Great Lakes-St. Lawrence River basin

Source: Great Lakes Commission Great Lakes Regional Water Use Database

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The data in Tables A and B and Figure C summarize the components of the Great Lakes – St. Lawrence River basin water budget and the relative hydrologic effect of consumptive uses and diversions in the watershed. In 2022 and 2023, flow related to consumptive uses and diversions was less than 2% of both other inflows (runoff and precipitation) and other outflows (evaporation and the St Lawrence River) across the Great Lakes-St. Lawrence River basin. The percentage of flow related to consumptive uses and diversions decreased from 2022 to 2023 for both inflows and outflows.¹⁷

3. Interviews: Issues and Themes

¹⁷ Great Lakes Commission 2023 annual GLRWUD report Appendix C pgs 75-77.

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The Great Lakes-St. Lawrence River Basin is a fertile region for constituencies who are concerned and are deeply engaged in the stewardship of the world’s largest system of freshwater lakes. It is no surprise, then, that the drafting and implementation of the Great Lakes Compact and Agreement generated considerable public comment and engagement. For purposes of this project, we selected approximately 40 individuals from key governments, stakeholders, and experts to interview regarding the issues associated with implementation of the Compact and protection of the waters of the Great Lakes from diversions and withdrawals in general. Finally, we asked the interviewees to comment on the status of the IJC’s 2015 recommendations.

The interviewees were from state and provincial governments, Indigenous Nations, the Great Lakes-St. Lawrence Governors and Premiers, the Great Lakes-St. Lawrence Cities Initiative, the Great Lakes Commission, environmental non-profit organizations, academia, the business community and others. Most interviews were recorded in sessions that lasted from 30 minutes to over an hour. A total of almost 40 persons responded to the interview request and were interviewed via videoconference Interviewees were told they would not be identified by name in this report. Several interviewees responded in writing instead of being recorded. With their consent, the interview questions were sent to interviewees in advance of the interview.

There were two sets of survey questions, one dealing primarily with policies and the other primarily with water use, data reporting and some specific technical questions. The policy-related interview consisted of questions about the general effectiveness of the Compact and Agreement, governance issues, the role of Indigenous Peoples in the implementation of the Compact and Agreement, public awareness and stakeholder participation, science and monitoring, climate change adaptation, economic and social impacts, and evaluation and recommendations.

The sections below discuss common issues and themes that many of the interviewees provided.

3.1 Role of Indigenous Nations

There was general agreement that the role of Indigenous Nations was not sufficiently recognized by the states and provinces in the process of drawing up and seeking formal approval of the Compact and Agreement. The November 2004 Tribal and First Nations Great Lakes Accord called the efforts of the Great Lakes states and provinces to draft the Compact “flawed because these efforts do not involve the direct participation of the governments of Tribes and First Nations.” Tribes and First Nations were treated as stakeholders rather than sovereign nations during the consideration of the Waukesha diversion, said one interviewee.¹⁸

Relationships between the Regional Body, the Compact Council and Indigenous Nations have since improved, according to some interviewees. For the most part, there is meaningful exchange of information and Tribes and First Nations are explicitly engaged in substantive processes. One possibility discussed was a substantive memorandum of understanding between

¹⁸ see Kyle P. Whyte, Nicholas J. Reo, Deborah McGregor, M.A. (Peggy) Smith, James F. Jenkins, Kathleen A. Rubio "Seven Indigenous principles for successful cooperation in Great Lakes conservation initiatives" in "Biodiversity, Conservation and Environmental Management in the Great Lakes Basin", Chapter 15, pp 182-194, 1st Edition, Taylor and Francis Group, 2017.

776 the parties to the Compact and Agreement and Indigenous Nations spelling out their role as
777 sovereigns in the proposal consultation, review, and decision-making process on diversions.¹⁹
778

779 3.2 Reasonable Water Supply Alternative 780

781 The only proposal considered by the Compact Council, consistent with the Compact, was
782 a community within a straddling county diversion to replace the contaminated public water
783 supply source of the City of Waukesha, located in the straddling county of Waukesha County.
784 The Waukesha straddling county exception to the Compact’s diversion ban raised the issue of
785 what types of alternatives to a proposed diversion need to be considered by applicants. Section
786 4.1.3 of the Compact says a straddling county diversion can proceed only if a “reasonable water
787 supply alternative within the basin in which the community is located, including conservation of
788 existing water supplies,” does not exist.
789

790 The City of Waukesha reported to the Regional Body and Compact Council that it had
791 done an extensive alternatives analysis and that no alternative to the diversion could be
792 considered reasonable. Some environmental organizations challenged the City’s statement and
793 proposed alternatives, such as blending deep- and shallow-aquifer water and using the best
794 available technology for removing radium and other contaminants.²⁰
795

796 Our interviewees differed on whether Waukesha’s alternatives analysis was sufficiently
797 rigorous. In the end, the Regional Body and Compact Council approved the diversion, accepting
798 the City’s analysis. The diversion went online in 2023. The diversion appears to be functioning
799 as approved.²¹
800

801 3.3 Largely Residential Users 802

803 Discussion of the straddling community diversion authorized by the State of Wisconsin
804 for the City of Racine revealed a key difference of opinion on whether the diversion was
805 consistent with the Compact and Agreement. The straddling community diversion exception
806 holds that the diverted water must be used for public water supply purposes, meaning “water
807 distributed to the public through a physically connected system of treatment, storage and
808 distribution facilities serving a group of largely residential customers that may also serve
809 industrial, commercial, and other institutional operators.”
810

811 The Racine diversion was requested primarily to support a major manufacturing facility
812 and associated development. Opponents said the Compact was not intended to provide a water
813 supply primarily for economic development. However, Racine officials said the diversion
814 complied with the Compact because Racine’s system *as a whole* provided water to a largely

¹⁹ See for example Ijatuyi et al " Integration of indigenous knowledge with scientific knowledge: A systematic review, Environmental Science and Policy 170 (2025)104119 pp 1-12, as well as Lorrilee McGregor "Drawing on Anishinaabek knowledge to protect water" Journal of Great Lakes Research 49 (2023) S84-S86, as well as Deborah McGregor et al " Towards meaningful research and engagement: Indigenous knowledge systems and Great Lakes governance" Journal of Great Lakes Research 49 (2023) S22-S31.

²⁰ see for example Christina L. Wabiszewski "Diversions from the Great Lakes: Out of the Watershed and in Contravention of the Compact" Marquette Law Review Volume 100 Issue 2 Winter 2016 Article 9.

²¹ see for example Amanda K. Beggs ""Death by a Thousand Straws": Why and How the Great Lakes Council Should Define "Reasonable Water Supply Alternative" Within the Great Lakes Compact" Iowa Law Review Vol. 100:361, PP 362- 385.

815 residential population. Interviewees for this report remain divided on the City of Racine’s
816 rationale.²²

817

818 3.4 Humanitarian Exception

819

820 The Compact and Agreement provide for several exceptions to the water diversion ban
821 besides those for communities within a straddling county and straddling communities. Section
822 4.13 of the Compact states that water can be diverted “1. To supply vehicles, including vessels
823 and aircraft, whether for the needs of the persons or animals being transported or for ballast or
824 other needs related to the operation of the vehicles. 2. To use in a non-commercial project on a
825 short-term basis for firefighting, humanitarian, or emergency response purposes. Some
826 interviewees expressed concern about the lack of definitions of “short-term” and “humanitarian,”
827 but most did not regard it as an urgent issue.

828

829 3.5 Jurisdictional Collaboration

830

831 Most interviewees expressed that current collaboration between the U.S. states and
832 Canadian provinces is effective in implementing the goals of the Compact and Agreement and
833 that the Regional Body, especially through its annual meetings open to the public, is serving as
834 an effective tool for coordination among the states and provinces, as well as for public
835 engagement. Learning about the various jurisdictions' data collection processes, diversion
836 possibilities and other related issues at these meetings, and generally through informal collegial
837 communication, was mentioned as a benefit. The Great Lakes Commission reports that data
838 quality has improved, there is improved compliance in water use data collection and reporting as
839 well as documentation of data sources, and a high commitment/investment by the states and
840 provinces in their water user data collection and reporting programs.

841

842 Because this governance process appears to be working well, there were few barriers
843 mentioned to cross-border coordination. One interviewee suggested a weakness is that the
844 Compact allows the states to set their own scope and threshold in terms of what proposals will be
845 subject to regulation, and some states may not have tight enough regulations or appropriate
846 thresholds.²³ The interviewee also expressed concern that the Agreement, unlike the Compact, is
847 not binding across the border.²⁴ However, the Secretariat for the Regional Body and Council
848 noted that recognizing this necessary limitation, the process has worked efficiently. The Regional
849 Body (with all eight States and two provinces) meets and then the Compact Council (just the
850 states) meets, so to date the process has been collegial and inclusive. There is, however, some
851 uncertainty about how resilient existing mechanisms may be under evolving political or climatic
852 conditions, and concerns were also expressed about reduced frequency of cross-border
853 communication and long-term funding commitments for coordination bodies.²⁵

854

855 3.6 Public Awareness

²² see for example John V. Casey “Irrigating Industry: Is the Great Lakes Compact Being Drowned for Industrial Gain”
University of Illinois Law Review Vol. 2020 pp 308- 340.

²³ see Kenneth Kilbert, Aubrey Merkle and Forrest Miller “An Assessment of the Great Lakes States' Implementation of the
Water Management and Conservation Provisions of the Great Lakes-St. Lawrence River Basin Water Resources Compact”
University of Toledo College of Law's Legal Institute of the Great Lakes. October 2019.

²⁴ see Kayla Brinda “WANTED: The Great Lakes Water-Unsustainable Out-of-Basin-Diversions and Canada's Options” J. Envl.
Law and Litigation, Vol. 33 199 2018

²⁵ see for example Jared Teutsch “On Track? Ensuring the Resilience of the Great Lakes Compact” Alliance for the Great Lakes
September 26, 2013.

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Education of the public and private sectors as to the critical issues facing the Great Lakes Basin is often voiced as an important need²⁶, especially now, in the face of various water pollution challenges, water level fluctuations, climate change threats and fears of large-scale removals. Public awareness was one of the themes that emerged in our interviews. There were differences of opinion on the level of public awareness with respect to the Great Lakes Compact and Agreement.

Certainly, downstream in Québec, which is a signatory to the Agreement, it was suggested there was little awareness of the Compact and Agreement due to the province's distance from the Great Lakes and other priorities. In Ontario and the eight Great Lakes States, it is difficult to generalize, but most interviewees believe the public may be aware there is some sort of agreement to ban removals from the Great Lakes but most of the public is not familiar with the Compact and Agreement per se and its (complex) provisions.

Most interviewees indicated observed that unless there was a clear diversion proposal in a Great Lakes Basin community, little attention was paid to the Compact and Agreement. This is not necessarily a significant problem but it is a reality when so many other environmental issues are in the public domain. In the few cases where a diversion has been approved under the Compact and Agreement, there is continued interest in how the diversions are in fact being implemented. Is it following all the conditions on which its approval was based? There is also modest interest in the data reported annually on withdrawals, diversions, and consumptive uses. We asked interviewees how this should change. Should more of an education effort be expended? We received mixed answers.

Efforts to educate the public about the Compact and Agreement may not be a worthwhile investment of time, effort, and cost, said many of the interviewees. In some instances, jurisdictions lack staff to conduct these tasks. In other situations, funds do not exist for such a purpose and in still other cases, expertise to do the work simply is not available. One interviewee remarked that it would be better to educate the public about the importance of the Great Lakes Basin to the global ecosystem and let them learn about agreements like the GLWQA and the Compact when the need arose. Some commented that the governments were not successful with telling the story of efforts to address critical issues in the Great Lakes Basin.

Some interviewees offered suggestions on improving public awareness and education should any of the jurisdictions care to do so. Some possibilities with respect to the media that appear to have raised public consciousness about various environmental issues in the past, such as television documentaries or series of articles in newspapers or magazines were suggested. Social media might be helpful in educating certain segments of the population as well as school systems themselves. Presentations and open houses at community events, especially staged by local public interest groups, were also suggested. One interview suggested framing the issue with a financial or economic security point of view to better get the public's attention. A public awareness campaign would be a major undertaking with money and people behind it.

3.7 Stakeholder Participation

²⁶ see IJC "Protection of the Waters of the Great Lakes 2015 Review of the Recommendations from the February 2000 Report" December 2015.

902 A related concern in the interview process was whether communication and outreach
903 efforts around the Compact and Agreement have effectively engaged all relevant stakeholders.
904 The annual reports of the Great Lakes Regional Water Use Database were noted as helpful to
905 those seeking specific data and information, as well as efforts to improve access and query
906 function to the database. Some mentioned webinars and similar efforts to involve and inform the
907 public as helpful.

908
909 Most interviewees said they believed that communication and outreach efforts generally
910 have improved over the years since the Compact and Agreement came into force and that the
911 Regional Body and the jurisdictions have effectively kept stakeholders aware of issues as they
912 arise, especially if a diversion proposal was under consideration by a jurisdiction or the
913 Council.²⁷ However, most interviewees commented that there were insufficient efforts to inform
914 and involve Indigenous Peoples in the work of the Council and Regional Body, and although
915 some improvements in this area were noted, many wanted more to be done. The Secretariat of
916 the Great Lakes - St. Lawrence Governors and Premiers noted increased outreach efforts
917 including broad invitations to communities prior to Council meetings, invitations to participate in
918 meetings of the Advisory Committee and invitations to attend and present at Science Team
919 meetings.

920

921 **4. Status of 2015 IJC Recommendations²⁸**

922

923 **2015 RECOMMENDATION 1:** The existing Agreement and Compact should continue to be
924 rigorously implemented to minimize loss of water from the Basin, including full implementation
925 of existing legislation to ensure that the Great Lakes are protected as intended by the Agreement
926 and Compact.

927

928 **STATUS:** *The three diversions authorized since the IJC's 2015 report (Racine 2018; Waukesha*
929 *2019 and Somers 2022) were required to comply with return flow conditions. States and*
930 *provinces have been implementing relevant statutes and improving water use data collection and*
931 *reporting. Consumptive use has not increased; cumulative impact assessments have been*
932 *conducted as required and institutional arrangements such as the Regional Body and Great*
933 *Lakes Council continue to be in place and operating effectively.*

934

935 **2015 RECOMMENDATION 2:** Great Lakes states and provinces should consider the
936 advisability of developing, harmonizing and implementing a bi-national public trust framework
937 as a backstop to the Agreement and Compact, in order to fill gaps and to deal with as yet
938 undefined stresses likely to impact negatively on the Great Lakes in the future.

939

940 **STATUS:** *This recommendation has not been implemented to date and there are no indications*
941 *that it is seriously being considered by any jurisdiction; however, implementation of this*
942 *recommendation continues to have value as a supplemental support for protecting the Great*
943 *Lakes Waters.*²⁹

²⁷ see for example Ben Merriman "Testing the Great Lakes Compact: Administrative Politics and the Challenge of Environmental Adaptation" University of Kansas, Politics & Society, 1-26.2017.

²⁸ The following are brief status comments on each of the IJC's recommendations in its 2015 review Report. More details on the comments are provided elsewhere in this report.

²⁹ The Public Trust Doctrine holds that certain natural resources like navigable waters are preserved in perpetuity for the benefit of the public to use and enjoy. The state serves as a trustee to maintain and protect the trust or common trust resources for the benefit of current and future generations, who are the legal beneficiaries. Any private, public or commercial existing or proposed

944

945 **2015 RECOMMENDATION 3:** The precautionary approach regarding diversions must
946 continue to guide the states and provinces to protect the Great Lakes from an ever-increasing
947 number of larger-scale removals.

948

949 **STATUS:** *Consistent with the Compact and Agreement, the states and provinces have followed*
950 *a precautionary approach regarding diversions. Since 2015, there have not been any proposals*
951 *for larger-scale removals.*

952

953 **2015 RECOMMENDATION 4:** The Great Lakes states and provinces, in collaboration with
954 the two federal governments, should develop methodologies for improving the accuracy of water
955 use and consumptive use estimates, with priority given to the largest water users or water use
956 sectors in the basin within the next five years. Given uncertainty in the drivers of water use in
957 key use sectors, states and provinces should carefully monitor water use trends, highlighting the
958 need for accurate reporting in withdrawals and consumptive use.

959

960 **STATUS:** *The quality of water use and consumptive use data and reporting by states and*
961 *provinces has improved significantly since 2015. The jurisdictions are exchanging information*
962 *about best practices for collecting water use data. Trend information is growing more accurate*
963 *and meaningful. Withdrawals and consumptive use are reported regularly; however, the*
964 *consumptive use estimating methodology varies among the states and provinces and this is*
965 *problematic because such imprecision could in the future result in unanticipated impacts.*

966

967 **2015 RECOMMENDATION 5:** Further refinement of water balance components should
968 continue to occur through federal agencies such the USGS, NOAA, US Army Corps of
969 Engineers, and Environment Canada. Assuming that the science will continue to evolve rapidly,
970 the Regional Body/Council should continuously review new knowledge regarding lake-wide
971 hydrology and incorporate new advancements the gaps. in decision-making processes for
972 existing and new withdrawals and diversions. This review should focus on state-of-the-art lake-
973 wide hydrology, identifying key information gaps, and determining how to close the gaps.

974

975 **STATUS:** *The Great Lakes - St. Lawrence Governors and Premiers provided a detailed*
976 *response to this recommendation on May 11, 2025 which is provided in Appendix C of this*
977 *report and is paraphrased below:*

978

979 *Since the Compact has come into force, three cumulative impact assessments (CIA) have*
980 *been completed covering the years 2006-2010; 2011-2015; and 2016-2020. Among other issues,*
981 *the CIA Reports note that the effects of climate change on water levels in the Basin are difficult*
982 *to model due to the uncertainty associated with future climate scenarios and the uncertainty in*
983 *the calculation of Basin water budget components. Specific areas stand out for near-term action:*

use, diversion or discharge cannot harm the waters of the Great Lakes by materially reducing the flow, changing the levels, or polluting the waters of the Great Lakes Basin. Under the public trust doctrine, the waters of the Great Lakes Basin can never be controlled by or transferred to private interests for private purposes or gain. See also Bridget Donegan "The Great Lakes Compact and the Public Trust Doctrine: Beyond Michigan and Wisconsin Common Law" J. Env'tl. Law and Litigation Vol. 24, 455 2009 pp.455-494; and Courtney M. Hammer "Standing Under the Great Lakes Compact: A Broad-Based Argument Infused with Public Trust Principles For Those With Diversion Aversion" Michigan State Law Review 251 pp. 251-306.

984 • *Research is needed to improve estimates of consumptive use and to improve consistency in*
985 *application of consumptive use coefficients by the Parties.*

986 • *Further work is needed to improve understanding of the impacts of new or increased*
987 *withdrawals on flows, associated chemical and biological conditions, as well as on other water*
988 *uses at scales from local to regional to basin.*

989 • *Changes to methods to improve calculations of runoff, evaporation from the Lakes, and*
990 *precipitation on the Lakes are ongoing at Provincial and federal agencies, and universities. This*
991 *research is vital to understanding the natural variability of the Basin water balance and to*
992 *assessing potential changes in the future.*

993
994 *A Regional Body/Compact Council Science Team was formed several years ago. Meeting*
995 *at least twice a year, the Science Team hosts a series of presentations and discussions on issues*
996 *of interest to the Science Team members.*

997
998 **2015 RECOMMENDATION 6:** Considering the large uncertainties surrounding climate
999 change and other human impacts on the hydrologic cycle, federal, provincial and state
1000 governments should, in addition to continuing to take an adaptive management approach in
1001 decision-making, incorporate climate resilience into policies and management practices
1002 regarding decision-making for diversions, consumptive use, and lake level management.
1003 Provincial and state governments should survey how widespread the development and adoption
1004 of adaptation strategies are across the Basin. Advancements in the state of science on climate
1005 change impacts in the Great Lakes should be encouraged by federal, state, and provincial
1006 governments through further funding and a synthesis of the state of the science. As part of a
1007 precautionary approach for limiting climate change impacts on Great Lakes water resources,
1008 state and provincial governments should urge the federal governments of Canada and the United
1009 States to aggressively pursue strategies for reducing greenhouse gas emissions.

1010
1011 **STATUS:** *States and provinces have developed resilience strategies related to climate*
1012 *variation. Climate variation is not taken into account directly in the Compact and Agreement but*
1013 *rather indirectly through the Cumulative Impact Assessment (CIA) reports. The Regional Body*
1014 *also organizes climate change symposia and other fora. The Canadian and U.S. governments*
1015 *have funded state of the science reports involving Great Lakes states and provinces. Several*
1016 *Great Lakes states have called on the U.S. government to pursue strategies for reducing*
1017 *greenhouse gas emissions and have enacted their own greenhouse gas emissions reduction*
1018 *plans.*

1019
1020 **2015 RECOMMENDATION 7:** Great Lakes states and provinces should fully factor the
1021 adverse ecological and water quality impacts of groundwater withdrawals into both water use
1022 permitting procedures and decisions regarding consumptive use. Great Lakes states and
1023 provinces should identify where groundwater levels are continuing to decline and recommend
1024 management strategies for stabilizing groundwater levels. Federal, state, and provincial research
1025 should continue to improve mapping and understanding groundwater aquifers in the basin,
1026 determining where groundwater supplies may be and stream habitat. degraded in the future,
1027 identifying management methods for avoiding these problems, and achieving an improved
1028 understanding of the relationship between land uses and groundwater and surface water quality
1029 and stream habitat.

1030

1031 **STATUS:** *Groundwater research and reporting appears to be more advanced in the United*
1032 *States than in Canada, but there has been little advancement in the ability of the parties to the*
1033 *Compact and Agreement to adequately ascertain withdrawal impacts on groundwater.*

1034

1035 *The Great Lakes - St. Lawrence Governors and Premiers provided a detailed response to*
1036 *this recommendation on May 11, 2025 which is provided in Appendix C of this report and is*
1037 *paraphrased below:*

1038

1039 *Many of the terms of the Compact are implemented by the individual States and*
1040 *Provinces. Groundwater research has been identified as a priority in the Regional*
1041 *Body/Compact Council Science Strategy. Specifically, Section 2.2 of the strategy states in part*
1042 *that groundwater is an important element of the water budget and for maintaining chemical,*
1043 *physical, and biological integrity of the Great Lakes Basin. Direct groundwater discharge to the*
1044 *Great Lakes is a small proportion of the overall water budget; however, indirect groundwater*
1045 *discharge to Great Lakes tributary streams is a significant portion of the streamflow in many*
1046 *Basin tributaries. Our understanding of the availability and extent of groundwater resources*
1047 *stored and flowing through aquifer systems across the Great Lakes Basin is comprehensive in*
1048 *some locations but can be improved in others. The details of how to evaluate the impacts of a*
1049 *specific groundwater withdrawal on a specific water resource are an area of active research,*
1050 *and there is a need to better understand the contributions of groundwater at a basin-wide scale.*
1051 *Furthermore, understanding of regional groundwater flow patterns is important to assess Intra-*
1052 *Basin Transfer and Diversion proposals and meet the Agreement/Compact requirements. These*
1053 *requirements include evaluating water supply alternatives as there can be a potential for*
1054 *groundwater outside of the topographical Great Lakes Basin to have a hydrogeological*
1055 *connection to waters of the Basin.*

1056

1057 **2015 RECOMMENDATION 8:** *The IJC recommends broad-based collaboration among public*
1058 *and private sectors to enhance water stewardship by fixing leaking public water infrastructure,*
1059 *supporting innovation, and increasing funding to close the region's water infrastructure deficit,*
1060 *unlock water conservation potential and encourage a water stewardship focus region wide.*

1061

1062 **STATUS:** *Fixing public water infrastructure continues to be a critical issue that needs to be*
1063 *addressed. The American Water Works Association's "Buried No Longer" report, published in*
1064 *2012, highlighted the significant financial burden of replacing aging water infrastructure in the*
1065 *United States, projecting a cost of at least \$1 trillion over 25 years. The report emphasized that*
1066 *the costs of inaction, such as emergency repairs due to pipeline failures, would be even higher*
1067 *than proactive maintenance and replacement. "Buried No Longer" also provided a framework*
1068 *for cost estimation and a tool for individual utilities to forecast their own pipe repair and*
1069 *replacement needs.³⁰ On the U.S. side of the Great Lakes, water infrastructure funding falls*
1070 *below what is calculated to be necessary to protect water quality. This includes upgrading*
1071 *wastewater treatment facilities and fixing leaks. It is estimated that it will take \$200 billion over*
1072 *the next 20 years in the Great Lakes states to meet drinking and wastewater infrastructure needs.*

1073

1074 *Meanwhile, today's aging infrastructure results in water leaks that waste billions of*
1075 *gallons of potable water annually. One example was a catastrophic failure on August 13, 2022*
1076 *of a 120-inch diameter water transmission main operated by the Great Lakes Water Authority*
1077 *between the Lake Huron Water Treatment Plant and the Imlay City Booster Pump Station*

³⁰ American Water Works Association "Buried No Longer: Confronting America's Water Infrastructure Challenge", 2012.

1078 *resulting in boil water advisories for 23 communities and almost 1 million people affected*³¹.
1079 *Another was a main break in Montreal in August 2024 that triggered boil-water advisories and*
1080 *significant urban flooding. Recently the security of Canadian water treatment plants was called*
1081 *into question by possible cyber attack threats.*³²

1082
1083 *Regarding water conservation and efficiency, while all the jurisdictions continue to file*
1084 *conservation strategies and plans, it is unclear looking at the various conservation and efficiency*
1085 *plans submitted by the jurisdictions how effective they are in meeting their goals and objectives.*
1086

1087 **5. Findings and Recommendations**

1088 1089 **5.1 Changes to the Great Lakes – St. Lawrence River Basin Water Resources Compact and** 1090 **Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement**

1091
1092 *Based on our review of the Compact and Agreement, and consistent with the views of*
1093 *most of the interviewees, we find that no changes to the two agreements are warranted at this*
1094 *time. Further, we find no basis for amending the Compact and Agreement based on experience*
1095 *with them since 2008. This is not to say that either document is flawless or that there is no room*
1096 *for improvements in its implementation. Addressing those changes, however, does not require*
1097 *formal changes to the Compact and Agreement but rather perhaps through changes in the*
1098 *policies and procedures.*³³

1099 1100 **Recommendation**

1101
1102 *1. It is recommended that the parties to the Compact and Agreement make no changes in the*
1103 *foreseeable future and remain vigilant as water scarcity outside the basin and water demand*
1104 *within the basin (particularly with respect to burgeoning industries such as data centers) strain*
1105 *available water resources. Further, the Regional Body and Compact Council continue their*
1106 *policies of transparency to build public awareness of and confidence in their processes.*
1107

1108 **5.2 Indigenous Nations**

1109
1110 *Indigenous Nations are not treated as sovereigns and rights holders in the Agreement and*
1111 *Compact, although parties to the Compact and Agreement are improving communication and*
1112 *participation. Still, Indigenous Nations are not formally represented on the Regional Body and*
1113 *Compact Council nor were they formally included in the negotiations leading to both*
1114 *agreements. This is a major deficiency.*
1115

1116 **Recommendations**

1117
1118 *2. It is recommended that the parties to the Compact and Agreement commit to greater*
1119 *collaboration with Indigenous Nations and engage Indigenous Nations to determine whether and*

³¹ Great Lakes Water Authority "Incident Report for 120-inch Water Transmission Main Break of August 13, 2022", December 20, 2022.

³² Patrick White "Security of Canadian water treatment plants called into question as cyber attack threats mount" The Globe and Mail November 19, 2024.

³³ for an alternative viewpoint see for example Kelly Kane "The Great Lakes-St. Lawrence River Basin Agreement: What Happens in the Great Lakes Won't Stay in the Great Lakes" Michigan State International Law Review Vol.25.2 pp. 429=453.

1120 *how they would like to contribute to decision making. For example, governments could explore*
1121 *the possibility of Secretariat meetings with Tribes and First Nations prior to Council and*
1122 *Regional Body meetings.*

1123

1124 *3. It is recommended that, by the next IJC review, the Regional Body and Compact Council*
1125 *formally recognize that First Nations, Tribes, and Métis are not "stakeholders" and recognize*
1126 *the ways in which they are distinct rights holders, as well as recognize the interests, needs and*
1127 *concerns, distinct ways of knowing (such as traditional ecological knowledge practices) and*
1128 *institutions for governance of Tribes, First Nations, and Métis peoples.*

1129

1130 *4. It is recommended that, by the next IJC review, the Regional Body add Indigenous*
1131 *representation to its membership.*

1132

1133 **5.3 Clarifications of Compact Definitions**

1134

1135 The review process for the three diversions authorized through the Compact and
1136 Agreement since 2015 has demonstrated the ambiguity of key definitions in the two documents.
1137 This has led to controversy over the permissibility of the authorizations themselves. To build the
1138 quality of decision making and promote public confidence in this decision making, public
1139 engagement on these definitions is advisable.

1140

1141 *Reasonable water supply alternative:* The Waukesha straddling county exception to the
1142 Compact’s diversion ban raised the issue of what types of alternatives to a proposed diversion
1143 need to be considered by applicants.

1144

1145 *Largely residential:* The Racine straddling community definition raised the issue of whether
1146 exceptions to the diversion ban that primarily serve commercial uses constitute “largely
1147 residential” diversions and on what scale this should be measured – by the proposed use itself or
1148 the use considered as a portion of the entire originating water supply.

1149

1150 *Humanitarian exception:* The Compact provides an exception to the diversion ban for short-term
1151 humanitarian needs. The definitions of “short-term” and “humanitarian” are unclear.

1152

1153 Recommendation

1154

1155 *5. It is recommended that by the next IJC review, the Compact Council and Regional Body hold*
1156 *public engagement opportunities to help define “reasonable water supply alternative,” “largely*
1157 *residential” and the "humanitarian exception" and make appropriate adjustments to the*
1158 *Compact and Agreement.*

1159

1160 **5.4 Climate Variation**

1161

1162 Climate change is affecting all sectors of the economy. The science points strongly to
1163 continued if not intensifying climate change-induced alterations in precipitation timing and
1164 volume, over-lake evaporation, drought, flooding, and other factors that have implications for
1165 water withdrawal and diversion decision making. A central climate variation information and
1166 data repository, incorporating existing repositories and tools, such as the Great Lakes Observing
1167 System, is needed in the Great Lakes basin, including state of the art science on future
1168 precipitation, water levels, and impacts on people and communities, and how the jurisdictions are

1169 doing with regard to mitigation and adaptation. While the Compact and Agreement do not
1170 address climate change directly, the sustainability of water in the Great Lakes is influenced by a
1171 changing climate.³⁴

1172

1173 Recommendations

1174

1175 *6. It is recommended that the Regional Body and Compact Council oversee continued*
1176 *improvements in climate modeling and organize workshops and other fora to share knowledge*
1177 *and improve collaboration.*

1178

1179 *7. It is recommended that the federal, state, and provincial governments encourage*
1180 *advancements in the state of science on climate variation impacts in the Great Lakes through*
1181 *additional funding and synthesis of the state of the science.*

1182

1183 **5.5 Public Education Regarding the Existence and Purpose of Compact and Agreement**

1184

1185 Most individuals interviewed for this project noted that while the public may have a
1186 general awareness that large-scale water removals from the Great Lakes are restricted, there is
1187 limited understanding of the specific provisions and significance of the Great Lakes–St.
1188 Lawrence River Basin Water Resources Compact and Agreement. Interviewees further noted
1189 that public attention to the Compact and Agreement tends to arise primarily in response to
1190 specific diversion proposals within the Basin. Broad public education efforts may offer limited
1191 return on investment in terms of time and resources; however, targeted outreach to specific
1192 demographic groups may yield more meaningful engagement and impact.

1193

1194 Recommendation

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1196 *8. It is recommended that, consistent with the availability of funds and development of an*
1197 *education plan by the next IJC review, the Compact/Agreement parties should increase outreach*
1198 *not related to a specific diversion proposal, but targeted at all relevant stakeholders including*
1199 *Indigenous communities, businesses, local governments and youth.*

1200

1201 **5.6 Water Use Data Collection, Analysis, and Reporting**

1202 Since 2015, considerable progress has been made by the Parties to the Compact and
1203 Agreement to improve data collection, reporting, quality, accuracy, and compatibility. The Great
1204 Lakes Commission is well-positioned to continue to serve as the repository for water use data.

1205

1206 Starting with the 2014 water use year, the Great Lakes Commission collected information
1207 from each jurisdiction that describes water use data and includes information related to data
1208 sources, rates of reporting compliance (i.e., the percentage of users submitting the required
1209 reports to their respective jurisdiction) by water use sector, the year from which the data was
1210 collected, significant changes in the data between the current year and previous years and
1211 reasons for those changes. To achieve this, the Great Lakes Commission created an online data
1212 management system that assists in the creation of metadata. These are important steps. However,
1213 methods of estimating consumptive use vary among the states and provinces.

³⁴ See for example Frank Seglenieks and Andre Temgous "Future water levels of the Great Lakes under 1.5°C to 3°C warmer climates, *Journal of Great Lakes Research* 48 (2022) 865-875 and Andrew Gronewold "Climate Change Science in the Great Lakes-St. Lawrence Region and an overview of future research needs" Presentation to the September 2019 meeting of the Regional Body and Compact Council Science Team.

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Groundwater is an important consideration in protecting the waters of the Great Lakes, and while the science and monitoring aspects have improved since 2015, more needs to be done especially in terms of adverse ecological and water quality impacts of groundwater withdrawals and groundwater monitoring.

The Compact and Agreement require that a full cumulative impact assessment (CIA) be prepared every five years and that an Interim CIA be prepared following an increase in net water losses from the basin of more than 50 MGD, (which occurred from 2022-2023), or at the request of one or more of the Parties. To date CIAs have been prepared for the periods 2006-2010, 2011-2015, and 2016-2020 and the next one will be developed for 2021-2025.

Recommendations

9. It is recommended that the Parties establish a uniform methodology for reporting consumptive use by all jurisdictions by the next IJC review.

10. It is recommended that the Parties continue and strengthen research and monitoring of groundwater use and develop a groundwater plan by the next IJC review.

11. It is recommended that the criteria for initiating interim cumulative impact assessments be reviewed and adjusted as necessary.

12. It is recommended that care should be taken by the Great Lakes Commission, which is well placed to continue to be the repository for water use data, to ensure that this data is secure.

5.7 Water Efficiency and Conservation Plans

Assuring efficient use and conservation of water, and developing and implementing such plans, is a vital component of the Compact and Agreement. Fulfilling commitments on these issues is critical to a regional approach to demonstrating good stewardship of the Great Lakes. Most interviewees believed conservation and efficiency plans required of the States and Provinces do not seem to be spurring new water efficiency and conservation initiatives in some jurisdictions.

Recommendation

13. It is recommended that the Compact Council and Regional Body provide guidance regarding the rigor needed in jurisdictional water conservation and efficiency plans and assure their implementation.

5.8 New Pressures

Most interviewees believe there will be pressures for large-scale diversion proposals of Great Lakes water outside the basin in the next ten years or so and hope the Compact and Agreement will continue to be sufficiently strong and robust to deal with them. Some think the risk is great, others not so much. As discussed in Section 3, Artificial intelligence (AI) and data centers pose some of the largest threats as they are both energy and water intensive, thus posing potentially significant demands on Basin waters.

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Recommendation

14. It is recommended that before further pursuing AI and data center projects for siting within their boundaries, the states and provinces consult with experts on the volume and impacts of these growing uses on the Great Lakes basin.

5.9 Public Trust

The Compact declares the Great Lakes to be “precious public natural resources shared and held in trust by the States.” The Agreement declares the waters of the Great Lakes Basin to be “a shared public treasure” and that the states and provinces “as stewards have a shared duty to protect, conserve and manage these renewable but finite Waters.” This language is comparable to some degree with the public trust doctrine mentioned previously.

The public trust doctrine in the U.S. and its Canadian equivalent are common law with the potential to assist the Great Lakes states and provinces to buttress protections for the waters of the basin. Its explicit recognition by the States and Provinces could provide a valuable supplemental tool to the Compact and Agreement.

Recommendation

15. It is recommended that the States and Provinces convene a panel of legal experts to ascertain the significance and potential of the public trust doctrine to assist in protection of the waters of the Great Lakes while allowing for a public comment period on this matter.

5.10 Next Ten-Year Review

The waters of the Great Lakes Basin are a critical part of the natural and cultural heritage of the region and the global community. While some trends leading to societal and other changes may be discernible now, their nature and scope are largely unpredictable, for the Great Lakes and elsewhere.

Recommendation

16. In preparation for the IJC’s next 10-year review of its recommendations for the protection of the waters of the Great Lakes, it is recommended that the IJC monitor climate variability, new and increased water uses, population trends and emerging science on an ongoing basis..

Appendices

- Appendix A 1999 Reference to IJC from Governments
- Appendix B Recommendations from the IJC 2000 Report
- Appendix C The Great Lakes - St. Lawrence Governors and Premiers response to the 2015 IJC recommendations 5 and 7

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Appendix A - Excerpt of the 1999 Letters of Reference from Governments

I have the honor to inform you the Governments of the United States and Canada have agreed, pursuant to Article IX of the Boundary Waters Treaty of 1909, to request the Commission to examine into and report upon matters concerning the use of waters along our common border.

Recently, a proposal to export water by tanker from Lake Superior arose. The Governments are concerned that individual projects of apparently minor effect will set a precedent of bulk removal of water from the Great Lakes basin, opening the Great Lakes and other water bodies to subsequent water removal initiatives, with unpredictable consequences. The bulk removal of water raises serious concern over cumulative impacts on lakes, rivers and other water sources.

Boundary water resources continue to be the subject of ever-increasing demands in the light of expanding populations. Proposals to use, divert and remove greater amounts of such waters can be expected.

The Governments are concerned that current management principles and conservation measures may be inadequate to ensure the future sustainable use of our shared waters.

The Commission is requested to examine, report upon, and provide recommendations as the Commission deems appropriate on the following matters which have, or may have, effects on levels and flows of waters within the boundary or transboundary basins and shared aquifers:

- a) Existing and potential consumptive uses of water;
- b) Existing and potential diversions of water in and out of the transboundary basins, including withdrawals of water for export;
- c) The cumulative effects of existing and potential diversions, and removals of water, including removals in bulk for export;
- d) The current laws and policies as may affect the sustainability of the water resources in boundary and transboundary basins.

The Governments note that extensive research has already been conducted about the Great Lakes, in particular, the Commission's January 1985 report "Great Lakes Diversions and Consumptive Uses". The Governments believe that the Commission's 1985 Report with respect to the Great Lakes, including Lake Michigan, provides a good basis on which to begin the study. In the light of this existing body of knowledge pertaining to the Great Lakes, as well as the urgency of this issue precipitated by export proposals, the Governments request that the Commission give first priority to an examination of the Great Lakes basin, focussing on the potential effects of bulk water removal, including removals for export and provide interim recommendations for the protection of the waters of the Great Lakes, as can be developed from available data, in six months from February 10, 1999.

The Governments further request that the Commission subsequently complete other work on the Great Lakes as may be needed. The Commission is asked to submit its final report on the Great Lakes at the latest six months after the interim report.

In its final report on the Great Lakes, the Commission is further requested to report on additional work that may be required to better understand the implications of consumption, diversions and

1361 removal of water, including removals for export from other boundary waters, waters of
1362 transboundary basins, and groundwater of shared aquifers. In this regard, the Commission is
1363 asked to prepare a plan proposing the phasing of such additional work.
1364

1365 In preparing recommendations, the Commission shall consider in general terms such matters as
1366 potential effects on the environment and other interests of diversions and consumptive uses and
1367 where appropriate, the implications of climatological trends and conditions.
1368

1369 In the conduct of its investigation and the preparation of its report, the Commission shall have
1370 use of information and technical data available to the Governments and that may become
1371 available to the Governments during its investigations. In addition, the Commission shall seek
1372 the assistance, as required, of specifically qualified personnel in the two countries.
1373

1374 The Governments shall seek in equal shares the funds required to provide the Commission with
1375 the resources needed to discharge the obligations under the reference. The Commission shall
1376 develop, as early as practicable, cost projecting for the studies under reference, for the
1377 information of the Governments.
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Appendix B - Recommendations from the IJC 2000 Report

The following recommendations build upon the Boundary Waters Treaty, which provides the principles and mechanisms to help prevent and resolve disputes (primarily those concerning water quantity and water quality along the boundary between Canada and the United States), and upon the Great Lakes Charter, which brings together the Great Lakes states and provinces in a cooperative arrangement designed to protect the Great Lakes. They were developed in accordance with the ecosystem approach adopted by the governments of Canada and the United States in the Great Lakes Water Quality Agreement, the purpose of which is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem. The Commission's recommendations have also been prepared to support and enhance the economic and social well-being of the Great Lakes Basin community and to ensure that the beneficial uses associated with ecosystem integrity are sustained over the long term.

Recommendation I. Removals

Without prejudice to the authority of the federal governments of the United States and Canada, the governments of the Great Lakes states and Ontario and Quebec should not permit any proposal for removal of water from the Great Lakes Basin to proceed unless the proponent can demonstrate that the removal would not endanger the integrity of the ecosystem of the Great Lakes Basin and that:

- a. there are no practical alternatives for obtaining the water,
- b. full consideration has been given to the potential cumulative impacts of the proposed removal, taking into account the possibility of similar proposals in the foreseeable future,
- c. effective conservation practices will be implemented in the place to which the water would be sent,
- d. sound planning practices will be applied with respect to the proposed removal, and
- e. there is no net loss to the area from which the water is taken and, in any event, there is no greater than a 5 percent loss (the average loss of all consumptive uses within the Great Lakes Basin); and the water is returned in a condition that, using the best available technology, protects the quality of and prevents the introduction of alien invasive species into the waters of the Great Lakes.

In reviewing proposals for removals of water from the Great Lakes to near-Basin communities, consideration should be given to the possible interrelationships between aquifers and ecosystems in the requesting communities and aquifers and ecosystems in the Great Lakes Basin.

In implementing this recommendation, states and provinces shall ensure that the quality of all water returned meets the objectives of the Great Lakes Water Quality Agreement.

At this time, removal from the Basin of water that is used for ballast or that is in containers of 20 liters or less should be considered, prima facie, not to endanger the integrity of the ecosystem of the Great Lakes. However, caution should be taken to accurately assess the possible significant local impacts of removals in containers.

1457 Removal of water for short-term humanitarian purposes should be exempt from the above
1458 restrictions.

1459
1460 The governments of Canada and the United States and the governments of the Great Lakes states
1461 and Ontario and Quebec should notify each other of any proposals for the removal of water from
1462 the Great Lakes Basin, except for removal of water that is used for ballast or that is in containers
1463 of 20 liters or less.

1464
1465 Consultations regarding proposed removals should continue in accordance with the procedures
1466 and processes that are evolving throughout the Great Lakes Basin and should be coupled with
1467 additional opportunities for public involvement.

1468
1469 Any transboundary disagreements concerning any of the above matters that the affected
1470 governments are not able to resolve may, as appropriate, be referred by the governments of
1471 Canada or the United States to the International Joint Commission pursuant to Article IX of the
1472 Boundary Waters Treaty.

1473
1474 Nothing in this recommendation alters rights or obligations under the Boundary Waters Treaty.

1475
1476 **Recommendation II. Major New or Increased Consumptive Uses**

1477
1478 To avoid endangering the integrity of the ecosystem of the Great Lakes Basin, and without
1479 prejudice to the authority of the federal governments of the United States and Canada, the
1480 governments of the Great Lakes states and Ontario and Quebec should not permit any proposal
1481 for major new or increased consumptive use of water from the Great Lakes Basin to proceed
1482 unless:

- 1483
1484 a. full consideration has been given to the potential cumulative impacts of the proposed new or
1485 increased major consumptive use, taking into account the possibility of similar proposals in the
1486 foreseeable future,
1487 b. effective conservation practices will be implemented in the requesting area, and
1488 c. sound planning practices will be applied with respect to the proposed consumptive use.
1489 In implementing this recommendation, states and provinces shall ensure that the quality of all
1490 water returned meets the objectives of the Great Lakes Water Quality Agreement.

1491
1492 The governments of Canada and the United States and the governments of the Great Lakes states
1493 and Ontario and Quebec should notify each other of any proposals for major new or increased
1494 consumptive uses of water from the Great Lakes Basin.

1495
1496 Consultations regarding proposed major new or increased consumptive uses should continue in
1497 accordance with the procedures and processes that are evolving throughout the Great Lakes
1498 Basin and should be coupled with additional opportunities for public involvement.

1499
1500 Any transboundary disagreements concerning the above that the affected governments are not
1501 able to resolve may, as appropriate, be referred by the governments of Canada or the United
1502 States to the International Joint Commission pursuant to Article IX of the Boundary Waters
1503 Treaty.

1504
1505 Nothing in this recommendation alters rights or obligations under the Boundary Waters Treaty.

1506

1507 **Recommendation III. Conservation**

1508

1509 In order to avoid endangering the integrity of the ecosystem of the Great Lakes Basin, the
1510 governments of the Great Lakes states and Ontario and Quebec should apply conservation
1511 measures to significantly improve efficiencies in the use of water in the Great Lakes Basin and
1512 should implement the conservation measures set out in this recommendation.

1513

1514 The governments of the Great Lakes states and Ontario and Quebec, in collaboration with local
1515 authorities, should develop and launch a coordinated basin-wide water conservation initiative,
1516 with quantified consumption reduction targets, specific target dates, and monitoring of the
1517 achievement of targets, to protect the integrity of the Great Lakes Basin ecosystem, and to take
1518 advantage of the other economic and environmental benefits that normally flow from such
1519 measures.

1520

1521 In developing and implementing this initiative, the governments should, among other things,
1522 consider:

1523

1524 a. state-of-the-art conservation and pollution-control technologies and practices,

1525 b. potential cumulative impacts,

1526 c. the application of sound planning practices,

1527 d. to the extent practicable, the setting of water prices at a level that will encourage conservation,

1528 e. conditioning financial help from governments for water and wastewater infrastructure on the
1529 application of sound conservation practices,

1530 f. promotion of eco-efficient practices, especially in the industrial and agricultural sectors,

1531 g. establishment of effective leak detection and repair programs for water infrastructure in all
1532 municipalities,

1533 h. the inclusion of strong performance and environmental standards and financial incentives for
1534 water saving in contractual arrangements for delivery of water-related services, whether public
1535 or private,

1536 i. the application of best practicable water-saving technologies in governmental facilities,

1537 j. sharing experiences with respect to the planning and implementation of conservation policies
1538 and programs and

1539 k. the use of water-saving technologies, and joint preparation of promotional and educational
1540 materials and publication of success stories, including sponsoring conferences and workshops on
1541 water conservation, in partnership with others.

1542

1543 **Recommendation IV. Great Lakes Charter Standards**

1544

1545 Without prejudice to the authority of the federal governments of the United States and Canada,
1546 the Great Lakes States and Ontario and Quebec, in carrying out their responsibilities under the
1547 Great Lakes Charter, should develop, within 24 months, with full public involvement and in an
1548 open process, the standards and the procedures, including the standards and the procedures in
1549 Recommendations I and II, that would be used to make decisions concerning removals or major

1550 new or increased consumptive uses. Federal, state, and provincial governments should not
1551 authorize or permit any new removals and should exercise caution with respect to major new or
1552 increased consumptive use until such standards have been promulgated or until 24 months have
1553 passed, whichever comes first.

1554

1555 **Recommendation V. Existing Institutions and Mechanisms**

1556

1557 To help ensure the effective, cooperative, and timely implementation of programs for the
1558 sustainable use of the water resources of the Great Lakes Basin, governments should use and
1559 build on existing institutions to implement the recommendations of this report. In this regard, the
1560 governments of the states and the provinces should take action, with respect to the
1561 implementation of the Great Lakes Charter, to:

1562

1563 a. develop and implement, on an urgent basis, the Basin Water Resources Management Program,

1564 b. develop a broader range of consultation procedures than is currently called for in the Charter
1565 to assure that significant effects of proposed uses of water resources in the Great Lakes Basin are
1566 assessed, and

1567 c. ensure that the notice and consultation process under the Charter is open and transparent and
1568 that there is adequate consultation with the public.

1569

1570 **Recommendation VI. Data and Research**

1571

1572 Federal, state, and provincial governments should move quickly to remedy water use data
1573 deficiencies by:

1574

1575 a. allocating sufficient staff and financial resources to upgrade the timeliness, precision, and
1576 accuracy of water use data,

1577 b. working much closer together to ensure consistency in water use monitoring, estimation
1578 techniques, and reporting,

1579 c. emphasizing and supporting the development and maintenance of a common base of data and
1580 information regarding the use and management of the water resources of the Great Lakes Basin,
1581 establishing systematic arrangements for the exchange of water data and information, and
1582 undertaking coordinated research efforts to provide improved information for future water
1583 planning and management decisions.

1584

1585 Furthermore, governments should immediately take steps to ensure that, on a binational basis,
1586 research is coordinated on individual and cumulative impacts of water withdrawals on the
1587 integrity of the Great Lakes Basin ecosystem. In support of their decision-making, governments
1588 should implement long-term monitoring programs capable of detecting threats (including
1589 cumulative threats) to ecosystem integrity. Such monitoring programs should be comprehensive,
1590 particularly in their approaches to detecting threats to ecosystem integrity at a spectrum of space
1591 and time scales.

1592

1593 As part of an anticipatory policy for identifying emerging issues, governments should, on a
1594 binational basis, undertake more active science and research and, in particular, should implement
1595 appropriate long-term monitoring programs for key indicators of ecosystem change.

1596

1597 **Recommendation VII. Groundwater**

1598

1599 Governments should immediately take steps to enhance groundwater research to better
1600 understand the role of groundwater in the Great Lakes Basin. In particular, they should conduct
1601 research related to:

1602

- 1603 a. unified, consistent mapping of boundary and transboundary hydrogeological units,
- 1604 b. a comprehensive description of the role of groundwater in supporting ecological systems,
- 1605 c. improved estimates that reliably reflect the true level and extent of consumptive use,
- 1606 d. simplified methods of identifying large groundwater withdrawals near boundaries of
1607 hydrologic basins,
- 1608 e. effects of land-use changes and population growth on groundwater availability and quality,
- 1609 f. groundwater discharge to surface water streams and to the Great Lakes, and systematic
1610 estimation of natural recharge areas, and
- 1611 g. systematic monitoring and tracking of the use of water-taking permits, especially for bottled
1612 water operations.

1613

1614 In recognition of the frequent and pervasive interaction between groundwater and surface water
1615 and the virtual impossibility of distinguishing between them in some instances, governments
1616 should apply the precautionary principle with respect to removals and consumptive use of
1617 groundwater in the Basin.

1618

1619 **Recommendation VIII. Climate Change**

1620

1621 Recognizing that the Intergovernmental Panel on Climate Change has concluded that human
1622 activities are having a discernible effect on global climate, and despite the uncertainties
1623 associated with the modeling of future climate, the governments of Canada and the United States
1624 should fully implement their international commitments to reduce greenhouse gas emissions.

1625

1626 **Recommendation IX. Trade Law**

1627

1628 The governments of the United States and Canada should direct more effort to allaying the
1629 public's concern that international trade law obligations could prevent Canada and the United
1630 States from taking measures to protect waters in the boundary region, and they also need to
1631 direct more effort to bringing greater clarity and consensus to the issue.

1632

1633 **Recommendation X. Standing Reference**

1634

1635 The Commission should be given a standing reference to review its recommendations for the
1636 protection of the waters of the Great Lakes in three years and thereafter at 10-year intervals
1637 unless conditions dictate a more frequent review.

1638

1639 **Recommendation XI. Next Steps**

1640

1641 The Commission recommends that the governments consider for adoption the proposed plan of
1642 work for Commission activities on the rest of the border, focusing on priority issues and on

1643 specific regional issues where the Commission can contribute binational experience and
1644 resources.

1645

1646 **Recommendation XII. Implementation**

1647

1648 The Commission recommends that the governments of the United States and Canada and the
1649 governments of the Great Lakes states and Ontario and Quebec, acting individually or
1650 collectively, as appropriate, take the necessary steps to implement the recommendations
1651 contained in this report.

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1692 **Appendix C - The Great Lakes - St. Lawrence Governors and Premiers**
1693 **response to the 2015 IJC recommendations 5 and 7**
1694

1695 **Recommendation 5:** *Further refinement of water balance components should continue to occur*
1696 *through federal agencies such the USGS, NOAA, US Army Corps of Engineers, and Environment*
1697 *Canada. Assuming that the science will continue to evolve rapidly, the Regional Body/Council*
1698 *should continuously review new knowledge regarding lake-wide hydrology and incorporate new*
1699 *advancements in decision-making processes for existing and new withdrawals and diversions.*
1700 *This review should focus on state-of-the-art lake-wide hydrology, identifying key information*
1701 *gaps, and determining how to close the gaps.*
1702

1703 Article 209 of the Great Lakes St. Lawrence River Basin Sustainable Water Resources
1704 Agreement (Agreement) and Section 4.15 of the Great Lakes St. Lawrence River Basin Water
1705 Resources Compact (Compact) states that “The [States and Provinces] shall collectively conduct
1706 within the Basin, on a Lake watershed and St. Lawrence River Basin basis, a periodic assessment
1707 of the Cumulative Impacts of Withdrawals, Diversions and Consumptive Uses from the Waters
1708 of the Basin....”

1709
1710 Since the Compact has come into force, three cumulative impact assessments have been
1711 completed ([https://www.glsregionalbody.org/program-areas/science-and-research/#tab--](https://www.glsregionalbody.org/program-areas/science-and-research/#tab--assessments)
1712 [assessments](https://www.glsregionalbody.org/program-areas/science-and-research/#tab--assessments)). These assessments cover the years 2006-2010; 2011-2015; and 2016-2020.

1713
1714 As noted in the first assessment (released on December 4, 2013):
1715

1716 “...the approach in this assessment focuses on the hydrologic effects of Withdrawals,
1717 Consumptive Uses and Diversions on water supply and flow at Watershed and Basin scales.
1718 These hydrologic effects are presented in the context of Watershed and Basin water budgets, that
1719 is, the flows into and out of each Watershed and the Basin. This assessment presents water
1720 budgets for the Basin as a whole and, separately, for each of the individual Watersheds. These
1721 include the watersheds for Lake Superior, Lakes Michigan-Huron, Lake Erie, Lake Ontario
1722 (collectively, Lakes) and the St. Lawrence River (River). The Basin water budget is an
1723 accounting of water flows into and out of the Basin. Some of these flows are natural and some
1724 are constructed or affected by humans. Withdrawals, Consumptive Uses and Diversions are part
1725 of the water budget. All of the flows vary from year to year, either due to natural variability in
1726 climate or due to human activities.”
1727

1728 It was also noted in that and the following report that “The effects of climate change on water
1729 levels in the Basin are difficult to model due to the uncertainty associated with future climate
1730 scenarios and the uncertainty in the calculation of Basin water budget components. Research
1731 conducted through the IUGLS, which ended in 2012, showed an increasing trend in evaporation
1732 from all of the Lakes since 1948. This was offset to some extent by increased precipitation,
1733 except for Lake Superior. Thus, this research suggested that the net effect on water levels is not
1734 as great as reported in previous studies. In fact, some models predicted an increase in water
1735 levels on Lakes Michigan-Huron, while others predicted a decrease. The study concluded: “In
1736 terms of the limits of the Study’s hydroclimatic analysis, perhaps most notable from the
1737 perspective of effective lake regulation is how little the lake dynamics on inter-annual and
1738 decadal timescales are understood. Despite best efforts, the lake levels remain almost entirely
1739 unpredictable more than a month ahead....Cumulative impact assessments require reliable data
1740 and information regarding the Basin water budget and Consumptive Uses. As noted throughout

1741 this report, much of this data and information has significant uncertainty associated with it.
1742 While work is needed in many areas to improve Basin water budget data and reduce uncertainty,
1743 several specific areas stand out for near-term action:

1744

1745 • Research is needed to improve estimates of Consumptive Use and to improve consistency in
1746 application of Consumptive Use coefficients by the Parties.

1747 • Further work is needed to improve understanding of the impacts of new or increased
1748 withdrawals on flows, associated chemical and biological conditions, as well as on other water
1749 uses at scales from local to regional to Basin.

1750 • Changes to methods to improve calculations of runoff, evaporation from the Lakes, and
1751 precipitation on the Lakes are ongoing at Provincial and federal agencies, and universities. This
1752 research is vital to understanding the natural variability of the Basin water balance and to
1753 assessing potential changes in the future.”

1754

1755 These issues that were identified in the first cumulative impacts were addressed in the most
1756 recent cumulative impact assessment released on June 15, 2023.

1757

1758 The issue of uncertainty was addressed in the 2023 assessment as follows:

1759

1760 “To address these significant uncertainties in the Basin water balance, the University of
1761 Michigan (UM) developed the Large Lake Statistical Water Balance Model (L2SWBM) This
1762 model allows the input of numerous datasets of historical values for the water balance
1763 components, then runs those values through a supercomputer for thousands or even millions of
1764 iterations. In the model, each component value depends on every other value in the water
1765 balance, and in each of its iterations, it validates and adjusts each value, eventually settling on
1766 the most likely estimate of each value with much lower uncertainty. This allows the overall water
1767 balance to be much more accurate in terms of overall water levels, and individual hydrologic
1768 components. This model operates using historical data, or existing data, rather than projections of
1769 future data. The UM work shows that: (1) the L2SWBM can be used to significantly reduce
1770 uncertainty in the water balance (see Table 1 in Supplementary Report) and close the water
1771 balance over various time scales; and (2) as more iterations occur and more data sources are
1772 reconciled, the uncertainty will shrink further. In short—the use of these new models will result
1773 in ever decreasing uncertainty in future iterations of the Cumulative Impact Assessment.”

1774

1775 With regard to climate change, the 2023 assessment notes that:

1776

1777 [The University of Michigan] also compared trends in the historical data to some existing climate
1778 change scenarios in the academic literature. As part of that comparison, the past impacts of
1779 climate change on the water balance and the likely future impacts were examined, resulting in a
1780 review of both long-term averages and seasonal variation. A series of statistical methods were
1781 used to analyze the outputs of the L2SWBM model in order to attempt to find trends in the
1782 historical record for precipitation, evaporation, runoff, and outflow between the Great Lakes.
1783 Using methods like segmented regression and smooth moving averages, the team was able to
1784 filter out some extreme values and highlight long-term trends, as well as more recent short term
1785 deviations. For example, there has been a dramatic increase in precipitation in Lake Superior
1786 over the last two decades, especially since 2013. All the Great Lakes showed change points, or
1787 markers of a shift upwards in mean, for precipitation around the year 2010.”

1788

1789 To summarize:

- 1790 1. In the initial assessments challenges for completing a comprehensive cumulative impact
1791 assessment were identified, including data uncertainties and the impacts of climate
1792 change on the water budget; and,
- 1793 2. Working with University partners, those issues were addressed in follow up cumulative
1794 impact assessments.

1795
1796 It was also recognized that this was not “the end of the road” and there are ongoing needs for
1797 improvement. By expressly identifying them in the cumulative impact assessment, the Regional
1798 Body/Compact Council has been announcing to the research community their priorities. For
1799 example, in the 2023 cumulative impact assessment, it was stated that:

1800
1801 “...with the potential for changes in the growing season due to changes in the climate, the
1802 forecasting of the demand by the agricultural sector may be of particular interest as the region’s
1803 water managers work to ensure that water is available for such uses. However, it was determined
1804 that the tools necessary to complete such a forecast are not available at this point in time.”

1805
1806 To that end, there are already ongoing efforts to address this issue and the other issues identified
1807 in the cumulative impact assessment, though they make take some time to fully address.

1808
1809 In addition, a Regional Body/Compact Council Science Team was formed several years ago.
1810 Meeting at least twice a year, the Science Team hosts a series of presentations and discussions on
1811 issue of interest to the Science Team members. Recordings of some of the presentations can be
1812 found at <https://www.glsregionalbody.org/program-areas/science-and-research/#tab--webinars>.

1813
1814 Finally, the Regional Body/Compact Council have adopted a science strategy most recently
1815 updated in 2024. The science strategy can be found at
1816 <https://www.glsregionalbody.org/media/plufgrbh/rb-cc-science-strategy-2019.pdf>.

1817
1818 Priorities identified in the science strategy include:

- 1819
1820 2025: Agricultural water use and water efficiency
- 1821 2026: Quantifying Groundwater resources in the Great Lakes St. Lawrence River Basin
- 1822 2027: Projecting water demands and cumulative impacts by water use sector
- 1823 2028: Tools for identifying drought and triggering drought response
- 1824 2029: Updates to the Science Strategy

1825
1826 ***Recommendation 7:*** Great Lakes states and provinces should fully factor the adverse ecological
1827 and water quality impacts of groundwater withdrawals into both water use permitting
1828 procedures and decisions regarding consumptive use. Great Lakes states and provinces should
1829 identify where groundwater levels are continuing to decline and recommend management
1830 strategies for stabilizing groundwater levels. Federal, state and provincial research should
1831 continue to improve mapping and understanding groundwater aquifers in the basin, determining
1832 where groundwater supplies may be degraded in the future, identifying management methods for
1833 avoiding these problems, and achieving an improved understanding of the relationship among
1834 land uses and groundwater and surface water quality and stream habitat.

1835

1836 As much of this work would be done by the individual States and Provinces, I can't speak to the
1837 details of the work that has been completed or ongoing. Much of the terms of the Compact are
1838 implemented by the individual States and Provinces.

1839

1840 Groundwater research has been identified as a priority in the Regional Body/Compact Council
1841 Science Strategy. Specifically, Section 2.2 of the strategy states that:

1842

1843 “Groundwater is an important element of the water budget and for maintaining chemical,
1844 physical, and biological integrity of the Great Lakes Basin. Direct groundwater discharge to the
1845 Great Lakes is a small proportion of the overall water budget, however indirect groundwater
1846 discharge to Great Lakes tributary streams is a significant portion of the streamflow in many
1847 Basin tributaries. Groundwater discharge at the local scale is also responsible for maintaining
1848 streamflow and inland lake levels, particularly during the summer and fall months and during
1849 droughts (Grannemann G, Van Stempvoort D. (Eds.), 2016). Groundwater discharge at the local
1850 scale is also linked to supporting aquatic ecosystems and groundwater serves as an important
1851 resource for drinking water supply, agricultural irrigation, and industrial use across the basin.
1852 Our understanding of the availability and extent of groundwater resources stored and flowing
1853 through aquifer systems across the Great Lakes Basin is comprehensive in some locations, but
1854 can be improved in others. Additionally, it is well understood that groundwater – surface water
1855 are closely linked in many aquifer systems. However, the details of how to evaluate the impacts
1856 of a specific groundwater withdrawal on a specific water resource are an area of active research,
1857 and there is a need to better understand the contributions of groundwater at a basin-wide scale.
1858 This information is critical in determining whether water is available and sustainable in the Great
1859 Lakes Basin to meet demands for drinking water, agricultural, industrial, and other uses, and to
1860 support healthy ecosystems (IJC, 2018). The identification and delineation of gaining and losing
1861 reaches of major Great Lakes tributaries is both critical to understanding groundwater – surface
1862 water interactions and especially challenging given the dynamic nature of these processes. As
1863 part of the water budget used in the cumulative impact assessment, indirect groundwater
1864 discharge is captured in the calculations of tributary surface water discharges to the Great Lakes.
1865 A more refined understanding of the geography of the groundwater – surface water dynamic
1866 along these tributaries is needed to better assess the proportion and origin of indirect
1867 groundwater discharge as part of the overall tributary discharge to the Great Lakes. Direct
1868 groundwater discharge to the Great Lakes has not been included to date due to limited estimates
1869 available. When estimates of direct groundwater discharge have been made, it is a relatively
1870 small component of the Great Lakes water budget and is less than the uncertainty associated with
1871 major inflows and outflows of the Great Lakes (Feinstein, 2010). A continually improved
1872 understanding of groundwater flow to the Great Lakes and tributaries, and groundwater – surface
1873 water interactions is needed to better determine what type of water management is needed.
1874 Furthermore, understanding of regional groundwater flow patterns is important to assess Intra-
1875 Basin Transfer and Diversion proposals and meet the Agreement/Compact requirements. These
1876 requirements include evaluating water supply alternatives as there can be a potential for
1877 groundwater outside of the topographical Great Lakes Basin to have a hydrogeological
1878 connection to Waters of the Basin.”

1879

1880 By identifying such priorities, the States and Provinces are using their collective platform to
1881 educate the research community on the collective priorities.